Scientific and Technical Aerospace Reports

STAR

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National Aeronautics and Space Administration
Langley Research Center

Scientific and Technical Information Program Office

NASA STI Program ... in Profile

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20020081288 NASA Glenn Research Center, Cleveland, OH USA
Computing Jet Screech: A Complex Aeroacoustic Feedback System
Loh, Ching Y., Taitech, Inc., USA; Hultgren, Lennart S., NASA Glenn Research Center, USA; August 2002; 11p; In English; Second International Conference on Computational Fluid Dynamics, 15-19 Jul. 2002, Sydney, Australia; Sponsored by NASA, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-90-43
Report No.(s): NASA/TM-2002-211807; E-13502; NAS 1.15:211807; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The space-time conservation-element and solution-element method is employed to numerically study the near-field axisymmetric screech-tone noise of a typical underexpanded circular jet issuing from a sonic nozzle. For the computed case, corresponding to a fully expanded Mach number of 1.19, the self-sustained feedback loop is established without artificial means. The computed shock-cell structure, acoustic wave length, screech tone frequency, and sound pressure levels are in good agreement with existing experimental results
Author
Aeroacoustics; Feedback; Numerical Analysis; Screech Tones; Noise (Sound); Sound Waves

20020082922 NASA Glenn Research Center, Cleveland, OH USA
Fan Noise Source Diagnostic Test: Far-Field Acoustic Results
Woodward, Richard P., NASA Glenn Research Center, USA; Hughes, Christopher E., NASA Glenn Research Center, USA; Jeracki, Robert J., NASA Glenn Research Center, USA; Miller, Christopher J., NASA Glenn Research Center, USA; May 2002; 30p; In English; Eighth Aeroacoustics Conference, 17-19 Jun. 2002, Breckenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS3-26617; NAS3-98004; RTOP 781-30-11
Report No.(s): NASA/TM-2002-211591; E-13348; NAS 1.15:211591; AIAA Paper 2002-2427; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A comprehensive model fan source diagnostic test was conducted in the NASA Glenn Research Center 9 x 15 Low Speed Wind Tunnel. Far field acoustic data were acquired at 0.10M, which is representative of aircraft approach/takeoff conditions. Concurrent data (reported elsewhere) were taken to quantify the radiating modal field, rotor wake characteristics (laser-Doppler velocimeter), and detailed aerodynamic performance measurements, thus giving a comprehensive view of the fan noise-generation mechanisms. This report presents an overview of the far-field acoustic results for this fan test. The research fan hardware consisted of two rotors and three stator sets. Far-field acoustic results are presented which show the effect of rotor blade loading and wake distribution, stator vane number (cuton and cutoff for the rotor BPF tone) and stator sweep. The cuton swept stator was typically the quietest stator configuration. A Rotor-Alone Nacelle (RAN) configuration (with no downstream stator) was also tested in which the nacelle was externally supported and actively centered on the rotor. Acoustic results showed that designing for a higher rotor speed but with reduced blade unit area loading may significantly reduce overall fan stage noise, especially at subsonic rotor tip speeds. The RAN results showed that stator-induced noise might account for 4 or more EPNdB

at lower fan speeds. Acoustic results are presented in terms of fly over effective perceived noise and sound power level. An analysis code was used to show the acoustic effect of selectively removing the fundamental BPF tone and all harmonics thereof. Significant noise benefits may be realized with active noise control and/or tuned duct liners to reduce the fundamental BPF tone near the rotor transonic condition.
Author
Acoustic Properties; Fan Blades; Far Fields; Rotor Dynamics; Aerodynamic Configurations; Aircraft Noise

20020082937 NASA Glenn Research Center, Cleveland, OH USA
Spiral Bevel Gear Damage Detection Using Decision Fusion Analysis
Dempsey, Paula J., NASA Glenn Research Center, USA; Handschuh, Robert F., Army Research Lab., USA; Afjeh, Abdollah A., Toledo Univ., USA; August 2002; 12p; In English; Fifth International Conference on Information Fusion, 8-11 Jul. 2002, Annapolis, MD, USA; Sponsored by International Society of Information Fusion, USA
Contract(s)/Grant(s): DA Proj. 1L1-62211-A-47-A; RTOP 728-30-10
Report No.(s): NASA/TM-2002-211814; NAS 1.26:211814; E-13356; ARL-TR-2744; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A diagnostic tool for detecting damage to spiral bevel gears was developed. Two different monitoring technologies, oil debris analysis and vibration, were integrated using data fusion into a health monitoring system for detecting surface fatigue pitting damage on gears. This integrated system showed improved detection and decision-making capabilities as compared to using individual monitoring technologies. This diagnostic tool was evaluated by collecting vibration and oil debris data from fatigue tests performed in the NASA Glenn Spiral Bevel Gear Fatigue Rigs. Data was collected during experiments performed in this test rig when pitting damage occurred. Results show that combining the vibration and oil debris measurement technologies improves the detection of pitting damage on spiral bevel gears.
Author
Detection; Pitting; Spiral Bevel Gears; Vibration; Damage Assessment; Systems Health Monitoring; Multisensor Fusion

20020082941 NASA Glenn Research Center, Cleveland, OH USA
Fan Noise Source Diagnostic Test: Tone Modal Structure Results
Heidelberg, Laurence J., NASA Glenn Research Center, USA; May 2002; 24p; In English; Eighth Aeroacoustics Conference, 17-19 Jun. 2002, Breckenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS3-00170; NAS3-26617; RTOP 781-30-11
Report No.(s): NASA/TM-2002-211594; NAS 1.15:211594; E-13378; AIAA Paper 2002-2428; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This investigation is part of a test series that was extremely comprehensive and included aerodynamic and acoustic testing of a fan stage using two different fan rotors and three different stator designs. The test series is known as the Source Diagnostic Test (SDT) and was conducted by NASA Glenn as part of the Advanced Subsonic Technology (AST) Noise Reduction Program. Tone mode measurements of one of the rotors with three different stators were made. The stator designs involve changes in vane count and sweep at constant solidity. The results of both inlet and exhaust tone mode measurements are presented in terms of mode power for both circumferential and radial mode orders. The results show benefits of vane sweep to be large, up to 13 dB in total tone power. At many conditions, the increase in power due to cutting on the rotor/stator interaction is more than offset by vane sweep. The rotor locked mode is shown as an important contributor to tone power when the blade tip speed is near and above Mach one. This is most evident in the inlet when the direct rotor field starts to cut on.
Author
Aerodynamic Noise; Blade Tips; Vanes; Wind Tunnel Tests; Noise Reduction; Fan Blades; Aerodynamic Characteristics; Rotors

20020083024 Air Command and Staff Coll., Maxwell AFB, AL USA
C-130 Programmed Depot Maintenance
Daniels, John A.; Feb. 1998; 33p; In English
Report No.(s): AD-A405792; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The current USAF process for establishing C-130 PDM intervals does not account for the wide range of aircraft variables within each aircraft MDS. This paper develops an analytical model that C-130 maintainers can use to forecast when a C-130 aircraft requires PDM. The model is based on five unique aircraft variables: (1) aircraft age, (2) total flying hours, (3) average yearly flying hours, (4) mission profile (expressed as a severity factor), and (5) operating location of the aircraft. Interviews with C-130 SPO personnel, combined with use of the C-130 Service Life Data Base, provided the required data for developing the

C-130 PDM interval model. The C-130 PDM interval model developed in this paper allows maintainers and operators to predict the optimum time between C-130 PDM activities. It eliminates the requirement to base PDM intervals on aircraft MDS. As a result, there is a potential for significant savings by deferring PDM for a portion of the C-130 fleet. Finally, the PDM interval model developed in this paper may be applicable for other Department of Defense aircraft for which MDS is used as the determinant of PDM intervals.
DTIC
Aircraft Maintenance; C-130 Aircraft; Service Life; Maintenance; Data Bases; Armed Forces

20020083065 Missouri Univ., Rolla, MO USA
NASA/DERA Collaborative Program ***Final Report***
Whitefield, Phillip D., Missouri Univ., USA; Hagen, Donald E., Missouri Univ., USA; Wormhoudt, Jody C., Aerodyne Research, Inc., USA; Miake-Lye, Richard C., Aerodyne Research, Inc., USA; Brundish, Kevin, Defence Evaluation Research Agency, UK; Wilson, Christopher W., Defence Evaluation Research Agency, UK; September 2002; 82p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-98102; NAG3-2179; NAG3-2185; RTOP 714-01-20; DA Proj. 1L1-62211-A-47-A
Report No.(s): NASA/CR-2002-211899; E-13586; NAS 1.26:211899; ARL-CR-0509; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report is an interim report. The work reported are the results from the combustor testing, the first phase of testing in the DERA/NASA collaborative program. A program of work was developed by DERA and NASA utilizing specialist facilities within the UK, and specialist measurement techniques developed within the U.S. Under a Memorandum of Understanding (MoU) between the UK and U.S. governments, the joint UK/U.S. funded program commenced. The objective of the program was to make combustor and engine exit plane emissions measurements, including particulate and sulphur measurements, for kerosene fuels with different sulphur levels. The combustor test program was performed in August/September 2000. Although probe issues complicated the test program, a consistent set of data, including CO, NO(x), NO, NO2, CO2, O2, smoke number, particulate number density and size distribution, SO2, SO3 and HONO were collected at the exit plane of the DERA TRACE engine combustor. A second probe was utilized to measure spatial location of CO, NO(x), NO, NO2 and CO2 concentrations. Data are therefore available for development of aerosol, particulate and aerosol precursor chemistry sub-models for inclusion into CFD. Inlet boundary conditions have been derived at the exit of the combustion system for the modelling of the DERA TRACE engine. The second phase of the program is to perform identical measurements at the engine exit, to allow a full data set to be available. This will be performed in July 2001 at the Glenn test facility, DERA Pyestock.
Author
Combustion Chambers; Flow Measurement; Turbines; Aerosols; Carbon Dioxide Concentration; Exhaust Emission; Size Distribution

20020083066 Missouri Univ., Rolla, MO USA
NASA/QinetiQ Collaborative Program ***Final Report***
Whitefield, Phillip D., Missouri Univ., USA; Hagen, Donald E., Missouri Univ., USA; Wormhoudt, Jody C., Aerodyne Research, Inc., USA; Miake-Lye, Richard C., Aerodyne Research, Inc., USA; Wilson, Christopher, QinetiQ Ltd., UK; Brundish, Kevin, QinetiQ Ltd., UK; Waitz, Ian, Massachusetts Inst. of Tech., USA; Lukachko, Stephen, Massachusetts Inst. of Tech., USA; Yam, Chi Kin, Massachusetts Inst. of Tech., USA; September 2002; 194p; In English; Original contains color illustrations
Contract(s)/Grant(s): NASA Order C-74791-N; NAG3-98102; NAG3-2179; RTOP 714-01-20; DA Proj. 1L1-62211-A-47-A
Report No.(s): NASA/CR-2002-211900; E-13587; NAS 1.26:211900; ARL-CR-0508; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This report details the measurements performed at the exit of the combustor and the engine, and the modelling of the hot section (turbine and jet pipe) of the engine. Under a Memorandum of Understanding (MoU) between the U.K. and U.S. governments, the joint U.K./U.S. funded program commenced. The objective of the program was to make combustor and engine exit plane emissions measurements, including particulate and sulphur measurements, for kerosene fuels with different sulphur levels. The emissions measurements were to be utilized to develop and validate combustion models, with the ultimate aim of improving the prediction of aviation effects on the environment. The combustor exit plane emissions were to be used as inlet boundary conditions for modelling the effects of the hot section (turbine and jet pipe) of the gas turbine on gaseous and aerosol composition. The engine exit plane emissions were to be used for validation for modelling. The combustor test program was performed in August/September 2000. The second and final phase of the program was performed in July 2001 at the Glenn Test Facility, QinetiQ Pyestock. Operating conditions were established that enabled a good match of the combustor inlet and outlet conditions for both the combustor and engine tests. A set of data, including CO, NO(x), NO, NO2, CO2 O2, smoke number,

particulate number density and size distribution, So2 and HONO were collected at the exit plane of the QinetiQ TRACE engine. In both test programs, although considerable effort was expended in attempting to measure SO3, only an upper limit for detection was obtained.
Author
Engine Tests; Exhaust Emission; Flow Measurement; Particle Emission; Turbines; Combustion Chambers; Combustion Physics; Size Distribution

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also 34 Fluid Mechanics and Heat Transfer.

20020080990 QSS Group, Inc., Cleveland, OH USA
User Manual for the NASA Glenn Ice Accretion Code LEWICE, 2.2.2 ***Final Report***
Wright, William B., QSS Group, Inc., USA; August 2002; 425p; In English
Contract(s)/Grant(s): NAG3-00145; RTOP 708-20-13
Report No.(s): NASA/CR-2002-211793; E-13488; NAS 1.26:211793; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

A research project is underway at NASA Glenn to produce a computer code which can accurately predict ice growth under a wide range of meteorological conditions for any aircraft surface. This report will present a description of the code inputs and outputs from version 2.2.2 of this code, which is called LEWICE. This version differs from release 2.0 due to the addition of advanced thermal analysis capabilities for de-icing and anti-icing applications using electrothermal heaters or bleed air applications. An extensive effort was also undertaken to compare the results against the database of electrothermal results which have been generated in the NASA Glenn Icing Research Tunnel (IRT) as was performed for the validation effort for version 2.0. This report will primarily describe the features of the software related to the use of the program. Appendix A of this report has been included to list some of the inner workings of the software or the physical models used. This information is also available in the form of several unpublished documents internal to NASA. This report is intended as a replacement for all previous user manuals of LEWICE. In addition to describing the changes and improvements made for this version, information from previous manuals may be duplicated so that the user will not need to consult previous manuals to use this code.
Author
Deicers; Computer Programs; User Manuals (Computer Programs); Ice Formation; NASA Programs; Aircraft Icing

20020081290 NASA Glenn Research Center, Cleveland, OH USA
An Evaluation of Parameters Influencing Jet Mixing Using the WIND Navier-Stokes Code
Dembowski, Mary Ann, NASA Glenn Research Center, USA; Georgiadis, Nicholas J., NASA Glenn Research Center, USA; August 2002; 23p; In English
Contract(s)/Grant(s): RTOP 708-90-43
Report No.(s): NASA/TM-2002-211727; E-13478; NAS 1.15:211727; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The WIND code, a Reynolds-averaged Navier-Stokes solver used for a variety of aerospace flow simulations, was investigated for a Mach 2 nozzle at a series of nozzle stagnation temperatures. Comparisons of WIND calculations are made to experimental measurements of axial velocity, Mach number, and stagnation temperature along the jet centerline. The primary objective was to investigate the capabilities of the two-equation turbulence models available in WIND, version 4.0, for the analysis of heated supersonic nozzle flows. The models examined were the Menter Shear Stress Transport (SST) model and the Chien k-epsilon model, with and without the compressibility correction due to Sarkar. It was observed that all of the turbulence models investigated produced solutions that did not agree well with the experimental measurements. The effects of freestream Mach number and turbulent Prandtl number specifications were also investigated.
Author
Jet Mixing Flow; Navier-Stokes Equation; Nozzle Flow; Turbulence Models; Turbulent Mixing; Supersonic Nozzles; Applications Programs (Computers)

20020081335 NASA Glenn Research Center, Cleveland, OH USA

On Hammershock Propagation in a Supersonic Flow Field

Porro, A. Robert, NASA Glenn Research Center, USA; Julu 2002; 16p; In English; 23rd Congress of the International Council of the Aeronautical Sciences, 8-13 Sep. 2002, Toronto, Canada; Sponsored by International Council of the Aeronautical Sciences, Sweden; Original contains color illustrations

Contract(s)/Grant(s): RTOP 708-90-43

Report No.(s): NASA/TM-2002-211717; NAS 1.15:211717; E-13469; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A wind tunnel test program was conducted to acquire flow-field data during a supersonic propulsion system compressor stall and inlet unstart sequence. The propulsion system consisted of a mixed-compression, two-dimensional bifurcated inlet coupled to a General Electric J85-13 turbojet engine. The propulsion system was mounted beneath a large flat plate that simulated an underwing propulsion pod installation. Transient flow-field pitot pressure and wing simulator surface static pressure data were acquired during multiple compressor stall and inlet unstart events at a free-stream Mach number of 2.20. The experimental results obtained in this investigation indicate that a supersonic propulsion system compressor stall-inlet unstart transient event adversely affects the surrounding local flow field. The data show that the stall-unstart event affects the surrounding flow field on a millisecond time scale and causes a three-dimensional expanding wave front called a hammershock to propagate outward from the inlet. The flow nearest the wing simulator separates from the surface during the transient event. At the end of the transient event, a distinct process occurs wherein the affected flow field recovers to free-stream conditions and the wing simulator boundary layer reattaches to the flow surface.

Author

Wind Tunnel Tests; Flight Simulation; Flow Distribution; Jet Propulsion; Rotating Stalls; Shock Fronts; Data Acquisition

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety; and 85 Technology Utilization and Surface Transportation.

20020080802 General Accounting Office, Washington, DC USA

Aviation Safety: Better Guidance and Training Needed on Providing Files on Pilots' Background Information

Aug. 2002; 138p

Report No.(s): PB2003-100281; GAO-02-722; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

In 1996, Congress enacted the Pilot Records Improvement Act to keep unsafe pilots out of the cockpits of commercial aircraft. GAO did this study to determine (1) whether air carriers have complied with the act by requesting and receiving key documents about pilots' qualifications, performance, and training from the Federal Aviation Administration (FAA), the National Driver Register (NDR), and other carriers and whether these documents have been provided on time; (2) whether carriers are aware of requirements for protecting pilots' rights; (3) what FAA has done to oversee compliance with the act; and (4) whether carriers believe the act has helped them make pilot-hiring decisions.

NTIS

Pilots (Personnel); Aerospace Safety

20020080851 Civil Aerospace Medical Inst., Oklahoma City, OK USA

Access-to-Egress I: Interactive Effects of Factors That Control the Emergency Evacuation of Naive Passengers Through the Transport Airplane Type-III Overwing Exit ***Final Report***

McLean, Garnet A., Civil Aerospace Medical Inst., USA; Corbett, Cynthia L., Civil Aerospace Medical Inst., USA; Larcher, Kenneth G., Civil Aerospace Medical Inst., USA; McDown, Jerry R., Civil Aerospace Medical Inst., USA; Palmerton, David A., Civil Aerospace Medical Inst., USA; Shaffstall, Robert M., Civil Aerospace Medical Inst., USA; Odom, Rita S., Advancia Corp., USA; August 2002; 40p; In English

Contract(s)/Grant(s): AM-B-01-PRS-93

Report No.(s): DOT/FAA/AM-02/16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Simulated emergency evacuations were conducted from a narrow-body transport airplane simulator through a Type-III swarming exit. The independent variables were passageway configuration, hatch disposal location, subject group size, and subject

group motivation level. Additional variables of interest included individual subject characteristics, i.e., gender, age, waist size, and height, all of-which had been shown in previous studies to significantly affect emergency egress. Participants were restricted to those who had no previous emergency evacuation (research) history. The dependent variables of interest included hatch operation time and the time for individual subjects to egress. Evacuation trials were conducted, with 48 groups of either 30, 50, or 70 subjects per group, for a total of 2,544 subject participants. Each subject group completed 4 evacuation trials, totaling 192 evacuations. Results reported for hatch operation time include data from all trials, since each trial had a different, naive hatch operator. The egress time results include data only from each group's first evacuation trial in which every subject was naive. Significant main effects of hatch disposal location on both Exit-Ready-to-Use Time (p less than .004) and First-Person-Out Time (p less than .008) were revealed, without effects of the other variables. Significant main effects on individual subject egress time were found for waist size (p less than .0001), gender (p less than .0001), and age (p less than .0001). A small, but significant, main effect was also found for passageway configuration (p less than .001), which was confounded by improper hatch disposal and a between-groups imbalance in individual subject characteristics. This situation produced a significant (4-way) passageway configuration by hatch disposal location by subject group density by subject group motivation level interaction effect (p less than .008). The findings replicate prior research showing that passageway configuration has only minimal effects on emergency egress, as long as ergonomic minimums are respected. In contrast, differences in the physical characteristics of individual subjects produce large differences in emergency evacuation performance, as does subject naivete.
Author
Egress; Emergencies; Passengers; Simulators; Swarming; Hatches

20020080864 American Airlines, Inc., Dallas, TX USA
Airline Operations Aid
Spinoff 1993; 1993, pp. 88; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

C Language Integrated Production System (CLIPS), a NASA-developed expert systems program, is used by American Airlines for three purposes: as a rapid prototyping tool; to develop production prototypes; and to develop production application. An example of the latter is CLIPS' use in "Hub S1AAshing," a knowledge based system that recommends contingency plans when severe schedule reductions must be made. Hub S1AAshing has replaced a manual, labor intensive process. It saves time and allows Operations Control Coordinators to handle more difficult situations. Because the system assimilates much of the information necessary to facilitate educated decision making, it minimizes negative impact in situations where it is impossible to operate all flights.
Author
Airline Operations; C (Programming Language); Knowledge Based Systems; Rapid Prototyping

20020080880 General Accounting Office, Washington, DC USA
National Airspace System: Status of FAA's Standard Terminal Automation Replacement System
Sep. 2002; 24p
Report No.(s): PB2002-109153; GAO-02-1071; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Since September 1996, the Federal Aviation Administration (FAA) has been developing the Standard Terminal Automation Replacement System (STARS) project to replace the outdated computer equipment that air traffic controllers currently use in some facilities to control air traffic within 5 to 50 nautical miles of an airport. Persuant to a Congressional request, this report addresses the following questions: How do the currently projected cost and deployment schedule for STARS compare with the original cost and schedule. How often has FAA changed its approved estimates. How has FAA responded to the Department of Transportation Inspector General's concerns about the agency's plans for deploying STARS in Philadelphia. What has been the impact of changes in the schedule for deploying STARS.
NTIS
National Airspace System; Computers; Air Traffic Control; Upgrading

20020080962 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA
Reduced Approach Lighting Systems (ALS) Configuration Simulation Testing *Final Report*
Gallagher, D. W.; Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-109173; No Copyright; Avail: National Technical Information Service (NTIS)

The availability of Global Positioning System (GPS) approaches has already increased the number of runways capable of handling Instrument Flight Rule (IFR) approach operations. A major factor in upgrading the instrument capability of these

runways is, and will remain, the need for installation of many new approach lighting systems (ALS). Therefore, it has become necessary to re-evaluate the present standard systems to identify possible means by which installation, operation, and maintenance costs can be reduced. In an effort to reduce the overall length of ALS's, this report describes the methods, using simulation, by which the minimum visual cues with respect to length of an ALS is needed by pilots during an approach at Category I minimums. The current US standard is the 2400-foot-long Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). Subject pilots evaluated ten different length configurations and were given questionnaires for each configuration flown.
NTIS
Landing Aids; Runway Lights; Visual Aids; Aircraft Landing

20020081040 Search Technology, Inc., Norcross, GA USA
Aircraft Icing Weather Data Reporting and Dissemination System ***Final Report***
Bass, Ellen J., Search Technology, Inc., USA; Minsk, Brian, Search Technology, Inc., USA; Lindholm, Tenny, National Center for Atmospheric Research, USA; Politovich, Marcia, National Center for Atmospheric Research, USA; August 2002; 73p; In English; Original contains color illustrations
Contract(s)/Grant(s): NASA Order C-74790-N; RTOP 708-20-13
Report No.(s): NASA/CR-2002-211800; E-13495; NAS 1.26:211800; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The long-term operational concept of this research is to develop an onboard aircraft system that assesses and reports atmospheric icing conditions automatically and in a timely manner in order to improve aviation safety and the efficiency of aircraft operations via improved real-time and forecast weather products. The idea is to use current measurement capabilities on aircraft equipped with icing sensors and in-flight data communication technologies as a reporting source. Without requiring expensive avionics upgrades, aircraft data must be processed and available for downlink. Ideally, the data from multiple aircraft can then be integrated (along with other real-time and modeled data) on the ground such that aviation-centered icing hazard metrics for volumes of airspace can be assessed. As the effect of icing on different aircraft types can vary, the information should be displayed in meaningful ways such that multiple types of users can understand the information. That is, information must be presented in a manner to allow users to understand the icing conditions with respect to individual concerns and aircraft capabilities. This research provides progress toward this operational concept by: identifying an aircraft platform capable of digitally capturing, processing, and downlinking icing data; identifying the required in situ icing data processing; investigating the requirements for routing the icing data for use by weather products; developing an icing case study in order to gain insight into major air carrier needs; developing and prototyping icing display concepts based on the National Center for Atmospheric Research's existing diagnostic and forecast experimental icing products; and conducting a usability study for the prototyped icing display concepts. Author
Aircraft Icing; Aircraft Safety; Data Processing; Data Systems; Flight Safety; Aircraft Hazards; In Situ Measurement; Meteorological Parameters; Flight Conditions

20020082986 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
A "SMART" Approach to VV&A
Muessig, Paul R.; Aug. 2001; 17p; In English; Original contains color images
Report No.(s): AD-A405923; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Susceptibility Model Assessment and Range Test (SMART) Project was commissioned in FY92 to develop test and transition to DoD (Department of Defense) a proven and efficient credibility assessment process for joint-use aircraft survivability models and simulations (M&S) currently supporting major weapons system acquisition and testing decisions. SMART is sponsored by the Joint Technical Coordinating Group for Aircraft Survivability (JTCG/AS) is funded by OUSD(A&T) DT&E and enjoys tri-service participation and support. It is scheduled for completion in FY95. SMART integrates the key elements of M&S credibility (verification and validation (V&V) and configuration management (C/M)) into a process that provides essential information to decision-makers and analysts to support accreditation decisions for survivability M&S. This paper describes the development history of the SMART V&V and C/M processes for these M&S, and the integration of this process into an attack on the accreditation problem. Although focused on V&V and C/M process development for mature aircraft survivability M&S the approach taken and the lessons learned should be of broad interest to all who struggle with the M&S credibility problem.
DTIC
Computerized Simulation; Program Verification (Computers); Aircraft Survivability

20020082998 Naval Postgraduate School, Monterey, CA USA

What Practices in Airport Security Should the USA Implement at Commercial Airports in Light of the Events of September 11, 2001?

CHurchward, Charles E.; Jun. 2002; 97p; In English; Original contains color images

Report No.(s): AD-A406042; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The terrorist attacks of September 11, 2001 changed forever the way America views its everyday safety, as well as the safety of how we travel. The USA government took swift and dramatic action to change civil aviation security with the passing of the Aviation Transportation and Security Act (ATSA) of 2001. In the months following the attacks, politicians and the media made their viewpoints known while civil aviation security professionals have been unheard. The objective of this thesis is to ascertain the best practices and recommendations of these stakeholders to provide the highest level of security at our nations airports. to gather these data, the researcher conducted on-site interviews of these professionals. The study reveals civil aviation was not adequately prepared for the terrorist attacks of September 11. Congressional mandates of the ATSA have driven government's behavior. The lack of aviation experience of senior leadership and its top-down approach has alienated stakeholders. Other key government issues include funding constraints, potential complacency and conflicts of interest.

DTIC

Civil Aviation; Airports; Terrorism; Airport Security

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications; Spacecraft Communications, Command and Tracking, and 32 Communications and Radar.

20020080743 NASA Goddard Space Flight Center, Greenbelt, MD USA

Assimilation Experiments of One-Dimensional Variational Analyses with GPS/MET Refractivity

Poli, Paul, Maryland Univ. Baltimore County, USA; Joiner, Joanna, NASA Goddard Space Flight Center, USA; [2002]; 8p; In English; CHAMP First Science Meeting, 21-25 Jan. 2002, Potsdam, Germany; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The GPS/MET 1995 experiment demonstrated the feasibility of remote soundings of the Earth's atmosphere using the GPS radio occultation technique. Subsequent studies assessed the information content of such measurements. Several groups have attempted to assimilate the GPS radio occultation measurements into a global Data Assimilation System (DAS). These attempts followed in general the methodology proposed by Eyre, and range from die act four-dimensional variational assimilation of bending angles to assimilation of inverted profiles of temperature and/or humidity. We present here an hybrid approach. We attempted to take advantage of the accuracy of current, weather models to constrain one-dimensional variational analyses using GPS refractivity. Retrieved profiles of atmospheric parameters were then assimilated like other types of observations in a global DAS for issuing the next forecast period.

Author

Global Positioning System; Radio Occultation; Meteorological Parameters; Sounding; Assimilation; Atmospheric Models

20020080961 Federal Aviation Administration, Cambridge, MA USA

Federal Radionavigation Systems for 2001 ***Final Report, Jan. 00 - Dec. 01***

Dec. 2001; 130p; In English

Report No.(s): PB2003-100309; DOD-4650.5; DOT/VNTSC/RSPA-01-3.1; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This edition of Federal Radio navigation Systems (FRS) updates and replaces sections in the 1999 Federal Radio navigation Plan (FRP) relating to Government roles and responsibilities, system selection considerations, civil user requirements, and systems descriptions. The FRS is jointly prepared by the Department of Transportation (DOT) and the Department of Defense (DoD), and will be updated as necessary. Inputs for the next edition of this document are welcome. Interested parties and advisory groups from the private sector are invited to submit their inputs to the Chairman of the DOT Positioning and Navigation (POS/NAV) Working Group (Attn: OST/P-7), Department of Transportation, Office of the Assistant Secretary for Transportation Policy, Washington, D.C. 20590. The FRS covers common-use radio navigation systems (i.e., systems used by both civil and military sectors). These systems are sometimes used in combination with each other or with other systems. Systems used exclusively by the military are covered in the Chairman, Joint Chiefs of Staff (CJCS) Master Positioning, Navigation, and Timing

Plan (MPNTP). Privately operated radio navigation systems may be discussed in order to provide a complete picture of U.S. radio navigation. The document does not include systems that mainly perform surveillance and communication functions.
NTIS
Radio Navigation; Civil Aviation

20020082947 NASA Glenn Research Center, Cleveland, OH USA
Real-Time In Situ Signal-to-Noise Ratio Estimation for the Assessment of Operational Communications Links
Manning, Robert M., NASA Glenn Research Center, USA; August 2002; 17p; In English
Contract(s)/Grant(s): RTOP 727-01-10
Report No.(s): NASA/TM-2002-211703; E-13448; NAS 1.15:211703; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The work presented here formulates the rigorous statistical basis for the correct estimation of communication link SNR of a BPSK, QPSK, and for that matter, any M-ary phase-modulated digital signal from what is known about its statistical behavior at the output of the receiver demodulator. Many methods to accomplish this have been proposed and implemented in the past but all of them are based on tacit and unwarranted assumptions and are thus defective. However, the basic idea is well founded, i.e., the signal at the output of a communications demodulator has convolved within it the prevailing SNR characteristic of the link. The acquisition of the SNR characteristic is of the utmost importance to a communications system that must remain reliable in adverse propagation conditions. This work provides a correct and consistent mathematical basis for the proper statistical 'deconvolution' of the output of a demodulator to yield a measure of the SNR. The use of such techniques will alleviate the need and expense for a separate propagation link to assess the propagation conditions prevailing on the communications link. Furthermore, they are applicable for every situation involving the digital transmission of data over planetary and space communications links.
Author
Communication Networks; Signal to Noise Ratios; Real Time Operation; Phase Modulation; Phase Shift Keying

20020083246 Army Research Lab., White Sands Missile Range, NM USA
Navigation Through Fog: A Mathematical Analysis of Folded Path Propagation ***Final Report, 1 Oct. 1999-30 Dec. 2000***
Tofsted, David H.; Sep. 2002; 56p; In English
Report No.(s): AD-A406007; ARL-TR-2648; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Wendall Watkins of the U.S. Army Research Laboratory has a currently pending patent, which provides a technique for solving the problem of navigation through fog. This technique entails the use of laser illumination of retroreflective targets on airfield runways, stereo detection of the return signal, and debluming processing of the received imagery. The current analysis attempts a mathematical analysis of this same problem. Here, the propagation equations necessary to model the propagation of a Gaussian beamwave through a forward scattering fog aerosol are developed. Interaction of the propagated wave with a retroreflective material is postulated. and the returned reflected energy is evaluated. Also, backscattered diffuse energy is analyzed. Through this analysis, it should be possible to predict the angular structure of energy returning from a retroreflector embedded within the fog field. It should also be possible to predict the level of diffuse radiation which must be dealt with in order to discriminate between the directly reflected radiation and the diffusely scattered radiation, both in the forward and backward hemispheres.
DTIC
Runways; Navigation Aids; Laser Applications; Fog; Air Navigation; Landing Aids; Aircraft Landing

20020083258 NASA Goddard Space Flight Center, Greenbelt, MD USA
Evaluation of Refractivity Profiles From Champ and SAC-C GPS Radio Occultation
Poli, Paul, NASA Goddard Space Flight Center, USA; Joiner, Joanna, NASA Goddard Space Flight Center, USA; delaTorreJuarez, Manuel, Jet Propulsion Lab., California Inst. of Tech., USA; Hoff, Raymond M., Joint Center for Earth Systems Technology, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The CHAMP and SAC-C missions are the first missions to carry a second-generation 'Blackjack' GPS receiver. One of the new features of this receiver is its ability to sense the lower troposphere closer to the surface than the proof-of-concept GPS/MET 1995 experiment. Since their launch, CHAMP and SAC-C have collected thousands of GPS radio occultations, representing a wealth of measurements available for data assimilation in Numerical Weather Prediction (NWP) models. In order to evaluate the refractivity data derived by JPL from raw radio occultation measurements, we use Data Assimilation Office (DAO) shout forecasts as an independent state of the atmosphere. We compare CHAMP and SAC-C refractivity (processed by JPL) with refractivity calculated from the DAO global fields of temperature, water vapor content and humidity. We will show statistics of

the differences as well as Probability Density Functions (PDFs) of the differences. Depending upon availability of AIRS data, we plan to show individual profile comparisons between GPS radio occultation and AIRS retrievals.
Author
Refractivity; Radio Occultation; Global Positioning System; Receivers

20020083320 Air Force Research Lab., Sensors Directorate, Wright-Patterson AFB, OH USA
Phase Calibration of a 2 by 2 GPS Antenna Array Using Real and Simulated Global Positioning System (GPS) Signals
Liou, L. L.; Tsui, J. B.; Lin, D. M.; Osman, S. L.; Burneka, C. R.; Aug. 2002; 9p; In English
Report No.(s): AD-A405705; AFRL-SN-WP-TP-2002-107; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Software GPS receiver development has been undertaken. We are particularly interested in improving the GPS signal-to-noise/interference ratio using beam forming techniques. The phase relationship among the antenna array elements requires careful calibration. In this study, we will report a phase calibration technique for a 2 by 2 GPS antenna array using both simulated and real GPS signals. This technique is based on the GPS signal-processing algorithm developed for the software GPS receiver. A four-channel digital data collecting system was used in the experiment. For a simulated GPS signal, the experiment was conducted in an anechoic chamber in which a GPS simulation system was facilitated. For real GPS signals, we conducted the experiment on a rooftop to receive the signal from GPS satellites. The calibration verified the coherent nature of the signals among the elements. The results also allowed the source's direction to be determined.
DTIC
Global Positioning System; Computerized Simulation; Antenna Arrays; Navigation Satellites; Signal Processing; Receivers

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20020080791 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden
Guidance of UAV along 4D-Trajectory ***Styrning av UAV Laengs 4D-Trajektoria***
Malmgren, A.; Jan. 2002; 58p; In Swedish
Report No.(s): PB2002-107071; FOA-R-00-01418-517-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this report a previously developed method for guiding a UAV with controlled speed along a trajectory in the 3-dimensional space is presented. Since the speed is also controlled, the trajectory is called a 4D-trajectory. The different steps of the method leading to the final implementation, shown to work in simulation, are displayed. The method involves designing a stabilizing controller. This controller is designed such that good robustness margins are achieved. by means on computer simulation it is shown that the total algorithm, resulting in the 4D-trajectory tracking of the UAV, is insensitive with respect to wind gust, GPS noise, deviations in mass and inertial momentum. The implemented algorithm has been evaluated in flight tests at four occasions. For this purpose a UAV at Naval Postgraduate School in Monterey, CA, USA, has been used. The three first flight tests failed. The fourth test has not yet been completely evaluated, but it was not flawless.
NTIS
Flight Tests; Speed Control

20020080936 McDonnell-Douglas Helicopter Co., Mesa, AZ USA
Helicopter Strakes
Spinoff 1993; 1993, pp. 92-93; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Langley Research Center has done extensive research into the effectiveness of tail boom strakes on conventional tail rotor helicopters. (A strake is a "spoiler" whose purpose is to alter the airflow around an aerodynamic body.) by placing strakes on a tail boom, the air loading can be changed, thrust and power requirements of the tail rotor can be reduced, and helicopter low speed flight handling qualities are improved. This research led to the incorporation of tail boom strakes on three production-type commercial helicopters manufactured by McDonnell Douglas Helicopter Company.
Author
Helicopter Performance; Strakes; Helicopter Design; Helicopter Tail Rotors

20020080971 European Aeronautic Defence and Space Co., Defence Electronics and Telecommunications Airborne Systems, Ulm Germany

Electromagnetic Effects Harmonization Working Group (EEHWG)-Lightning Task Group: Report on Aircraft Lightning Strike Data

Spiller, O.; Jul. 2002; 28p; In English

Report No.(s): PB2002-109228; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In 1995, in response to the lightning community's desire to revise the zoning criteria on aircraft, the Electromagnetic Effects Harmonization Working Group (EEHWG) decided that lightning attachments to aircraft causing damage should be studied and compared to the then valid zoning classification per Federal Aviation Administration Advisory Circular AC 20-53A. The primary function of the EEHWG is to harmonize the environments that aircraft are being subjected in both the North American and European environments. A Lightning Task Group was formed in EEHWG, and strike data were solicited from almost all major airframe manufacturers in North America and Europe. After these responses were received, the report was prepared for the general EEHWG committee.

NTIS

Lightning; Airspace; Flight Hazards; Weather

20020082880 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. fuer Flugsystemtechnik Aussenstelle fuer Flugerprobung Oberpfaffenhofen, Oberpfaffenhofen, Germany

Design and Simulation of Solar Powered Aircraft for Year-Round Operation at High Altitude *Auslegung und Simulaton von hochfliegenden, dauerhaft stationierbaren Solardrohnen*

Keidel, Bernhard, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; 2002; ISSN 1434-8454; 216p; In German

Report No.(s): DLR-FB-2002-01; Copyright; Avail: Issuing Activity

An unmanned solar powered aircraft configuration called SOLITAIR has been designed. This aircraft is intended to be used as a high attitude long endurance (HALE) sensor platform for year-round operation at intermediate latitudes up to about +/-55 deg. For the design studies leading to this aircraft configuration, a software package has been developed which enables an effective design and a proper simulation of the entire solar aircraft system for various flight missions. The performance analysis and the mission granulation showed, that a configuration with large additional solar panels, that can be tilted in order to follow the sun angle during daytime operation appears to be superior to aircraft configurations with wing-mounted solar cells for the desired operational area. In order to examine the basic flight characteristics of the SOLITAIR configuration a remote controlled demonstration model has been built and test flown.

Author

Aircraft Configurations; Aircraft Design; Flight Characteristics; Flight Operations; Pilotless Aircraft; Solar Powered Aircraft

20020082988 Naval Postgraduate School, Monterey, CA USA

Impact of the Integrated Maintenance Concept on EA-6B Readiness and Maintenance Support at NAS Whidbey Island, WA and NADEP Jacksonville, FL

Schulz, Kimberly J.; Jun. 2002; 66p; In English; Original contains color images

Report No.(s): AD-A405931; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Faced with an aging Navy air force, the EA-6B, a piece of the aging aircraft inventory puzzle, is included in a mandated program called Integrated Maintenance Concept (IMC). IMC incorporates a maintenance process called Reliability Centered Maintenance (RCM) to establish and adjust preventative maintenance requirements. The premise of the program is to justify each preventative maintenance action to maintain obsolescent airframes while reducing aircraft out-of-service-time and operating support costs. The implementation of a preventative maintenance program validated by RCM coupled with the fixed period end date (PED) will, in theory, reduce total ownership costs (TOC) to include reduced depot level turn around and scheduled maintenance time. The objective of this thesis is to ascertain how the move from SDLM to IMC is impacting the community from all perspectives and their views on readiness and supportability. to gather data, the researcher conducted on site interviews with key players at all levels of maintenance support. IMC, with the incorporation of RCM justified preventative maintenance actions can positively impact the life of the aircraft. However, to make it possible, the depot field site has to be fully supported and the organizational and intermediate levels manned at appropriate levels and training in structures repair, priority.

DTIC

Service Life; Aircraft Maintenance; Operations Research; Navy; Military Aircraft

20020082996 Naval Postgraduate School, Monterey, CA USA
The Effect of Unmanned Aerial Vehicle Systems on Precision Engagement
Werenskjold, Craig J.; Jun. 2002; 54p; In English
Report No.(s): AD-A406036; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The effect of integrating unmanned aerial vehicles (UAV) systems into today's battlespace is promoting concepts of precision engagement by enhancing our information advantage. This thesis explores the new paradigm evolving around UAV technology that has enabled UAV systems to become a central node for accelerated sensor-to-shooter capabilities involved with precision engagement by accelerating the integration of communications, command, control, computers, intelligence, surveillance, reconnaissance (C4ISR) systems with recent innovations in time-critical targeting. The increased information advantage and precision engagement strategies recently demonstrated in Operation Enduring Freedom have catalyzed further UAV system integration and highlighted the synergistic effects. Future technological advancements associated with UAV systems will allow new capabilities to evolve that increase our real-time intelligence capabilities and precision engagement strategies.
DTIC
Pilotless Aircraft; Military Operations; Combat; Military Technology; Real Time Operation

20020083069 Naval Postgraduate School, Monterey, CA USA
Modeling Robot Swarms Using Agent-Based Simulation
Dickie, Alistair; Jun. 2002; 131p; In English; Original contains color images
Report No.(s): AD-A405810; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

In the near future advances in mechanical and electrical engineering will enable the production of a wide variety of relatively low cost robotic vehicles. This thesis investigates the behavior of swans of military robots acting autonomously. The Multi-Agent Robot Swarm Simulation (MARSS) was developed for modeling the behavior of swarm of military robots. MARSS contains state, sensing, and behavioral model building tools that allow a range of complex entities and interactions to be represented. It is a model-building tool that draws theory and ideas from agent-based simulation, discrete event simulation, traditional operations research, search theory, swarm theory, and experimental design. MARS S enables analysts to explore the effect of individual behavioral factors on swarm performance. The performance response surface can be explored using designed experiments. A model was developed in MARS S to investigate the effects of increasing behavioral complexity for a search scenario involving a swarm of Micro Air Vehicles (MAV's) searching for mobile tanks in a region. Agreement between theoretical and simulated search scenarios for simple searchers was found. The effect of increased MAV sensory and behavioral capability was demonstrated to be important. Little improvement was observed in swarm performance with these capabilities, however agent performance was adversely affected by reacting to increased knowledge in the wrong way. The utility of MARSS for conducting this type of analysis was demonstrated.
DTIC
Computerized Simulation; Robots; Robotics; Mechanical Engineering; Experiment Design

20020083197 Sytronics, Inc., Dayton, OH USA
TH-67 Size Accommodation Report ***Interim Report, Dec. 2000-Jun. 2001***
Zehner, Gregory F.; Hudson, Jeffrey A.; Jun. 2001; 20p; In English; Original contains color images
Contract(s)/Grant(s): F41624-93-C-6001; Proj-7184
Report No.(s): AD-A406367; AFRL-HE-WP-TR-2002-0028; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes an evaluation of the TH-67 (Bell-Jet Ranger) helicopter. Subjects of widely varying body sizes were tested for: reach to controls, reach to rudder, internal and external vision, body clearances, and control authority. The results indicate that pilots of both small and large size are not accommodated very well in this aircraft.
DTIC
Helicopters; Evaluation

20020083250 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Victoria, Australia
Application of the Global Positioning System (GPS) to Low Airspeed Measurement for Helicopter Usage Monitoring Systems
Gan, Soon-Aik; Dutton, Scott; Apr. 2002; 43p; In English
Report No.(s): AD-A405992; DSTO-TN-0428; DSTO-AR-012-319; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report focuses on the field trial of a GPS (Global Positioning System) unit for measuring low helicopter airspeeds. The results indicated that the GPS has the potential to be used as a low-speed indicator. However, the possible loss of GPS signal,

transient GPS results due to changes in satellites being used for the solution, time lag in the results and whether the assumption of a constant wind-speed is valid need to be considered.
DTIC
Helicopters; Global Positioning System; Airspeed; Velocity Measurement

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

20020080869 Old Dominion Univ., Dept. of Aerospace Engineering, Norfolk, VA USA
Computational Predictions of the Performance Wright 'Bent End' Propellers ***Final Report***
Wang, Xiang-Yu, Old Dominion Univ., USA; Ash, Robert L., Old Dominion Univ., USA; Bobbitt, Percy J., Eagle Aeronautics, Inc., USA; [2002]; 45p; In English
Contract(s)/Grant(s): NCC1-369
Report No.(s): ODURF-101511; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Computational analysis of two 1911 Wright brothers 'Bent End' wooden propeller reproductions have been performed and compared with experimental test results from the Langley Full Scale Wind Tunnel. The purpose of the analysis was to check the consistency of the experimental results and to validate the reliability of the tests. This report is one part of the project on the propeller performance research of the Wright 'Bent End' propellers, intend to document the Wright brothers' pioneering propeller design contributions. Two computer codes were used in the computational predictions. The FLO-MG Navier-Stokes code is a CFD (Computational Fluid Dynamics) code based on the Navier-Stokes Equations. It is mainly used to compute the lift coefficient and the drag coefficient at specified angles of attack at different radii. Those calculated data are the intermediate results of the computation and a part of the necessary input for the Propeller Design Analysis Code (based on Adkins and Libeck method), which is a propeller design code used to compute the propeller thrust coefficient, the propeller power coefficient and the propeller propulsive efficiency.
Author
Propeller Efficiency; Propeller Blades; Computational Fluid Dynamics

20020081114 NASA Glenn Research Center, Cleveland, OH USA
The Role of Radial Clearance on the Performance of Foil Air Bearings
Radil, Kevin, Army Research Lab., USA; Howard, Samuel, NASA Glenn Research Center, USA; Dykas, Brian, Ohio Aerospace Inst., USA; July 2002; 19p; In English; International Joint Tribology Conference, 27-30 Oct. 2002, Cancun, Mexico; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): RTOP 708-18-13; DA Proj. 1L1-61102-AH-45
Report No.(s): NASA/TM-2002-211705; E-13450; NAS 1.15:211705; ARL-TR-2769; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Load capacity tests were conducted to determine how radial clearance variations affect the load capacity coefficient of foil air bearings. Two Generation III foil air bearings with the same design but possessing different initial radial clearances were tested at room temperature against an as-ground PS304 coated journal operating at 30,000 rpm. Increases in radial clearance were accomplished by reducing the journal's outside diameter via an in-place grinding system. From each load capacity test the bearing load capacity coefficient was calculated from the rule-of-thumb (ROT) model developed for foil air bearings. The test results indicate that, in terms of the load capacity coefficient, radial clearance has a direct impact on the performance of the foil air bearing. Each test bearing exhibited an optimum radial clearance that resulted in a maximum load capacity coefficient. Relative to this optimum value are two separate operating regimes that are governed by different modes of failure. Bearings operating with radial clearances less than the optimum exhibit load capacity coefficients that are a strong function of radial clearance and are prone to a thermal runaway failure mechanism and bearing seizure. Conversely, a bearing operating with a radial clearance twice the optimum suffered only a 20 percent decline in its maximum load capacity coefficient and did not experience any thermal management problems. However, it is unknown to what degree these changes in radial clearance had on other performance parameters, such as the stiffness and damping properties of the bearings.
Author
Foil Bearings; Gas Bearings; Turbomachinery; Load Tests; Loads (Forces); Airfoils; Design Analysis

20020081268 NASA Glenn Research Center, Cleveland, OH USA

An Interactive Excel Program for Tracking a Single Droplet in Crossflow Computation

Urip, E., Michigan Technological Univ., USA; Yang, S. L., Michigan Technological Univ., USA; Marek, C. J., NASA Glenn Research Center, USA; August 2002; 30p; In English

Contract(s)/Grant(s): RTOP 708-87-13

Report No.(s): NASA/TM-2002-211710; E-13459; NAS 1.15:211710; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Spray jet in crossflow has been a subject of research because of its wide application in systems involving pollutant dispersion, jet mixing in the dilution zone of combustors, and fuel injection strategies. The focus of this work is to investigate dispersion of a 2-dimensional atomized spray jet into a 2-dimensional crossflow. A quick computational method is developed using available software. The spreadsheet can be used for any 2D droplet trajectory problem where the drop is injected into the free stream eventually coming to the free stream conditions. During the transverse injection of a spray into high velocity airflow, the droplets (carried along and deflected by a gaseous stream of co-flowing air) are subjected to forces that affect their motion in the flow field. Based on the Newton's Second Law of motion, four ordinary differential equations were used. These equations were then solved by a fourth-order Runge-Kutta method using Excel software. Visual basic programming and Excel macrocode to produce the data facilitate Excel software to plot graphs describing the droplet's motion in the flow field. This program computes and plots the data sequentially without forcing users to open other types of plotting programs. A user's manual on how to use the program is also included in this report.

Author

Cross Flow; Differential Equations; Flow Distribution; Fluid Injection; Drops (Liquids); Spray Characteristics; Applications Programs (Computers)

20020081280 NASA Glenn Research Center, Cleveland, OH USA

Characterization of the Temperature Capabilities of Advanced Disk Alloy ME3

Gabb, Timothy P., NASA Glenn Research Center, USA; Telesman, Jack, NASA Glenn Research Center, USA; Kantzos, Peter T., Ohio Aerospace Inst., USA; OConnor, Kenneth, NASA Glenn Research Center, USA; August 2002; 56p; In English

Contract(s)/Grant(s): RTOP 714-04-20

Report No.(s): NASA/TM-2002-211796; NAS 1.15:211796; E-13491; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The successful development of an advanced powder metallurgy disk alloy, ME3, was initiated in the NASA High Speed Research/Enabling Propulsion Materials (HSR/EPM) Compressor/Turbine Disk program in cooperation with General Electric Engine Company and Pratt & Whitney Aircraft Engines. This alloy was designed using statistical screening and optimization of composition and processing variables to have extended durability at 1200 F in large disks. Disks of this alloy were produced at the conclusion of the program using a realistic scaled-up disk shape and processing to enable demonstration of these properties. The objective of the Ultra-Efficient Engine Technologies disk program was to assess the mechanical properties of these ME3 disks as functions of temperature in order to estimate the maximum temperature capabilities of this advanced alloy. These disks were sectioned, machined into specimens, and extensively tested. Additional sub-scale disks and blanks were processed and selectively tested to explore the effects of several processing variations on mechanical properties. Results indicate the baseline ME3 alloy and process can produce 1300 to 1350 F temperature capabilities, dependent on detailed disk and engine design property requirements.

Author

Gas Turbine Engines; Rotating Disks; Heat Resistant Alloys; Fatigue (Materials); Powder Metallurgy

20020081292 NASA Glenn Research Center, Cleveland, OH USA

Unsteady Pressures in a Transonic Fan Cascade Due to a Single Oscillating Airfoil

Lepicovsky, J., QSS Group, Inc., USA; McFarland, E. R., NASA Glenn Research Center, USA; Capece, V. R., Kentucky Univ., USA; Hayden, J., Kentucky Univ., USA; July 2002; 17p; In English; Turbo Expo 2002, 3-6 Jun. 2002, Amsterdam, Netherlands; Sponsored by American Society of Mechanical Engineers, USA

Contract(s)/Grant(s): RTOP 708-28-13

Report No.(s): NASA/TM-2002-211723; E-13474; GT-2002-30312; NAS 1.15:211723; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An extensive set of unsteady pressure data was acquired along the midspan of a modern transonic fan blade for simulated flutter conditions. The data set was acquired in a nine-blade linear cascade with an oscillating middle blade to provide a database for the influence coefficient method to calculate instantaneous blade loadings. The cascade was set for an incidence of 10 dg. The

data were acquired on three stationary blades on each side of the middle blade that was oscillated at an amplitude of 0.6 dg. The matrix of test conditions covered inlet Mach numbers of 0.5, 0.8, and 1.1 and the oscillation frequencies of 200, 300, 400, and 500 Hz. A simple quasiunsteady two-dimensional computer simulation was developed to aid in the running of the experimental program. For high Mach number subsonic inlet flows the blade pressures exhibit very strong, low-frequency, self-induced oscillations even without forced blade oscillations, while for low subsonic and supersonic inlet Mach numbers the blade pressure unsteadiness is quite low. The amplitude of forced pressure fluctuations on neighboring stationary blades strongly depends on the inlet Mach number and forcing frequency. The flowfield behavior is believed to be governed by strong nonlinear effects due to a combination of viscosity, compressibility, and unsteadiness. Therefore, the validity of the quasi-unsteady simplified computer simulation is limited to conditions when the flowfield is behaving in a linear, steady manner. Finally, an extensive set of unsteady pressure data was acquired to help development and verification of computer codes for blade flutter effects.
Author
Computerized Simulation; Fan Blades; Flow Distribution; Influence Coefficient; Pressure Oscillations; Oscillating Flow; Computational Fluid Dynamics; Cascade Flow

20020081294 NASA Glenn Research Center, Cleveland, OH USA
Effects of Fuel Distribution on Detonation Tube Performance
Perkins, Hugh Douglas, NASA Glenn Research Center, USA; August 2002; 72p; In English
Contract(s)/Grant(s): RTOP 708-48-13
Report No.(s): NASA/TM-2002-211712; E-13463; NAS 1.15:211712; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A pulse detonation engine (PDE) uses a series of high frequency intermittent detonation tubes to generate thrust. The process of filling the detonation tube with fuel and air for each cycle may yield non-uniform mixtures. Lack of mixture uniformity is commonly ignored when calculating detonation tube thrust performance. In this study, detonation cycles featuring idealized non-uniform H2/air mixtures were analyzed using the SPARK two-dimensional Navier-Stokes CFD code with 7-step H2/air reaction mechanism. Mixture non-uniformities examined included axial equivalence ratio gradients, transverse equivalence ratio gradients, and partially fueled tubes. Three different average test section equivalence ratios (phi), stoichiometric (phi = 1.00), fuel lean (phi = 0.90), and fuel rich (phi = 1.10), were studied. All mixtures were detonable throughout the detonation tube. It was found that various mixtures representing the same test section equivalence ratio had specific impulses within 1 percent of each other, indicating that good fuel/air mixing is not a prerequisite for optimal detonation tube performance.
Author
Navier-Stokes Equation; Pulse Detonation Engines; Fuel Combustion; Fuel-Air Ratio; Detonation; Detonable Gas Mixtures; Detonation Waves

20020081337 NASA Glenn Research Center, Cleveland, OH USA
Spontaneous Raman Scattering: From Atmospheric CH4/Air Diffusion Flame to 55 Bar Jet-A-Fueled, Aviation Gas Turbine Combustor
Locke, R. J., QSS Group, Inc., USA; Hicks, Y. R., NASA Glenn Research Center, USA; Anderson, R. C., NASA Glenn Research Center, USA; DeGroot, W. A., Silicon Light Machines, USA; September 2002; 16p; In English; 22nd Aerodynamic Measurement Technology and Ground Testing Conference, 24-26 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 714-02-40
Report No.(s): NASA/TM-2002-211869; E-13551; NAS 1.15:211869; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Quantitative in situ species and temperature measurements acquired from within liquid-fueled combustors at high pressure and temperature conditions are critical to industrial and government research efforts to design and build power plants for the next-generation of civilian aircraft. Researchers at NASA Glenn Research Center (GRC) have successfully demonstrated a Raman scattering technique as a viable candidate to satisfy this diagnostic requirement. Our approach involved build-up and testing of a Raman apparatus around an atmospheric Corsair diffusion burner to determine proper optical filtering to effectively eliminate Rayleigh and incident laser scatter from the collected signal while retaining a useful spectral range resolving both Stokes and anti-Stokes peaks of O2 N2 water, CO2, and hydrocarbons. These capabilities once demonstrated on the lab-scale, atmospheric flame. were then transferred to a large-scale, aviation combustor burning jet fuel. Tests at NASA GRC have successfully

demonstrated the use of this Raman technique to measure combustion species and to ratio the anti-Stokes versus Stokes peaks of N2 to derive flow temperatures over a wide range of operational temperatures and pressures, up to 639K and 55 bar.
Author
Raman Spectra; Temperature Measurement; Image Processing; Fuel Injection; Gas Turbines; Combustion Chambers; Jet Engine Fuels

20020082871 Defence Science and Technology Organisation, Airframes and Engines Div., Fishermans Bend, Australia
Review of Risk and Reliability Methods for Aircraft Gas Turbine Engines
Kappas, Joanna, Defence Science and Technology Organisation, Australia; May 2002; 60p; In English
Report No.(s): DSTO-TR-1306; DODA-AR-012-320; Copyright; Avail: Issuing Activity

Risk and reliability assessment of aircraft gas turbine engines for the evaluation of component failure has received increasing interest in the last few years, fueled by the greater appreciation of stochastic models and the concern for airworthiness issues. This report reviews the current status of probabilistic methods available for the risk and reliability assessment of gas turbine engines and the potential benefits of their implementation in the military environment. The definition of acceptable risk of failure in the military standards and the current relevant activities in the US which are of particular interest to the RAAF, are also discussed.
Author
Aircraft Engines; Gas Turbine Engines; Component Reliability; Failure Analysis; Reliability Analysis; Risk; Stochastic Processes

20020082901 NASA Glenn Research Center, Cleveland, OH USA
Tribological Limitations in Gas Turbine Engines: A Workshop to Identify the Challenges and Set Future Directions
DellaCorte, Chris, NASA Glenn Research Center, USA; Pinkus, Oscar, Mohawk Innovative Technology, Inc., USA; August 2002; 74p; In English; Tribological Limitations in Gas Turbine Engines, 15-17 Sep. 1999, Albany, NY, USA; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 523-18-13
Report No.(s): NASA/TM-2000-210059/REV1; E-12261-2/REV1; NAS 1.15:210059/REV1; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The following report represents a compendium of selected speaker presentation materials and observations made by Prof. O. Pinkus at the NASA/ASME/Industry sponsored workshop entitled ”Tribological Limitations in Gas Turbine Engines” held on September 15-17, 1999 in Albany, New York. The impetus for the workshop came from the ASME’s Research Committee on tribology whose goal is to explore new tribological research topics which may become future research opportunities. Since this subject is of current interest to other industrial and government entities the conference received cosponsorship as noted above. The conference was well attended by government, industrial, and academic participants. Topics discussed included current tribological issues in gas turbines as well as the potential impact (drawbacks and advantages) of future tribological technologies especially foil air bearings and magnetic bearings. It is hoped that this workshop report may serve as a starting point for continued discussions and activities in oil-free turbomachinery systems.
Author
Gas Turbines; Foil Bearings; Magnetic Bearings; Gas Bearings

20020082902 NASA Glenn Research Center, Cleveland, OH USA
Pulse Detonation Engines for High Speed Flight
Povinelli, Louis A., NASA Glenn Research Center, USA; September 2002; 16p; In English; 11th International American Inst. of Aeronautics and Astronautics and Association Aeronautique et Astronautique de France Conference, 29 Sep. - 4 Oct. 2002, Orleans, France; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 706-21-33-07
Report No.(s): NASA/TM-2002-211908; E-13598; NAS 1.15:211908; Paper-17-5169; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Revolutionary concepts in propulsion are required in order to achieve high-speed cruise capability in the atmosphere and for low cost reliable systems for earth to orbit missions. One of the advanced concepts under study is the air-breathing pulse detonation engine. Additional work remains in order to establish the role and performance of a PDE in flight applications, either as a stand-alone device or as part of a combined cycle system. In this paper, we shall offer a few remarks on some of these remaining issues, i.e., combined cycle systems, nozzles and exhaust systems and thrust per unit frontal area limitations. Currently, an intensive experimental and numerical effort is underway in order to quantify the propulsion performance characteristics of this

device. In this paper, we shall highlight our recent efforts to elucidate the propulsion potential of pulse detonation engines and their possible application to high-speed or hypersonic systems.
Author
Pulse Detonation Engines; Air Breathing Engines; Propulsion; High Speed

20020082943 Analex Corp., Brook Park, OH USA
APEX 3D Propeller Test Preliminary Design ***Final Report***
Colozza, Anthony J., Analex Corp., USA; September 2002; 36p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-00145; RTOP 708-87-13
Report No.(s): NASA/CR-2002-211866; NAS 1.26:211866; E-13539; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A low Reynolds number, high subsonic mach number flight regime is fairly uncommon in aeronautics. Most flight vehicles do not fly under these aerodynamic conditions. However, recently there have been a number of proposed aircraft applications (such as high altitude observation platforms and Mars aircraft) that require flight within this regime. One of the main obstacles to flight under these conditions is the ability to reliably generate sufficient thrust for the aircraft. For a conventional propulsion system, the operation and design of the propeller is the key aspect to its operation. Due to the difficulty in experimentally modeling the flight conditions in ground-based facilities, it has been proposed to conduct propeller experiments from a high altitude gliding platform (APEX). A preliminary design of a propeller experiment under the low Reynolds number, high mach number flight conditions has been devised. The details of the design are described as well as the potential data that will be collected.
Author
Three Dimensional Models; Low Reynolds Number; Propellers; Subsonic Speed; Performance Tests

20020082954 NASA Glenn Research Center, Cleveland, OH USA
Foreign Object Damage Behavior of Two Gas-Turbine Grade Silicon Nitrides by Steel Ball Projectiles at Ambient Temperature
Choi, Sung R., Ohio Aerospace Inst., USA; Pereira, J. Michael, NASA Glenn Research Center, USA; Janosik, Lesley A., NASA Glenn Research Center, USA; Bhatt, Ramakrishna T., NASA Glenn Research Center, USA; August 2002; 24p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-31-13
Report No.(s): NASA/TM-2002-211821; NAS 1.15:211821; E-13513; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Foreign object damage (FOD) behavior of two commercial gas-turbine grade silicon nitrides, AS800 and SN282, was determined at ambient temperature through strength testing of flexure test specimens impacted by steel-ball projectiles with a diameter of 1.59 mm in a velocity range from 220 to 440 m/s. AS800 silicon nitride exhibited a greater FOD resistance than SN282, primarily due to its greater value of fracture toughness (K(sub IC)). Additionally, the FOD response of an equiaxed, fine-grained silicon nitride (NC132) was also investigated to provide further insight. The NC132 silicon nitride exhibited the lowest fracture toughness of the three materials tested, providing further evidence that K(sub IC) is a key material parameter affecting FOD resistance. The observed damage generated by projectile impact was typically in the forms of well- or ill-developed ring or cone cracks with little presence of radial cracks.
Author
Impact Damage; Fracture Strength; Balls; Cracks; Foreign Bodies

20020082995 United Technologies Research Center, East Hartford, CT USA
Fuel-Cooled Thermal Management for Advanced Aero Engines GT-2002-30070
Huang, He; Spadaccini, Louis J.; Sobel, David R.; Jun. 2002; 12p; In English
Contract(s)/Grant(s): F33615-97-D-2784; Proj-3048
Report No.(s): AD-A406021; AFRL-PR-WP-TP-2002-203; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Fuel-cooled thermal management, including endothermic cracking and reforming of hydrocarbon fuels, is an enabling technology for advanced aero engines and offers potential for cycle improvements and pollutant emissions control in gas-turbine engine applications. The successful implementation of this technology is, however, predicated on the use of conventional multi-component hydrocarbon fuels and an understanding of the combustion characteristics of the reformed fuel mixture. The objective of this research is to develop and demonstrate the technologies necessary for utilizing conventional multi-component hydrocarbon fuels for fuel-cooled thermal management, including the development of the endothermic potential of JP-7 and

JP-8+100, a demonstration of the combustion of supercritical/endothermic fuel mixtures, and conceptual design of a fuel-air heat exchanger.
DTIC
Aircraft Engines; Temperature Control; Jet Engine Fuels; Endothermic Reactions

20020083005 NASA Dryden Flight Research Center, Edwards, CA USA
Initial Flight Tests of the NASA F-15B Propulsion Flight Test Fixture
Palumbo, Nathan, NASA Dryden Flight Research Center, USA; Moes, Timothy R., NASA Dryden Flight Research Center, USA; Vachon, M. Jake, NASA Dryden Flight Research Center, USA; July 2002; 17p; In English; 38th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 7-10 Jul. 2002, Indianapolis, IN, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 710-35-14-00-38-00-F15
Report No.(s): NASA/TM-2002-210736; NAS 1.15:210736; H-2507; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flights of the F-15B/Propulsion Flight Test Fixture (PFTF) with a Cone Drag Experiment (CDE) attached have been accomplished at NASA Dryden Flight Research Center. Mounted underneath the fuselage of an F-15B airplane, the PFTF provides volume for experiment systems and attachment points for propulsion experiments. A unique feature of the PFTF is the incorporation of a six-degree-of-freedom force balance. The force balance mounts between the PFTF and experiment and measures three forces and moments. The CDE has been attached to the force balance for envelope expansion flights. This experiment spatially and inertially simulates a large propulsion test article. This report briefly describes the F-15B airplane, the PFTF, and the force balance. A detailed description of the CDE is provided. Force-balance ground testing and stiffness modifications are described. Flight profiles and selected flight data from the envelope expansion flights are provided and discussed, including force-balance data, the internal PFTF thermal and vibration environment, a handling qualities assessment, and performance capabilities of the F-15B airplane with the PFTF installed.
Author
Flight Tests; Spacecraft Propulsion; F-15 Aircraft; Fixtures; Aerodynamic Drag; Aerodynamic Configurations

20020083038 NASA Glenn Research Center, Cleveland, OH USA
Flutter Analysis of a Transonic Fan
Srivastava, R., Toledo Univ., USA; Bakhle, M. A., Toledo Univ., USA; Keith, T. G., Jr., Toledo Univ., USA; Stefko, G. L., NASA Glenn Research Center, USA; September 2002; 14p; In English; Turbo Expo 2002, 3-6 Jun. 2002, Amsterdam, Netherlands; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 781-30-11
Report No.(s): NASA/TM-2002-211818; E-13511; NAS 1.15:211818; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes the calculation of flutter stability characteristics for a transonic forward swept fan configuration using a viscous aeroelastic analysis program. Unsteady Navier-Stokes equations are solved on a dynamically deforming, body fitted, grid to obtain the aeroelastic characteristics using the energy exchange method. The non-zero inter-blade phase angle is modeled using phase-lagged boundary conditions. Results obtained show good correlation with measurements. It is found that the location of shock and variation of shock strength strongly influenced stability. Also, outboard stations primarily contributed to stability characteristics. Results demonstrate that changes in blade shape impact the calculated aerodynamic damping, indicating importance of using accurate blade operating shape under centrifugal and steady aerodynamic loading for flutter prediction. It was found that the calculated aerodynamic damping was relatively insensitive to variation in natural frequency.
Author
Aeroelasticity; Flutter Analysis; Transonic Flow; Turbofans; Aerodynamic Configurations; Scale Models

20020083042 QSS Group, Inc., Cleveland, OH USA
Heat Transfer in a Complex Trailing Edge Passage for a High Pressure Turbine Blade, Part 2:, Simulation Results *Final Report*
Rigby, David L., QSS Group, Inc., USA; Bunker, Ronald S., General Electric Co., USA; August 2002; 13p; In English; Turbo Expo 2002, 3-6 Jun. 2002, Amsterdam, Netherlands; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS3-00145; RTOP 708-28-13
Report No.(s): NASA/CR-2002-211701; NAS 1.26:211701; ASME-2002-GT-30213; E-13430; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A combined experimental and numerical study to investigate the heat transfer distribution in a complex blade trailing edge passage was conducted. The geometry consists of a two pass serpentine passage with taper toward the trailing edge, as well as from hub to tip. The upflow channel has an average aspect ratio of roughly 14:1, while the exit passage aspect ratio is about 5:1. The upflow channel is split in an interrupted way and is smooth on the trailing edge side of the split and turbulated on the other side. A turning vane is placed near the tip of the upflow channel. Reynolds numbers in the range of 31,000 to 61,000, based on inlet conditions, were simulated numerically. The simulation was performed using the Glenn-HT code, a full three-dimensional Navier-Stokes solver using the Wilcox k-omega turbulence model. A structured multi-block grid is used with approximately 4.5 million cells and average y+ values on the order of unity. Pressure and heat transfer distributions are presented with comparison to the experimental data. While there are some regions with discrepancies, in general the agreement is very good for both pressure and heat transfer.

Author

Trailing Edges; Turbine Blades; Computerized Simulation; High Pressure; Heat Transfer Coefficients; Three Dimensional Flow

20020083330 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA

A Status Report of the X-50LR Program: A Laser Propulsion Program

Larson, C. W.; Kalliomaa, Wayne M.; Mead, Franklin B., Jr.; Jul. 2002; 8p; In English

Report No.(s): AD-A405728; AFRL-PR-ED-TP-2002-169; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Lightcraft Technology Demonstration (LTD) program was initiated in 1996, by the Air Force Research Laboratory's (AFRL) Propulsion Directorate at Edwards Air Force Base. The program was planned in three phases. Phase I, Lightcraft Concept Demonstration, was to demonstrate the feasibility of the basic concept. This phase ended successfully in December 1998. The basic conclusion of all this work was that the feasibility and basic physics of the Lightcraft concept had been adequately demonstrated, and that a much larger 100 kW class laser would be required to completely accomplish Phase II. Phase II, Lightcraft Vertical Launches to Extreme Altitudes, was initiated in January 1999, and was a five-year effort designed to extend Lightcraft flights in sounding rocket trajectories to 30 km, or the edge of space, with a 100 kW class CO2 laser. The first step of the Phase II vertical flight test program was to extend Lightcraft vertical free-flights to significantly higher altitudes in the range of 150 to 300 m using the 10 kW PLVTS laser. Tenth-scale, laser-powered vehicles were used. With this size vehicle, laser flight tests were conducted at the High Energy Laser Systems Test Facility (HELSTF), White Sands Missile Range (WSMR), New Mexico, using the 10 kW, Pulsed Laser Vulnerability Test System (PLVTS), CO2, electric discharge laser. The first composite, ceramic shroud components for the Lightcraft vehicle were fabricated, laboratory tested for performance, and flight tested. Performance details were subsequently presented comparing the composite material shroud with the all-aluminum vehicles, which had been used for most of the program.

DTIC

Laser Propulsion; Pulsed Lasers; Light Aircraft; Ion Engines; High Power Lasers; Fabrication; Flight Tests

20020083337 Louisiana State Univ., Dept. of Electrical and Computer Engineering, Baton Rouge, LA USA

Identification and Control for Nonlinear Systems with Applications to Aerospace Vehicles ***Final Report, 1 Apr. 1999-31 Mar. 2002***

Gu, Guoxiang; Zhou, Kemin; Apr. 2002; 21p; In English

Contract(s)/Grant(s): F49620-99-1-0179

Report No.(s): AD-A405744; AFRL-SR-AR-TR-02-0294; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The achievements and the research results of our research program for the past three years are summarized in this final report. We have developed new methods to robust model identification and robust control design for complex nonlinear uncertain systems with Air Force problems as application platforms. The primary focus of our research program has been on rotating stall and combustion instabilities which are the two primary constraints for performance improvement of future aeroengines. Both involve complicated flow patterns, and exhibit rich nonlinear dynamics with non-equilibrium steady state behavior. We have developed new modeling and control algorithms to approach nonlinear oscillatory systems. For compressor control, we employed bifurcation stabilization approach, and are able to control rotating stall for the multi-mode MooreGreitzer model. For combustion control, we are able to apply H(circumflex) robust control method to suppress nonlinear vibrations. Our research results have benefited Air Force Research Labs. in WPAFB, and aeroengine industry. For fault detection/identification, and reconfigurable flight control, we also made great progress. A new feedback control architecture has been developed that has the potential to overcome many conflicting problems in standard feedback control and provide a unified framework for robust and fault tolerant control. In addition we have made progress in system identification and robust control for several important aspects that will be described in this final report. The research objectives as proposed in our proposal have been accomplished successfully as demonstrated in

the 30 journal publications, one book, two book chapters, and 25 conference papers we have had for the past three years, including those accepted for publication.
DTIC
Aerospace Vehicles; Mathematical Models; Algorithms; Nonlinear Systems; Control Theory

20020083342 General Electric Aircraft Engines, Advanced Engineering Programs Dept., Cincinnati, OH USA
JP-8+100 Engine Demonstration: Industry Version ***Final Report, 23 Jun. 1995-30 Jul. 2000***
Pearce, Patricia D.; Seto, S.; Dom, P.; Moses, C.; Mar. 2002; 123p; In English
Contract(s)/Grant(s): F33615-95-C-2508; AF Proj. 2480
Report No.(s): AD-A405784; R2000AE322; AFRL-PR-WP-TR-2002-2061; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The effects of JP-8+100 fuel were investigated to: (1) identify and perform development work needed to accelerate the transition of JP-8+100 fuel to field use, (2) evaluate the cost effectiveness of using this fuel to reduce maintenance related to fuel fouling/coking in existing aircraft, and (3) assess the performance of JP-8+100 in current and future advanced high-performance engines and aircraft fuel systems. The additive selected by the Air Force was BetzDearbom Spec Aid 8Q462. The selected additive did not have any effect on endurance-engine hot sections. Maintenance records for Air National Guard squadrons were reviewed, and no evidence was found that the additive caused any change in the flight abort rate or was a reason for flight aborts. Fuel thermal-stability testing showed that additive increased fuel temperature capability. It was concluded that JP-8+100 would be safe to use in the field.
DTIC
Safety; Aircraft Fuel Systems; Aircraft Performance; Cost Effectiveness; Fuel Tests; Additives

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also 05 Aircraft Design, Testing and Performance and 06 Avionics and Aircraft Instrumentation.

20020083089 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Application of Sliding Mode Methods to the Design of Reconfigurable Flight Control Systems
Wells, Scott R.; Jun. 2002; 320p; In English
Report No.(s): AD-A406119; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

Observer-based sliding mode control is investigated for application to aircraft reconfigurable flight control. An overview of reconfigurable flight control is given, including a review of the current state-of-the-art within the subdisciplines of fault detection parameter identification, adaptive control schemes, and dynamic control allocation. of the adaptive control methods reviewed, sliding mode control (SMC) appears promising due its property of invariance to matched uncertainty. An overview of SMC is given and its properties are demonstrated. Sliding mode methods, however, are difficult to implement because unmodeled parasitic dynamics cause immediate and severe instability. This presents a challenge for all practical applications with limited bandwidth actuators. One method to deal with parasitic dynamics is the use of an asymptotic observer. Observer-based SMC is investigated, and a method for selecting observer gains is offered. An additional method for shaping the feedback loop using a filter is also developed. It is shown that this SMC prefilter is equivalent to a form of model reference hedging. A complete design procedure is given which takes advantage of the sliding mode boundary layer to recast the SMC as a linear control law. Frequency domain loop shaping is then used to design the sliding manifold. Finally, three aircraft applications are demonstrated. An F-18/HARV is used to demonstrate SISO and MIMO designs. The third application is a linear six degree-of-freedom advanced tailless fighter model. The observer-based SMC is seen to provide excellent tracking with superior robustness to parameter changes and actuator failures.
DTIC
Control Systems Design; Flight Control; Robustness (Mathematics); Linearity

20020083332 Civil Aeromedical Inst., Oklahoma City, OK USA
Applying Performance-Controlled Systems, Fuzzy Logic, and Fly-by-Wire Controls to General Aviation ***Final Report***
Beringer, Dennis B.; May 2002; 12p; In English
Report No.(s): AD-A405731; DOT/FAA/AM-02/7; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A fuzzy-logic 'performance control' system, providing envelope protection and direct command of airspeed, vertical velocity, and turn rate, was evaluated in a reconfigurable general aviation simulator (configured as a Piper Malibu) at the FAA Civil Aerospace Medical Institute. Performance of 24 individuals (6 each of high-time pilots, low-time pilots, student pilots, and non-pilots) was assessed during a flight task requiring participants to track a 3-D course, from take-off to landing, represented by a graphical pathway primary flight display. Baseline performance for each subject was also collected with a conventional control system. All participants operated each system with minimal explanation of its functioning and no training. Results indicated that the fuzzy-logic performance control reduced variable error and overshoots, required less time for novices to learn (as evidenced by time to achieve stable performance), required less effort to use (reduced control input activity), and was preferred by all groups.
DTIC
Control Systems Design; Fly by Wire Control; Fuzzy Systems; General Aviation Aircraft

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see 03 Air Transportation and Safety. For astronautical facilities see 14 Ground Support Systems and Facilities (Space).

20020080892 Interactive Simulation, Inc., Toronto, Ontario Canada
Motion Simulator
Spinoff 1993; 1993, pp. 80-81; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

MOOG, Inc. supplies hydraulic actuators for the Space Shuttle. When MOOG learned NASA was interested in electric actuators for possible future use, the company designed them with assistance from Marshall Space Flight Center. They also decided to pursue the system's commercial potential. This led to partnership with InterActive Simulation, Inc. for production of cabin flight simulators for museums, expositions, etc. The resulting products, the Magic Motion Simulator 30 Series, are the first electric powered simulators. Movements are computer-guided, including free fall to heighten the sense of moving through space. A projection system provides visual effects, and the 11 speakers of a digital laser based sound system add to the realism. The electric actuators are easier to install, have lower operating costs, noise, heat and staff requirements. The U.S. Space & Rocket Center and several other organizations have purchased the simulators.
Author
Actuators; Computerized Simulation; Hydraulic Equipment; Motion Simulators; Motion Perception

20020083158 NASA Goddard Space Flight Center, Greenbelt, MD USA
Development of A Thrust Stand to Meet LISA Mission Requirements
Willis, William D., III, NASA Goddard Space Flight Center, USA; Zakrzwski, C. M., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 7-10 Jul. 2002, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A thrust stand has been built and tested that is capable of measuring the force-noise produced by electrostatic micro-Newton (micro-Newton) thrusters. The LISA mission's Disturbance Reduction System (DRS) requires thrusters that are capable of producing continuous thrust levels between 1-100 micro-Newton with a resolution of 0.1 micro-Newton. The stationary force-noise produced by these thrusters must not exceed 0.1 pN/4Hz in a 10 Hz bandwidth. The LISA Thrust Stand (LTS) is a torsion-balance type thrust stand designed to meet the following requirements: stationary force-noise measurements from 10(exp-4) to 1 Hz with 0.1 micro-Newton resolution, absolute thrust measurements from 1-100 micro-Newton with better than 0.1 micro-Newton resolution, and dynamic thruster response from 10(exp -4) to 10 Hz. The ITS employs a unique vertical configuration, autocollimator for angular position measurements, and electrostatic actuators that are used for dynamic pendulum control and null-mode measurements. Force-noise levels are measured indirectly by characterizing the thrust stand as a spring-mass system. The LTS was initially designed to test the indium FEEP thruster developed by the Austrian Research Center in Seibersdorf (ARCS), but can be modified for testing other thrusters of this type.
Author
Mission Planning; Thrust Measurement; Electrostatics; Supports

20020083174 Defence Research and Development Canada, Ottawa, Ontario Canada
A Foray into Laser Projection and the Visual Perception of Aircraft Aspect
Niall, Keith K.; Apr. 01, 2002; 45p; In English
Report No.(s): AD-A406109; DRDC-TR-2002-108; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High-resolution visual displays have been designed for flight simulation so that observers may judge the aspect angle of aircraft at far distances. The present experiment compares two display devices as untrained observers judge the spatial orientation of two target aircraft: F15 and F16 jets. The display devices are a prototype direct-write microlaser projector, and an SXGA format CRT display. Observers' accuracy of aircraft identification is better with the laser projector, and recognition response times are faster. A simple rule was found to fit the observers' response times: the rule is expressed in terms of a - statistic on the autocorrelation of black and white silhouette images of aircraft. Observers' estimates of aspect are biased by the laser projector, while observers' estimates of aspect are accurate on average with the SXGA display. This bias in estimation of aspect may be attributable to variations in line brightness introduced by the laser projector.
DTIC
Lasers; Visual Perception; Flight Simulation; Fighter Aircraft; Projection

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see categories 13 through 20. For extraterrestrial exploration, see 91 Lunar and Planetary Science and Exploration.

20020080714 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Mars Sample Return Mission Planning
Beaty, David, Jet Propulsion Lab., California Inst. of Tech., USA; Mars Sample Handling Protocol Workshop Series; December 2001, pp. 77-80; In English; Also announced as 20020080712; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

This presentation considers the decisions which go into planning the Mars Sample Return Mission (i.e. spacecraft design) and how these choices affect concerns about the safe handling of any sample returns. Topics covered include: 'being there' trades, 'getting home' trades, quantitative functions and risk assessments.
CASI
Mars Sample Return Missions; Planetary Protection; Mission Planning; Spacecraft Design; Tradeoffs; Mars Surface Samples

20020080749 General Accounting Office, Washington, DC USA
Military Space Operations: Planning, Funding, and Acquisition Challenges Facing Efforts to Strengthen Space Control
Sep. 2002; 28p; In English
Report No.(s): PB2002-109167; GAO-02-738; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USA is increasingly dependent on space for its security and well being. The Department of Defense's (DOD) space systems collect information on capabilities and intentions of potential adversaries. They enable military forces to be warned of a missile attack and to communicate and navigate while avoiding hostile action. and they provide information that allows forces to precisely attack targets in ways to minimize collateral damage and loss of life. DOD's satellites also enable global communications, television broadcasts, weather forecasting; navigation of ships, planes, trucks, and cars; and synchronization of computers, communications, and electric power grids. This growing dependence, however, is also making commercial and military space systems attractive targets for adversarial attacks. According to DOD, our adversaries are exploring such capabilities as directed energy weapons, space object tracking systems, physical attacks on satellite ground stations, and signals jamming. Moreover, our adversaries are gaining access to space-based information as well as acquiring new spacebased capabilities. In view of this growing threat, DOD is taking on efforts to strengthen its ability to protect and defend space-based assets, also known as 'space control.' Given the importance and potential costs of its acquisitions related to space, we identified DOD's efforts to strengthen its ability to protect and defend its space assets and the challenges facing DOD in making those space control efforts successful.
NTIS
Military Operations; Ground Stations; Aerospace Systems; Broadcasting

20020080805 NASA Goddard Space Flight Center, Greenbelt, MD USA

Controller Design for the ST7 Disturbance Reduction System

Maghami, Peiman, NASA Goddard Space Flight Center, USA; Markley, F. Landis, NASA Goddard Space Flight Center, USA; Dennehey, Neil, NASA Goddard Space Flight Center, USA; Houghton, Martin B., NASA Goddard Space Flight Center, USA; Folkner, William M., Jet Propulsion Lab., California Inst. of Tech., USA; [2002]; 7p; In English; 5th International ESA Conference on GN&C Systems, 22-25 Oct. 2002, Frascati, Italy; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Space Technology 7 experiment will perform an on-orbit system-level validation of two specific Disturbance Reduction System technologies: a gravitational reference sensor employing a free-floating test mass and a set of micro-Newton colloidal thrusters. The Disturbance Reduction System is designed to maintain a spacecraft's position with respect to the free-floating test mass to less than 10 nm/ square root of Hz, over the frequency range 10(exp -3) Hz to 10(exp -2) Hz. This paper presents the design and analysis of the coupled drag-free and attitude control system that closes the loop between the gravitational reference sensor and the micro-Newton thrusters while incorporating star tracker data at low frequencies. The effects of actuation and measurement noise and disturbances on the spacecraft and test masses are evaluated in a seven-degree-of-freedom planar model incorporating two translational and one rotational degrees of freedom for the spacecraft and two translational degrees of freedom for each test mass.

Author

Attitude Control; Degrees of Freedom; Design Analysis; Floating; Space Technology Experiments; Position (Location)

20020080916 NASA Ames Research Center, Moffett Field, CA USA

Sample Acquisition Techniques for Exobiology Flight Experiments

Kojiro, Daniel R., NASA Ames Research Center, USA; Carle, Glenn C., NASA Ames Research Center, USA; Stratton, David M., Search for Extraterrestrial Intelligence Inst., USA; Valentin, Jose R., Canada Coll., Canada; [1999]; 1p; In English; American Chemistry Society, 22-27 Aug. 1999, Unknown

Contract(s)/Grant(s): RTOP 344-36-30-28; No Copyright; Avail: Issuing Activity; Abstract Only

Exobiology Flight Experiments involve complex analyses conducted in environments far different than those encountered in terrestrial applications. A major part of the analytical challenge is often the selection, acquisition, delivery and, in some cases, processing of a sample suitable for the analytical requirements of the mission. The added complications of severely limited resources and sometimes rigid time constraints combine to make sample acquisition potentially a major obstacle for successful analyses. Potential samples come in a wide range including planetary atmospheric gas and aerosols (from a wide variety of pressures), planetary soil or rocks, dust and ice particles streaming off of a comet, and cemetery surface ice and rocks. Methods to collect and process sample are often mission specific, requiring continual development of innovative concepts and mechanisms. These methods must also maintain the integrity of the sample for the experimental results to be meaningful. We present here sample acquisition systems employed from past missions and proposed for future missions.

Author

Space Missions; Sampling; Exobiology

20020082992 Air Force Research Lab., Edwards AFB, CA USA

Refined Orbital Performance Measurements of the Air Force Electric Propulsion Space Experiment (ESEX) Ammonia Arcjet

Fife, J. M.; Bromaghim, D. R.; Chart, D. A.; Hoskins, W. A.; Vaughan, C. E.; Jan. 11, 2001; 26p; In English

Report No.(s): AD-A406002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the Electric Propulsion Space Experiment (ESEX) mission, eight firings of the 26 kW ammonia arcjet were performed. Data taken from on-board systems, GPS (Global Positioning System) and ground tracking during these firings are used to determine thruster performance. The on-board Servo Accelerometer Assembly (SAA) measured spacecraft acceleration. The mean values of thrust, specific impulse and thrust efficiency are 1.93 +/- 0.06 Newtons, 786.2 +/- 43.0 seconds and 0.267 +/- 0. 021, respectively. This measured performance is lower than expected based on ground test. The most likely cause of this discrepancy is onboard measurement error in discharge power due to a 6% drift in the power processing unit current shunt. At the corrected power, performance falls within the expected envelope.

DTIC

Electric Propulsion; Spacecraft Propulsion; Arc Jet Engines; Test Firing; Rocket Firing

20020083012 Air Force Research Lab., Edwards AFB, CA USA

Solar Orbit Transfer Vehicle Conceptual Design

Jun. 17, 1999; 20p; In English

Contract(s)/Grant(s): F04611-97-C-0031

Report No.(s): AD-A405765; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In response to government and industry needs for greater space lift capability, greater space mobility, and more affordable spacecraft, the Air Force Research Lab has been researching advanced technologies that include solar thermal propulsion and solar thermionic based power systems. Efforts over the last ten years have focused on feasibility, design, and fabrication issues of the various components. Recent programs have progressed to the point of ground based demonstrations of major subsystems. Because solar thermal based concepts are designed to make use of the 0-g space environment, the validation of several key issues can only be accomplished with a space flight experiment. These issues include the long duration containment and acquisition of two-phase hydrogen, stability and dynamic control of large solar concentrators, exhaust plume impingement, and autonomous multi-impulse orbit raising. In an effort to validate these issues, a conceptual design of a space experiment has been created which includes basic layout and design drawings, performance predictions, and subsystem requirements. The design was produced using a design to cost approach. This paper gives a basic overview of the conceptual design as well as a description of the drivers and rational behind the design. The DTC method shows to be a valuable tool for defining low cost technology experiments although the results must be considered in the light of the driving factors.

DTIC

Solar Energy; Aerospace Environments; Dynamic Control; Solar Thermal Propulsion

20020083068 NASA Goddard Space Flight Center, Greenbelt, MD USA

From Monolithics to Tethers to Freeflyers: The Spectrum of Large Aperture Sensing from Space

Leitner, Jesse, NASA Goddard Space Flight Center, USA; Quinn, David, NASA Goddard Space Flight Center, USA; [2002]; 18p; In English; SPIE Interferometry in Space Conference, 22-28 Aug. 2002, Waikola, HI, USA; Sponsored by International Society for Optical Engineering, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As part of NASA's endeavor to push the envelope and go where we have never been before, the Space Science Enterprise has laid out a vision which includes several missions that revolutionize the collection of scientific data from space. Many of the missions designed to meet the objectives of these programs depend heavily on the ability to perform space-based interferometry, which has recently become a rapidly growing field of investigation for both the scientific and engineering communities. While scientists are faced with the challenges of designing high fidelity optical systems capable of making detailed observations, engineers wrestle with the problem of providing s-pace-based platforms that can permit this data gathering to occur. Observational data gathering is desired at's variety of spectral wavelengths and resolutions, calling for interferometers with a range of baseline requirements. Approaches to configuration design are as varied as the missions themselves from large monolithic spacecraft to multiple free-flying small spacecraft and everything in between. As will be discussed, no one approach provides a 'panacea' of solutions rather each has its place in terms of the mission requirements. The purpose here is to identify the advantages and disadvantages of the various approaches, to discuss the driving factors in design selection and determine the relative range of applicability of each design approach.

Author

Apertures; Data Acquisition; Interferometers; Spectra

20020083071 Naval War Coll., Joint Military Operations Dept., Newport, RI USA

Protecting Critical Space Systems: A National Security Issue *Final Report*

Cooney, William T.; May 13, 2002; 24p; In English

Report No.(s): AD-A405817; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Commercial space capabilities are expanding. As they expand, the capabilities will increase in their military utility. These capabilities include communications, remote sensing, navigation, and imagery. Spending in the commercial space industry between 1995 and 2010 will top 5100 billion. With the rise in commercially available services and declining defense budgets, the DoD will inevitably migrate traditionally dedicated space capabilities to commercial systems (communications, remote sensing, and possibly navigation). The space industry considers countermeasures costly and unnecessary against threats they deem not likely. With our economics well-being increasingly tied to space, what role should the U.S. Government and military play in assuring our access? Future projections point to force-on-force space confrontations with peer competitors and asymmetric attack by hostile groups, and individuals. Therefore, protection of commercial military space systems must be rooted in space law, space policy and doctrine with consideration to the and future strategic environment they will become. Key questions will address the impact on U.S. national security due to attacks on commercial and military space assets. What is the 'real' impact of commercial

space on the U.S. economy and military capability? How would loss of commercial space capabilities impact U.S. war fighting capability? What constitutes an attack on a commercial space system? How do we deter and detect an attack? Finally, what policy and process changes are needed to protect our national security?
DTIC
Protection; Aerospace Industry; Aerospace Systems; Economics; Losses; Policies; Security; Space Commercialization

20020083202 Maxwell Technologies, Inc., Federal Div., San Diego, CA USA
Space System Environment Interactions Investigation ***Final Report, Dec. 1991-Dec 1997***
Mandell, M. J.; Jongeward, G. A.; Davis, V. A.; Katz, I.; Kuharski, R. A.; Jan. 1998; 40p; In English
Contract(s)/Grant(s): F19628-91-C-0187; Proj-S327
Report No.(s): AD-A406336; MFD-DFR-98-15996; AFRL-VS-HA-TR-98-0019; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes work conducted for a contract to support research into the interactions of space systems with the space environment. This report covers theoretical and calculational research in support of the SPEAR 3 program using the EPSAT and DynaPAC computer codes. Analysis of CHAWS and PASP Plus flight data is discussed.
DTIC
Interactions; Aerospace Engineering; Aerospace Environments

20020083248 Engineering Research and Consulting, Inc., Edwards AFB, CA USA
Observations of the Effect on Spacecraft Function and Communications by the ESEX 26kW Ammonia Arcjet
Dulligan, M. J.; Bromaghim, D. R.; Zimmerman, J. A.; Hardesty, D.; Johnson, L. K.; Jan. 11, 2001; 43p; In English; Prepared in cooperation with Lockheed Martin Technical Operations, Dublin, CA; Aerospace Corp. El Segundo, CA
Report No.(s): AD-A406004; AFRL-PR-ED-TP-2001-008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Tests designed to detect the influence of operating the Electric Propulsion Space Experiment (ESEX) 26 kW ammonia arcjet on normal spacecraft communications and operations showed. Two on-board antennas sensitive to the 2, 4, 8, and 12 GHz frequencies detected no increase in signal amplitude that is clearly identifiable with arcjet operation. Analysis of the bit-error rate (BER) tests, a sensitive diagnostic for quantitatively measuring the effect of the arcjet plume on ground/spacecraft round trip communication, revealed no obvious correlation between arcjet operation and the observed increases in bit-error rate. Finally, a series of qualitative observations consistently indicated the benign nature of arcjet operation on normal spacecraft events. For example, commands uplinked without abnormal rejection rate and telemetry downlinked successfully during arcjet operation.
DTIC
Spacecraft Communication; Arc Jet Engines; Electric Propulsion; Spacecraft Propulsion

20020083277 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
An Overview of the On-Orbit Results from the Electric Propulsion Space Experiment (ESEX)
Bromaghim, D. R.; LeDuc, J. R.; Salasovich, R. M.; Spanjers, G. G.; Fife, J. M.; Feb. 02, 2001; 43p; In English; Prepared in collaboration with ERC Inc, Edwards AFB, Ca and We Research LLC, Rosamond Ca and Aerospace Corp, ELSegundo, Ca
Report No.(s): AD-A405916; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The USA Air Force (USAF) Research Laboratory's Electric Propulsion Space Experiment (ESEX) was launched and successfully operated -demonstrating the compatibility and readiness of a 26 kW ammonia arcjet subsystem for satellite applications. ESEX is one of nine experiments on the USAF's Advanced Research and Global Observation Satellite (ARGOS). Data were acquired to characterize the thruster in four different areas: electromagnetic interactions, contamination effects, optical properties of the plume, and thruster system performance. The results demonstrated that the critical system components (including the arcjet, power processor, and propellant system) operated well, and verified the interoperability of high power electric propulsion with generic satellite operations.
DTIC
Orbits; Test Vehicles; Electric Propulsion; Space; Aerospace Environments

13
ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

20020080712 NASA Ames Research Center, Moffett Field, CA USA
Mars Sample Handling Protocol Workshop Series
Race, Margaret S., Editor, Search for Extraterrestrial Intelligence Inst., USA; Nealson, Kenneth H., Jet Propulsion Lab., California Inst. of Tech., USA; Rummel, John D., Editor, NASA, USA; Acevedo, Sara E., Editor, Search for Extraterrestrial Intelligence Inst., USA; December 2001; 136p; In English, 19-21 Mar. 2001, San Diego, CA, USA; Also announced as 20020080713 through 20020080718
Contract(s)/Grant(s): RTOP 896-50-02-01
Report No.(s): NASA/CP-2001-211388; A-00V0051; NAS 1.55:211388; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report provides a record of the proceedings and recommendations of Workshop 3 of the Series, which was held in San Diego, California, March 19-21, 2001. Materials such as the Workshop agenda and participant lists as well as complete citations of all references and a glossary of terms and acronyms appear in the Appendices. Workshop 3 builds on the deliberations and findings of the earlier workshops in the Series, which have been reported separately. During Workshop 3, five individual sub-groups were formed to discuss the following topics: (1) Unifying Properties of Life, (2) Morphological organization and chemical properties, (3) Geochemical and geophysical properties, (4) Chemical Method and (5) Cell Biology Methods.
Author
Conferences; Mars Surface Samples; Mars Sample Return Missions; Planetary Protection; Biomarkers; Contamination; Decontamination; Sampling

20020081023 NASA Goddard Space Flight Center, Greenbelt, MD USA
Orbit Determination Issues for Libration Point Orbits
Beckman, Mark, NASA Goddard Space Flight Center, USA; [2002]; 11p; In English; International Conference of Libration Points Orbits and Applications, 10-14 Jun. 2002, Girona, Spain; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Libration point mission designers require knowledge of orbital accuracy for a variety of analyses including station keeping control strategies, transfer trajectory design, and formation and constellation control. Past publications have detailed orbit determination (OD) results from individual libration point missions. This paper collects both published and unpublished results from four previous libration point missions (ISEE (International Sun-Earth Explorer) -3, SOHO (Solar and Heliospheric Observatory), ACE (Advanced Composition Explorer) and MAP (Microwave Anisotropy Probe)) supported by Goddard Space Flight Center's Guidance, Navigation & Control Center. The results of those missions are presented along with OD issues specific to each mission. All past missions have been limited to ground based tracking through NASA ground sites using standard range and Doppler measurement types. Advanced technology is enabling other OD options including onboard navigation using seaboard attitude sensors and the use of the Very Long Baseline Interferometry (VLBI) measurement Delta Differenced One-Way Range (DDOR). Both options potentially enable missions to reduce coherent dedicated tracking passes while maintaining orbital accuracy. With the increased projected loading of the DSN (Deep Space Network), missions must find alternatives to the standard OD scenario.
Author
Libration; Orbit Determination; Stationkeeping; Very Long Base Interferometry; Spacecraft Control; Lagrange Coordinates

20020081116 NASA Goddard Space Flight Center, Greenbelt, MD USA
Getting to L1 the Hard Way: Triana's Launch Options
Houghton, Martin B., NASA Goddard Space Flight Center, USA; [2002]; 6p; In English; International Conference on Libration Point Orbits and Applications, 10-14 Jun. 2002, Gerona, Spain; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Over the past four years, NASA's Goddard Space Flight Center has built and tested the Triana observatory, which will be the first Earth observing science satellite to take advantage of the unique perspective offered by a Lissajous orbit about the first Earth-Sun Lagrange Point (L1). Triana was originally meant to fly on the U.S. Space Transportation System (a.k.a. the Space Shuttle), but complications with the shuttle manifest have forced Triana into a "wait and see" attitude. The observatory is currently being stored at NASA's Goddard Space Flight Center, where it waits for an appropriate launch opportunity to materialize. to that end, several possible alternatives have been considered, including variations on the nominal shuttle deployment scenario, a high inclination Delta-type launch from Vandenberg Air Force Base, a Tsyklon class vehicle launched from Baikonur, Kazakhstan, and

a ride on a French Ariane vehicle out of French Guiana into a somewhat arbitrary geostationary transfer orbit (GTO). This paper chronicles and outlines the pros and cons of how each of these opportunities could be used to send Triana on its way to L1.
Author
Space Transportation System; Observatories; Geosynchronous Orbits; Earth Sciences

20020083164 NASA Goddard Space Flight Center, Greenbelt, MD USA
Orbit Determination Issues for Libration Point Orbits
Beckman, Mark, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; International Conference on Libration Point Orbits and Applications, 10-14 Jun. 2002, Girona, Spain; No Copyright; Avail: Issuing Activity; Abstract Only

Libration point mission designers require knowledge of orbital accuracy for a variety of analyses including station keeping control strategies, transfer trajectory design, and formation and constellation control. Past publications have detailed orbit determination (OD) results from individual notation point missions. This paper collects both published and unpublished results from four previous notation point missions (ISEE-3, SOHO, ACE and MAP) supported by Goddard Space Flight Center's Guidance, Navigation & Control Center. The results of those missions are presented along with OD issues specific to each mission. All past missions have been limited to ground based tracking through NASA ground sites using standard marine and Doppler measurement types. Advanced technology is enabling other OD options including onboard navigation using onboard attitude sensors and the use of the Very Long Baseline Interferometry (VLBI) measurement Delta Differenced One-Way Range (DDOR). Both options potentially enable missions to reduce coherent dedicated tracking passes while maintaining orbital accuracy. With the increased projected loading of the DSN, missions must find alternatives to the standard OD scenario.
Author
Deep Space Network; Orbit Determination; Onboard Equipment; Navigation; NASA Space Programs; Space Missions

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also 09 Research and Support Facilities (Air).

20020083343 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Large Liquid Engine Test Facility
Mendez, Gabe; Jan. 2001; 11p; In English
Report No.(s): AD-A405809; AFRL-PR-ED-AB-2000-184; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Air Force Research Laboratory (AFRL), in order to support the Evolved Expendable Launch Vehicle (EELV) Program, recently activated a large liquid rocket engine test stand after a 25 years dormancy. Test Stand 1A, located at Edwards AFB CA, was left in a semi-abandoned condition since the early 1970's. With no definitive plans for re-activation, the facility was left to weather in the dry desert air. The objective was to provide the Air Force with the capability to test large liquid rocket engines up to 1.6 million pounds of thrust which utilize liquid oxygen for the oxidizer and either liquid hydrogen or kerosene for fuel. A high pressure hydrogen turbopump spin capability was also added to enable turbopump component development testing. This paper will review the lessons learned and observations from designing, modifying, and activating the test stand and performing the initial development activity on the new RS-68 rocket engine being developed for the Boeing Delta IV launch vehicle.
DTIC
Launch Vehicles; Test Stands; Delta Launch Vehicle; Engine Tests; Liquid Propellant Rocket Engines; Test Facilities; Military Air Facilities

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also 18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.

20020082904 NASA Glenn Research Center, Cleveland, OH USA
GTX Reference Vehicle Structural Verification Methods and Weight Summary
Hunter, J. E., NASA Glenn Research Center, USA; McCurdy, D. R., QSS Group, Inc., USA; Dunn, P. W., NASA Glenn Research

Center, USA; September 2002; 20p; In English; Combustion, Airbreathing Propulsion, Propulsion Systems Hazards and Modelling and Simulation Joint Meeting, 8-12 Apr. 2002, Destin, FL, USA; Sponsored by Department of the Army, USA
Contract(s)/Grant(s): RTOP 708-90-63
Report No.(s): NASA/TM-2002-211884; E-13200-1; NAS 1.15:211884; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The design of a single-stage-to-orbit air breathing propulsion system requires the simultaneous development of a reference launch vehicle in order to achieve the optimal mission performance. Accordingly, for the GTX study a 300-lb payload reference vehicle was preliminarily sized to a gross liftoff weight (GLOW) of 238,000 lb. A finite element model of the integrated vehicle/propulsion system was subjected to the trajectory environment and subsequently optimized for structural efficiency. This study involved the development of aerodynamic loads mapped to finite element models of the integrated system in order to assess vehicle margins of safety. Commercially available analysis codes were used in the process along with some internally developed spreadsheets and FORTRAN codes specific to the GTX geometry for mapping of thermal and pressure loads. A mass fraction of 0.20 for the integrated system dry weight has been the driver for a vehicle design consisting of state-of-the-art composite materials in order to meet the rigid weight requirements. This paper summarizes the methodology used for preliminary analyses and presents the current status of the weight optimization for the structural components of the integrated system.
Author
Hypersonic Aircraft; Reusable Launch Vehicles; Structural Design; Design Analysis; Air Breathing Engines

20020083297 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA
ARL Commissioning Experiments With a 4.5-MJ Pulsed Power Supply ***Final Report, Feb.-Apr. 2002***
Del Guercio, Miguel; Sep. 2002; 24p; In English; Original contains color images
Contract(s)/Grant(s): DA Proj. 1L1-622618-AH-80
Report No.(s): AD-A406130; ARL-TR-2814; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A 4.5-MJ capacitor-based, pulsed power supply has been installed at the U. S. Army Research Laboratory, Aberdeen Proving Ground, MD, for railgun operations. The system consists of 18 independent modules, each with an energy capacity of 250 kJ. Half of the modules were modified from their original condition to a pulse-forming inductance of ^24 mH, while the remainder maintained their original 60-mH inductance. Another modification included a pneumatic-operated shorting system, added to enhance the safety of the system. Simulations were conducted for a variety of load conditions using a SPICE-based code. Predicted currents and velocities are in reasonable agreement with measured quantities. The complete system allows the electromagnetic launch of hypervelocity launch packages to a downrange distance of 4 km.
DTIC
Capacitors; Pneumatics; Pulse Generators; Computerized Simulation; Hypervelocity Launchers

20020083335 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
MEMS Technology Demonstration on Traveler-1
DSouza, Brian; Jamison, Andrew J.; Young, Marcus; Ketsdever, Andrew D.; Chinnery, Anne; Jul. 15, 2002; 15p; In English; Prepared in collaboration with Univ of Southern Californa, Los Angeles and Microcosm Inc., El Segundo, CA
Report No.(s): AD-A405740; AFRL-PR-ED-TP-2002-182; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Traveler-I is a flight test platform for advanced micro-electro-mechanical systems (MEMS) devices that is being built at the University of Southern California (USC) and is to be flown aboard the next Scorpius(registered) sub-orbital launch vehicle. Microcosm, Inc. and Scorpius Space Launch Company have initiated a program that currently provides sub-orbital launch opportunities, with the possibility of orbital flights in the future. Flight opportunities such as these allow for short duration missions where new technologies can be rapidly developed and tested in a launch and space environment. Traveler-I allows for low cost flight demonstration and testing of new and innovative MEMS devices such as a Free-Molecule Micro-Resistojet (FMMR) and a Knudsen Compressor. The FMMR is a MEMS-based propulsion system for low impulse bit delivery, which is designed to perform attitude control and primary maneuvers for nanosatellites. The Knudsen Compressor is a MEMS-based vacuum pump that employs the physical principle of thermal transpiration to drive a flow across an aerogel substance. Advances in MEMS capabilities have allowed the construction of micro-scale versions of space sensors such as mass spectrometers, optical spectrometers, and gas chromatographs. These devices require vacuum pumps to provide the necessary environment for their operation. Inexpensive and rapid access to space may eventually lead to low-cost testing, which Supports rapid development and redesign so that more mature and reliable technologies can be used in future satellite systems, without the expense of designing, building and operating an entire satellite. In addition, the size of MEMS devices allows for the testing of multiple systems

simultaneously. Traveler-I is a good example of how advanced technologies may be tested for low cost while reducing risk and development time for future programs.
DTIC
Flight Tests; Microelectromechanical Systems; Technology Utilization; Resistojet Engines; Free Molecular Flow

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SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also 03 Air Transportation and Safety and 15 Launch Vehicles and Launch Vehicles, and 18 Spacecraft Design, Testing and Performance. For space suits, see 54 Man/System Technology and Life Support.

20020082881 NASA Johnson Space Center, Houston, TX USA
STS-112 Crew Interviews - Magnus
Aug. 15, 2002; In English; 43 min., 9 sec. playing time, in color, with sound
Report No.(s): JSC-1924C; NONP-NASA-VT-2002137519; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-112 Mission Specialist 2 Sandra H. Magnus is seen during a prelaunch interview. She answers questions about her inspiration to become an astronaut and her career path. She gives details on the mission's goals, the most significant of which will be the installation of the S-1 truss structure on the International Space Station (ISS). The installation, one in a series of truss extending missions, will be complicated and will require the use of the robotic arm as well as extravehicular activity (EVA) by astronauts. Magnus also describes her function in the performance of transfer operations. Brief descriptions are given of experiments on board the ISS as well as on board the Shuttle.
CASI
International Space Station; Trusses; Astronauts; Space Shuttles; Prelaunch Summaries; Loading Operations

20020082890 NASA Johnson Space Center, Houston, TX USA
STS-112 Crew Interviews: Sellers
Aug. 16, 2002; In English; 41 min., 24 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002137511; JSC-1924D; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Piers Sellers is an Astronaut from Crowborough, UK. His Bachelor of Science degree is in Ecological science from Scotland's University of Edinburgh and his doctorate is in biometeorology from Leeds University in the UK. After two years of intense training, Sellers's first assignment as a Mission Specialist is on Flight 111 STS-112. The goal of this flight is to continue building the International Space Station. Sellers, accompanied by five astronauts, will install the S1 truss of the space station which will take three EVA's, or Extra Vehicular Activities to complete. In EVA 1, the highest priority, the S1 truss will be attached to the space station. EVA 2, the electrical work, will set up the radiator and cooling equipment for the station. EVA 3, the final process of the flight, will prepare the station for the next mission. The primary reason for installing the truss is to change the center of gravity of the station so when the next truss is installed, it will be at a symmetrical point.
CASI
Space Transportation System; Space Stations; International Space Station; Extravehicular Activity

20020082898 NASA Johnson Space Center, Houston, TX USA
STS-112 Crew Interviews: Ashby
Aug. 15, 2002; In English; 25 min., 51 sec. playing time, in color, with sound
Report No.(s): JSC-1924A; NONP-NASA-VT-2002137582; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

STS-112 Mission Commander Jeffrey Ashby is seen during this preflight interview, answering questions about his inspiration in becoming an astronaut and his career path and provides an overview of the mission. Ashby outlines his role in the mission in general, and specifically during the docking and extravehicular activities (EVAs). He describes the payload (S1 truss) and the importance that the S1 truss will have in the development of the International Space Station (ISS). Ashby discusses the delivery and installation of the S1 truss scheduled to be done in the planned EVAs in some detail. He touches on the use and operation of

the Canadarm 2 robotic arm in this process and outlines what supplies will be exchanged with the resident crew of the ISS during transfer activities. He ends with his thoughts on the value of the ISS in fostering international cooperation.
CASI
Astronauts; Trusses; Crew Procedures (Inflight); Prelaunch Summaries; Integrated Truss Structure S1

20020082934 NASA Johnson Space Center, Houston, TX USA
STS-111 Flight Day 09 Highlights
Jun. 13, 2002; In English; 27 min., 29 sec., playing time, in color, with sound
Report No.(s): BRF-1434I; NONP-NASA-VT-2002137516; No Copyright; Avail: CASI; V02, Videotape-VHS

The STS-111 flight crew consists of Kenneth D. Cockrell, Commander, Paul S. Lockhart, Pilot, Franklin R. Chang-Diaz, Mission Specialist, Philippe Perrin, (CNES), Mission Specialist, Valery G. Korzun, (RSA), ISS Up, Peggy A. Whitson, ISS Up , Sergei Y. Treschev (RSC), ISS Up, Yuri I. Onufriyenko (RSA), ISS Down, Carl E. Walz, and Daniel W. Bursch (ISS) Down. The main goal on this ninth day of flight STS-111, is to replace the wrist roll joint of the Robotic Arm on the International Space Station. Live footage of the wrist roll joint replacement is presented. Paul Lockhart is the spacewalk coordinator for this mission. Franklin Chang-Diaz and Philippe Perrin, are responsible for replacing the wrist roll joint and performing maintenance activities. The spacewalk to repair this joint occurs outside the Space Station's Quest Airlock. The wrist roll joint was replaced successfully. The spacewalk took approximately 7 hours and 17 minutes to complete.
CASI
Extravehicular Activity; International Space Station; Robot Arms; Space Transportation System

20020082946 NASA Johnson Space Center, Houston, TX USA
Expedition 5 Crew Interviews: Peggy Whitson
May 08, 2002; In English; 38 min., 41 sec. playing time, in color, with sound
Report No.(s): JSC-1910B; NONP-NASA-VT-2002137655; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Expedition 5 Flight Engineer Peggy Whitson is seen during a prelaunch interview. She gives details on the mission's goals and significance, her role in the mission, what her responsibilities will be, what the crew activities will be like (docking and undocking of two Progress unpiloted supply vehicles, normal space station maintenance tasks, conducting science experiments, installing the CETA (Crew and Equipment Translation) cart, and supporting the installation of the International Truss Structure S1 segment), the day-to-day life on an extended stay mission, the experiments she will be conducting on board, and what the S1 truss will mean to the International Space Station (ISS). Whitson ends with her thoughts on the short-term and long-term future of the ISS.
CASI
International Space Station; Prelaunch Summaries; Astronauts; Crew Procedures (Inflight); Manned Orbital Laboratories

20020082948 NASA Johnson Space Center, Houston, TX USA
STS-112 Crew Interviews: Yurchikhin
Aug. 20, 2002; In English; 37 min., 22 sec. playing time, in color, with sound
Report No.(s): JSC-1924F; NONP-NASA-VT-2002137523; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

A preflight interview with mission specialist Fyodor Yurchikhin is presented. He worked for a long time in Energia in the Russian Mission Control Center (MCC). Yurchikhin discusses the main goal of the STS-112 flight, which is to install the Integrated Truss Assembly S1 (Starboard Side Thermal Radiator Truss) on the International Space Station. He also talks about the three space walks required to install the S1. After the installation of S1, work with the bolts and cameras are performed. Yurchikhin is involved in working with nitrogen and ammonia jumpers. He expresses the complexity of his work, but says that he and the other crew members are ready for the challenge.
CASI
International Space Station; Space Transportation System; Integrated Truss Structure S1; Installing

20020083229 NASA Johnson Space Center, Houston, TX USA
STS-113 Crew Interviews: John Herrington, Mission Specialist 2
Oct. 07, 2002; In English; 29 min., 46 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002137662; JSC-1925D; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

STS-113 Mission Specialist 2 John Herrington is seen during a prelaunch interview. He answers questions about his inspiration to become an astronaut and his career path, as well as his thoughts on becoming the first Native American in space. He gives details on the mission's goals and significance, which include the transfer of the International Space Station's (ISS) Expedition 6 crew for the Expedition 5 crew, as well as the installation of the ISS's P-1 integrated truss structure. Herrington, who will participate in three EVAs (extravehicular activity), provides details on the installation of the truss structure. He also describes the process of crew transfer, which also involves the transfer of soft goods and scientific experiments, such as the MEMS (microelectromechanical systems)-based Picosatellite Inspector (MEPSI) which will be ejected from the shuttle shortly after it undocks from the ISS.
CASI
Astronauts; International Space Station; Prelaunch Summaries; Crew Procedures (Inflight)

20020083230 NASA Johnson Space Center, Houston, TX USA
STS-113 Crew Interviews: Jim Wetherbee, Commander
Sep. 27, 2002; In English; 47 min., 30 sec. playing time, in color, with sound
Report No.(s): JSC-1925A; NONP-NASA-VT-2002137656; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-113 Commander Jim Wetherbee is seen during this preflight interview where he gives a quick overview of the mission before answering questions about his inspiration to become an astronaut and his career path. Wetherbee outlines his role in the mission, what his responsibilities will be, what the crew exchange will be like (transferring the Expedition 6 crew in place of the Expedition 5 crew on the International Space Station (ISS)) and what the importance of the primary payload (the P1 truss) will be. He also provides a detailed account of the three planned extravehicular activities (EVAs) and additional transfer duties. He ends by offering his thoughts on the success of the ISS as the second anniversary of continuous human occupation of the ISS approaches.
CASI
Prelaunch Summaries; Spacecrews; Trusses; Astronauts; International Space Station

20020083313 NASA Johnson Space Center, Houston, TX USA
STS-111 Crew Interviews: Phillippe Perrin, Mission Specialist 1
May 01, 2002; In English; 30 min., 30 sec. playing time, in color, with sound
Report No.(s): JSC-1912D; NONP-NASA-VT-2002137584; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-111 Mission Specialist 1 Phillippe Perrin is seen during this preflight interview, where he gives a quick overview of his mission before answering questions about his inspiration to become an astronaut and his career path. Perrin outlines his role in the mission in general, and specifically during the docking and extravehicular activities (EVAs). He describes what the crew exchange will be like (transferring the Expedition 5 crew in place of the Expedition 4 crew on the International Space Station (ISS)) and the payloads (Mobile Base System (MBS) and the Leonardo Multi-Purpose Logistics Module). Perrin discusses the planned EVAs in detail and outlines what supplies will be left for the resident crew of the ISS. He also provides his thoughts about the significance of the mission to France and the value of the ISS.
CASI
Spacecrews; Prelaunch Summaries; Crew Procedures (Inflight); International Space Station; Astronauts

20020083314 NASA Johnson Space Center, Houston, TX USA
Expedition 6 Crew Interviews: Don Pettit, Flight Engineer 2/ International Space Station (ISS) Science Officer (SO)
Oct. 09, 2002; In English; 21 min., 57 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002137661; JSC-1926C; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Expedition 6 member Don Pettit (Flight Engineer 2/ International Space Station (ISS) Science Officer (SO)) is seen during a prelaunch interview. He answers questions about his inspiration to become an astronaut and his career path. Pettit, who had been training as a backup crewmember, discusses the importance of training backups for ISS missions. He gives details on the goals and significance of the ISS, regarding experiments in various scientific disciplines such as the life sciences and physical sciences. Pettit also comments on the value of conducting experiments under microgravity. He also gives an overview of the ISS program to date, including the ongoing construction, international aspects, and the routines of ISS crewmembers who inhabit the station

for four months at a time. He gives a cursory description of crew transfer procedures that will take place when STS-113 docks with ISS to drop off Pettit and the rest of Expedition 6, and retrieve the Expedition 5 crew.
CASI
Astronauts; International Space Station; Spaceborne Experiments; Prelaunch Summaries; Experimentation; Microgravity

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SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

20020080788 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden
Controllaw for Near Optimal Search Search of Targets for a System with Fibre-Optically Guided Missiles ***Styrlad foer Naera Optimal Malsoekning foer ett system med Fiberoptiskt Styrda Robotar***
Fokas, A.; Dec. 1999; 34p; In Swedish
Report No.(s): PB2002-107187; FOA-R-99-01346-314-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes a control system for near optimal search of targets in a target area with a system of fibre-optical connected missiles. The missiles are linked to a global control centre on the ground supervised by a system operator in order to search, locate and destroy the targets within a target area. This report focuses to the problem of autonomously controlling a missile on a surveillance mission in a target area with mobile targets and hostile objects such as air defense. The control system is based on a global information-map which continuously is updated by all the missiles sensors taking part in the mission. Uncertainty about the contents of the target area is reduced for each reported observation. Entropy, a quantified measure of uncertainty, is used to guide the search process in the target area. The controller is developed by training a reinforcement learning agent to minimize a cost-function of the uncertainty or entropy in the information-map. A neural network is used to encode and generalize the controller. The controller is trained on training-set consisting of twenty different entropy scenarios. The controller after training was able to manage 83% of the maximum performance of dissolving the entropy on maps in the training set and 66% on a map not belonging to the training set.
NTIS
Fiber Optics; Missile Defense; Targets; Control; Missile Control

20020080859 NASA Goddard Space Flight Center, Greenbelt, MD USA
Guidance, Navigation and Control Innovations At the NASA Goddard Space Flight Center
Ericsson, Aprille Joy, NASA Goddard Space Flight Center, USA; [2002]; 13p; In English; 5th International Conference on Dynamics and Control of Systems Structures in Space, 13-20 Jul. 2002, Cambridge, UK; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper presents the Guidance, Navigation and Control Center. (GN&C) at NASA Goddard Space Flight Center.
CASI
Guidance (Motion); Navigation; NASA Space Programs; Microsatellites; Autonomy; Flight Control

20020081112 NASA Glenn Research Center, Cleveland, OH USA
Implementation of a 622 Mbps Digital Modem
Kifle, Muli, NASA Glenn Research Center, USA; Bizon, Thomas P., NASA Glenn Research Center, USA; Nguyen, Nam T., NASA Glenn Research Center, USA; Tran, Quang K., NASA Glenn Research Center, USA; Mortensen, Dale J., ZIN Technologies, Inc., USA; July 2002; 13p; In English; 20th International Communication Satellite Systems Conference and Exhibit, 12-15 May 2002, Montreal, Quebec, Canada; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-08-0B
Report No.(s): NASA/TM-2002-211680; E-13409; NAS 1.15:211680; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper presents the implementation and initial test results of an Orthogonal Frequency Division Multiplexing (OFDM) digital modem (modulator and demodulator) with an aggregate information throughput of 622 megabits per second (Mbps). The OFDM waveform is constructed by dividing an incoming data stream into four channels, each channel using either a 16-ary Quadrature Amplitude Modulation (16QAM) scheme or an 8-Phase Shift Keying (8PSK) scheme. The generation and detection of the composite waveform are performed using Discrete Fourier Transform (DFT) and polyphase filtering, to digitally stack and

band-limit the individual carriers respectively. The four-channel OFDM approach enables the implementation of a modem that can be both power and bandwidth efficient, with sufficient parallelism to meet higher data rate goals. As a result, the OFDM modem requires only a 240 MHz bandwidth to transmit 622 Mbps. Hardware and simulation results in the form of spectrum diagrams and bit-error-rate (BER) curves are also presented in this paper.
Author
Space Communication; Modems; Frequency Division Multiplexing; Data Flow Analysis; Component Reliability

20020081299 NASA Glenn Research Center, Cleveland, OH USA
Variable Delay Testing Using ONE
Ishac, Joseph, NASA Glenn Research Center, USA; August 2002; 14p; In English
Contract(s)/Grant(s): RTOP 258-90-00
Report No.(s): NASA/TM-2002-211802; E-13497; NAS 1.15:211802; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper investigates the effect of long and changing propagation delays on the performance of TCP file transfers. Tests are performed with machines that emulate communication from a low/medium-earth satellite to Earth by way of a geosynchronous satellite. As a result of these tests, we find that TCP is fairly robust to varying delays given a high enough TCP timer granularity. However, performance degrades noticeably for larger file transfers when a finer timer granularity is used. Such results have also been observed in previous simulations by other researchers, and thus, this work serves as an extension of those results.
Author
Satellite Communication; Orbits; Data Transmission; Networks

20020082875 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Raumflugbetrieb und Astronautentraining, Oberpfaffenhofen, Germany
The Onboard Navigation System for the BIRD Small Satellite ***Das Bordgestuetzte Navigationssystem des Kleinsatelliten BIRD***
Gill, Eberhard, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; Montenbruck, Oliver, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; 2002; ISSN 1434-8454; 104p; In German
Report No.(s): DLR-FB-2002-06; Copyright; Avail: Issuing Activity

The BIRD mission is a small satellite project carried out by the German Aerospace Center (DLR). Launched on October 22, 2001 its major objectives are the test of a new generation of infrared array sensors as well as the detection and scientific investigation of hot spots, like forest fires or volcanic activities. As a technology satellite, BIRD is equipped with a GPS-based autonomous navigation system which provides real-time onboard orbit determination as well as orbit and event prediction capabilities. The Onboard Navigation System (ONS) supports the BIRD Attitude Control System with real-time attitude information to allow for a nadir pointing of the spacecraft during image sessions and high-rate data downlinks. In addition, precise ONS position data are merged onboard the spacecraft with BIRD image sensor data, thus enabling a geocoding of satellite images on-the-flight. Furthermore, the ONS derives precise timing information from the GPS receiver, which allows a proper synchronization of the BIRD onboard clock based on the measured bias and the determined drift rate. Finally, NORAD Twoline elements are autonomously generated onboard from GPS position data, which are downlinked to a relocatable ground terminal for antenna pointing and pass scheduling. An example of the autonomous navigation capabilities of the ONS is the onboard computation of upcoming shadow transits and station contacts, that serves as a demonstration of more fundamental tasks like the support of onboard experiment scheduling or power management. Starting with an introduction to the BIRD satellite mission, a detailed mathematical description of the algorithms applied within the ONS is given. The concept and architectural design of the implemented system is presented with emphasis on the interaction of the ONS threads and their timing characteristics, followed by a description of the ONS software modules, A series of ONS-related software and hardware-in-the-loop test cycles has been conducted in the preparation of the mission, which are presented. Based on more than two months of flight experience, the performance of the ONS is analysed in detail, demonstrating the reliable performance of the system together with an excellent accuracy performance, which provides real-time position accuracy of a few meters on-board the BIRD satellite.
Author
Autonomous Navigation; Onboard Equipment; Small Satellite Technology; Global Positioning System; Infrared Detectors; Mathematical Models; Systems Engineering

20020082903 NASA Glenn Research Center, Cleveland, OH USA
Mobile Router Technology Development
Ivancic, William D., NASA Glenn Research Center, USA; Stewart, David H., Verizon - Federal Network Systems, LLC, USA;

Bell, Terry L., Lockheed Martin Global Telecommunications, USA; Kachmar, Brian A., Analex Corp., USA; Shell, Dan, Cisco Systems, Inc., USA; Leung, Kent, Cisco Systems, Inc., USA; August 2002; 24p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 322-20-2A
Report No.(s): NASA/TM-2002-210938; E-12791; NAS 1.15:210938; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cisco Systems and NASA have been performing joint research on mobile routing technology under a NASA Space Act Agreement. Cisco developed mobile router technology and provided that technology to NASA for applications to aeronautic and space-based missions. NASA has performed stringent performance testing of the mobile router, including the interaction of routing and transport-level protocols. This paper describes mobile routing, the mobile router, and some key configuration parameters. In addition, the paper describes the mobile routing test network and test results documenting the performance of transport protocols in dynamic routing environments.
Author
Mobile Communication Systems; Performance Tests

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see 54 Man/System Technology and Life Support. For related information, see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.

20020080847 Swedish Defence Research Establishment, Stockholm, Sweden
Space Weapons and Measures against Satellites ***Rymdvapen och Atgaerder mot Satelliter***
Ekblad, U.; Mar. 2000; 40p; In Swedish
Report No.(s): PB2002-107203; FOA-R-00-01456-201-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The report has been produced within the Project 'rules of Assessment.' The purpose is that it should be used within the study activities of the Armed Forces as a basis for judging threats against various satellite systems. It gives a general view of the space environment together with what weapon systems can be used against satellite systems. Also weapon threats from space against the ground are mentioned. The report gives a general picture of existing technical possibilities as well as their construction possibilities.
NTIS
Satellites; Threat Evaluation; Military Operations

20020081115 NASA Goddard Space Flight Center, Greenbelt, MD USA
Relative Navigation of Formation Flying Satellites
Long, Anne, Computer Science Corp., USA; Kelbel, David, Computer Science Corp., USA; Lee, Taesul, Computer Science Corp., USA; Leung, Dominic, Computer Science Corp., USA; Carpenter, Russell, NASA Goddard Space Flight Center, USA; Gramling, Cheryl, NASA Goddard Space Flight Center, USA; [2002]; 5p; In English; CNES's International Symposium on Formation Flying Missions and Technologies, 29-30 Oct. 2002, Toulouse, France; Sponsored by Centre National d'Etudes Spatiales, France; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Guidance, Navigation, and Control Center (GNCC) at Goddard Space Flight Center (GSFC) has successfully developed high-accuracy autonomous satellite navigation systems using the National Aeronautics and Space Administration's (NASA's) space and ground communications systems and the Global Positioning System (GPS). In addition, an autonomous navigation system that uses celestial object sensor measurements is currently under development and has been successfully tested using real Sun and Earth horizon measurements.The GNCC has developed advanced spacecraft systems that provide autonomous navigation and control of formation flyers in near-Earth, high-Earth, and libration point orbits. to support this effort, the GNCC is assessing the relative navigation accuracy achievable for proposed formations using GPS, intersatellite crosslink, ground-to-satellite Doppler, and celestial object sensor measurements. This paper evaluates the performance of these relative navigation approaches for three proposed missions with two or more vehicles maintaining relatively tight formations. High-fidelity simulations were performed to quantify the absolute and relative navigation accuracy as a function of navigation algorithm and measurement type. Realistically-simulated measurements were processed using the extended Kalman filter implemented in the GPS Enhanced Inboard Navigation System (GEONS) flight software developed by GSFC GNCC. Solutions

obtained by simultaneously estimating all satellites in the formation were compared with the results obtained using a simpler approach based on differencing independently estimated state vectors.
Author
Autonomous Navigation; Flight Control; Formation Flying; Guidance (Motion); Satellite Navigation Systems; Space Navigation; Librational Motion

20020081120 NASA Goddard Space Flight Center, Greenbelt, MD USA
Course: Tests of Space Vehicles
Kaufman, Daniel, NASA Goddard Space Flight Center, USA; [2002]; 56p; In English; Master in Aerospace Technology, 1-7 Jun. 2002, Buenos Aires, Argentina; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This viewgraph presentation covers the structural tests appropriate for a satellite, and the requirements its structures are expected to perform. Special attention is given to the structural environments which act upon a satellite during and after launch, the effects of those environments, including vibration and shock, and the analysis of those effects.
CASI
Spacecraft Structures; Structural Engineering; Ground Tests; Artificial Satellites

20020081248 NASA Langley Research Center, Hampton, VA USA
Thermal Analysis Methods for an Earth Entry Vehicle
Amundsen, Ruth M., NASA Langley Research Center, USA; Dec, John A., NASA Langley Research Center, USA; Lindell, Michael C., NASA Langley Research Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 187-203; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Thermal analysis of a vehicle designed to return samples from another planet, such as the Earth Entry vehicle for the Mars Sample Return mission, presents several unique challenges. The Earth Entry Vehicle (EEV) must contain Martian material samples after they have been collected and protect them from the high heating rates of entry into the Earth's atmosphere. This requirement necessitates inclusion of detailed thermal analysis early in the design of the vehicle. This paper will describe the challenges and solutions for a preliminary thermal analysis of an Earth Entry Vehicle. The aeroheating on the vehicle during entry would be the main driver for the thermal behavior, and is a complex function of time, spatial position on the vehicle, vehicle temperature, and trajectory parameters. Thus, the thermal analysis must be closely tied to the aeroheating analysis in order to make accurate predictions. Also, the thermal analysis must account for the material response of the ablative thermal protection system (TPS). For the exo-atmospheric portion of the mission, the thermal analysis must include the orbital radiation fluxes on the surfaces. The thermal behavior must also be used to predict the structural response of the vehicle (the thermal stress and strains) and whether they remain within the capability of the materials. Thus, the thermal analysis requires ties to the three-dimensional geometry, the aeroheating analysis, the material response analysis, the orbital analysis, and the structural analysis. The goal of this paper is to describe to what degree that has been achieved.
Author
Aerodynamic Heating; Thermal Analysis; Spacecraft Reentry; Aerodynamic Heat Transfer; Heat Shielding; Mathematical Models

20020081249 NASA Johnson Space Center, Houston, TX USA
Inclusion of Thermal Protection Systems in Spacecraft Thermal-Stress Analysis using Concurrent Engineering Techniques
Rickman, Steven L., NASA Johnson Space Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 205-213; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Creating compatible thermal and structural mathematical models is complicated by the different meshing requirements of the thermal and structural disciplines. Often times, the structural model is of significantly higher fidelity requiring the thermal model to grow to an intractable size if full compatibility is to be assured. Given that the structural finite element mesh can be transformed into a thermal model, the network description remains incomplete until the appropriate thermal protection system (TPS) features are added. For entry heating studies, a high fidelity TPS mesh is required to accurately predict structural temperatures. Additionally, local pressure, temperature and heating variations further complicate the analysis. A technique for the efficient extraction of thermal protection system thickness data from CAD geometry is presented. The technique allows for application of complicated TPS cross-sections consisting of different materials and permits local pressure and heating rate

variations. The resulting process has been successfully demonstrated on the X-38 crew return vehicle configuration and serves as a prototype for concurrent engineering techniques using a combination of custom and commercial software tools.
Author
Spacecraft Reentry; Concurrent Engineering; Finite Element Method; Mathematical Models; Stress Analysis; Thermal Stresses; Computer Aided Design; Reentry Shielding

20020081334 NASA Glenn Research Center, Cleveland, OH USA
Microgravity Emissions Laboratory Testing of the Physics of Colloids in Space Experiment
McNelis, Anne M., NASA Glenn Research Center, USA; September 2002; 18p; In English; 53rd International Astronautical Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by International Astronautical Federation, France
Contract(s)/Grant(s): RTOP 400-35-1A
Report No.(s): NASA/TM-2002-211901; NAS 1.15:211901; E-13589; IAC-02-J.P.20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Microgravity Emissions Laboratory (MEL) was developed at NASA Glenn Research Center (GRC) for the characterization, simulation, and verification of the International Space Station USS) microgravity environment. The NASA GRC lab was developed in support of the Fluid Combustion Facility (FCF). The MEL is a 6 degree of freedom inertial measurement system capable of characterizing the inertial response forces (emissions) of components, sub-rack payloads or rack-level payloads down to 1.0E-7 g's. The inertial force output data generated from the steady state or transient operations of the test article are utilized with Finite Element Analysis (FEA). Statistical Energy Analysis (SEA), and other analysis tools to predict the on-orbit environment at specific science or rack interface locations. The Physics of Colloids in Space (PCS) experiment was tested in the MEL in May 2000. PCS is a sub-rack payload that is accommodated in an EXPRESS-11 rack on the ISS. The inertial response forces from the fundamental PCS operations were measured with MEL testing. Reported herein is a description of the MEL laboratory, testing process, and results from ground based MEL-PCS testing and on-orbit PCS mixer operations.
Author
Colloids; Microgravity; Payloads; Simulation; Spaceborne Experiments; Statistical Analysis; Steady State; Research Facilities

20020082909 NASA Goddard Space Flight Center, Greenbelt, MD USA
Progress Towards the Solar Dynamics Observatory
Thompson, B. J., NASA Goddard Space Flight Center, USA; Schwer, K. O., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 34th COSPAR Scientific Assembly/2nd World Space Congress, 13-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Solar Dynamics Observatory, or SDO, is scheduled to be the first mission to launch in 2007 under the new Living With a Star (LWS) program. It builds on the success of SOHO and other recent solar missions, but will observe the Sun at greater resolution and faster time cadence with a set of remote sensing instruments generating data in excess of 100 megabytes per second. The Science Definition Team produced a report consisting of a series of science objectives and a baseline instrument complement. Instrument proposals were due in April 2002, with selection to occur in the late summer of 2002. The spacecraft is being built at NASA Goddard Spacecraft Center by a team of engineers which are currently undergoing the formulation process. The presentation will discuss the current status of the science investigation selection and the spacecraft formulation.
Author
Solar Observatories; Mission Planning; Helioseismology; Satellite-Borne Instruments

20020082923 NASA Glenn Research Center, Cleveland, OH USA
Alternatives to the ISS Plasma Contacting Units
Ferguson, Dale C., NASA Glenn Research Center, USA; May 2002; 10p; In English; 40th Aerospace Sciences Meeting and Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 755-A4-05
Report No.(s): NASA/TM-2002-211488; NAS 1.15:211488; E-13256; AIAA Paper 2002-0934; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A spacecraft in a high-density equatorial LEO plasma will float negative relative to the ambient plasma. Because of the electron collection of exposed conductors on its solar arrays, it may float negative by up to its array voltage. The floating potential depends on the relative areas of electron and ion collection of the spacecraft. Early estimates of the International Space Station (ISS) potential were about -140 V relative to the surrounding plasma, because of its 160 V solar array string voltage. Because of the possibility of arcing of ISS structures and astronaut EMUs (spacesuits) into the space plasma, Plasma Contacting Units (PCUs) were added to the ISS design, to reduce the highly negative floating potentials by emitting electrons (effectively increasing the

ion collecting area). In addition to the now-operating ISS PCUs, safety rules require another independent arc-hazard control method. In this paper, I discuss alternatives to the ISS PCUs for keeping the ISS floating potential at values below the arc-thresholds of ISS and EMU surface materials. Advantages and disadvantages of all of the recline loss will be presented.
Author
Space Plasmas; Plasmas (Physics); Alternatives; Electric Potential; Electrons

20020082933 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Closed-Loop Hardware Simulation of Decentralized Satellite Formation Control
Ebimuma, Takuji, Texas Univ., USA; Lightsey, E. Glenn, Texas Univ., USA; [2002]; 1p; In English; American Astronautical Society Guidance and Control Conference, Feb. 2003, Breckenridge, CO, USA; Sponsored by American Astronautical Society, USA
Contract(s)/Grant(s): NAG5-11287; No Copyright; Avail: Issuing Activity; Abstract Only

In recent years, there has been significant interest in the use of formation flying spacecraft for a variety of earth and space science missions. Formation flying may provide smaller and cheaper satellites that, working together, have more capability than larger and more expensive satellites. Several decentralized architectures have been proposed for autonomous establishment and maintenance of satellite formations. In such architectures, each satellite cooperatively maintains the shape of the formation without a central supervisor, and processing only local measurement information. The Global Positioning System (GPS) sensors are ideally suited to provide such local position and velocity measurements to the individual satellites. An investigation of the feasibility of a decentralized approach to satellite formation flying was originally presented by Carpenter. He extended a decentralized linear-quadratic-Gaussian (LQG) framework proposed by Speyer in a fashion similar to an extended Kalman filter (EKE) which processed GPS position fix solutions. The new decentralized LQG architecture was demonstrated in a numerical simulation for a realistic scenario that is similar to missions that have been proposed by NASA and the U.S. Air Force. Another decentralized architecture was proposed by Park et al. using carrier differential-phase GPS (CDGPS). Recently, Busse et al demonstrated the decentralized CDGPS architecture in a hardware-in-the-loop simulation on the Formation Flying TestBed (FFTB) at Goddard Space Flight Center (GSFC), which features two Spirent Cox 16 channel GPS signal generator. Although representing a step forward by utilizing GPS signal simulators for a spacecraft formation flying simulation, only an open-loop performance, in which no maneuvers were executed based on the real-time state estimates, was considered. In this research, hardware experimentation has been extended to include closed-loop integrated guidance and navigation of multiple spacecraft formations using GPS receivers and real-time vehicle telemetry. A hardware closed-loop simulation has been performed using the decentralized LQG architecture proposed by Carpenter in the GPS test facility at the Center for Space Research (CSR). This is the first presentation using this type of hardware for demonstration of closed-loop spacecraft formation flying.
Author
Hardware-In-The-Loop Simulation; Formation Flying; Satellite Control; Global Positioning System

20020082955 NASA Glenn Research Center, Cleveland, OH USA
Durability Issues for the Protection of Materials From Atomic Oxygen Attack in Low Earth Orbit
Banks, Bruce, NASA Glenn Research Center, USA; Lenczewski, Mary, Ohio Aerospace Inst., USA; Demko, Rikako, Cleveland State Univ., USA; August 2002; 15p; In English; 53rd International Astronautical Congress: The World Space Congress-2002, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by International Astronautical Federation, Switzerland; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-A4-06
Report No.(s): NASA/TM-2002-211830; NAS 1.15:211830; IAC-02-1.5.02; E-13524; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Low Earth orbital atomic oxygen is capable of eroding most polymeric materials typically used on spacecraft. Solar array blankets, thermal control polymers, and carbon fiber matrix composites are readily oxidized to become thinner and less capable of supporting the loads imposed upon them. Protective coatings have been developed that are durable to atomic oxygen to prevent oxidative erosion of the underlying polymers. However, the details of the surface roughness, coating defect density, and coating configuration can play a significant role as to whether or not the coating provides long duration atomic oxygen protection. Identical coatings on different surface roughness surfaces can have drastically different durability results. Examples and analysis of the causes of resultant differences in atomic oxygen protection are presented. Implications based on in-space experiences, ground laboratory testing, and computational modeling indicate that thin film vacuum-deposited aluminum protective coatings offer much less atomic oxygen protection than sputter-deposited silicon dioxide coatings.
Author
Earth Orbital Environments; Life (Durability); Oxygen Atoms; Protective Coatings

20020083018 Stanford Univ., Stanford, CA USA

A Low-Cost Spacecraft Mission for Validating Formation Flying Technologies ***Final Report, 1 Jun. 1999-30 Nov. 2001***

How, Jonathan; Kitts, Christopher; Twiggs, Robert; Nov. 30, 2001; 56p; In English

Contract(s)/Grant(s): F49620-99-1-0273; Proj-2305

Report No.(s): AD-A405778; AFRL-SR-AR-TR-02-0229; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

These viewgraphs concern the Nanosat program with the Emerald satellite. This is the combined efforts of the Stanford University and Santa Clara University Emerald Project.

DTIC

Navigation Satellites; Communication Satellites; Formation Flying; Nanosatellites

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also 06 Aircraft Instrumentation and Avionics; For spaceborne instruments not integral to the vehicle itself see 35 Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy, Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy.

20020081237 NASA Langley Research Center, Hampton, VA USA

Thermal Design and Analysis of the Stratospheric Aerosol and Gas Experiment III (SAGE III) for the ISS Mission

Gould, Dana C., NASA Langley Research Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 37-49; In English; Also announced as 20020081233; The thermal models described were substantially developed by Armen Melikian and Adrian Nagle of Ball Aerospace & Technologies Corp. under NAS1-18900; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Stratospheric Aerosol and Gas Experiment III (SAGE III) instrument is the fifth in a series of spaceborne remote sensing instruments developed by NASA Langley Research Center (LaRC) for monitoring global distribution of aerosols and gaseous constituents using the solar occultation approach. SAGE III will provide global profiles of atmospheric aerosol, ozone, water vapor, nitrogen dioxide, nitrogen trioxide, temperature, and chlorine dioxide in the mesosphere, stratosphere, and troposphere. The instrument is designed to be completely self-calibrating making it well-suited for long-term monitoring of atmospheric species which are important for global change study. to help achieve the desired long-term global coverage, three instruments have been built for different missions. The thermal design of SAGE III is primarily passive using surface finishes and high thermal resistance spacers. Active thermal control consists of operational and survival heaters along with a thermoelectric cooler to maintain the CCD detector temperature within tolerances. While the overall thermal design is consistent among the three instruments, some modifications were necessary to meet the individual mission requirements. The first SAGE III instrument is scheduled for launch on the Russian built METEOR-3M spacecraft in December 2000. This 2.5-ton spacecraft is 5 meters long and 1.5 meters in diameter and will fly a sun-synchronous, polar orbit at an altitude of 1020 km. The second instrument will fly on the International Space Station using an EXpedite the PRocessing of Experiments to Space Station (EXPRESS) Pallet Adapter. This flight has been particularly challenging for designers because of the constraints of the ISS as well as the differences in program schedules (the SAGE instrument has been fabricated and delivered while the EXPRESS project has yet to reach PDR.) For example, the attitude of the ISS can vary substantially making solar occultation difficult. to overcome this, a pointing system was added to the SAGE III instrument. However, the attitude variations also affect the instrument's thermal environment and therefore must be considered in the design of its thermal control system. This, along with other issues related to the thermal design of the SAGE III instrument for the ISS mission are presented in this paper.

Author

Design Analysis; Sage Satellite; Satellite Instruments; Thermal Analysis; Attitude (Inclination); Temperature Control

20020081297 NASA Glenn Research Center, Cleveland, OH USA

An Intelligent System for Monitoring the Microgravity Environment Quality On-Board the International Space Station

Lin, Paul P., Cleveland State Univ., USA; Jules, Kenol, NASA Glenn Research Center, USA; August 2002; 13p; In English; 2001 Instrumentation and Measurement Technology Conference, 21-23 May 2001, Budapest, Hungary; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): RTOP 400-35-4C

Report No.(s): NASA/TM-2002-211809; E-13504; NAS 1.15:211809; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An intelligent system for monitoring the microgravity environment quality on-board the International Space Station is presented. The monitoring system uses a new approach combining Kohonen's self-organizing feature map, learning vector quantization, and back propagation neural network to recognize and classify the known and unknown patterns. Finally, fuzzy logic is used to assess the level of confidence associated with each vibrating source activation detected by the system.
Author
Fuzzy Systems; Microgravity; Monitors; Smart Structures

20020081338 NASA Glenn Research Center, Cleveland, OH USA
Artificial Neural Networks Applications: From Aircraft Design Optimization to Orbiting Spacecraft On-Board Environment Monitoring
Jules, Kenol, NASA Glenn Research Center, USA; Lin, Paul P., Cleveland State Univ., USA; August 2002; 14p; In English; 2001 Advanced Study Institute on Neural Networks for Instrumentation, Measurement and Related Industrial Applications, 9-20 Oct. 2001, Crema, Italy; Sponsored by North Atlantic Treaty Organization, Unknown
Contract(s)/Grant(s): RTOP 400-35-4C
Report No.(s): NASA/TM-2002-211811; E-13505; NAS 1.15:211811; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper reviews some of the recent applications of artificial neural networks taken from various works performed by the authors over the last four years at the NASA Glenn Research Center. This paper focuses mainly on two areas. First, artificial neural networks application in design and optimization of aircraft/engine propulsion systems to shorten the overall design cycle. Out of that specific application, a generic design tool was developed, which can be used for most design optimization process. Second, artificial neural networks application in monitoring the microgravity quality onboard the International Space Station, using on-board accelerometers for data acquisition. These two different applications are reviewed in this paper to show the broad applicability of artificial intelligence in various disciplines. The intent of this paper is not to give in-depth details of these two applications, but to show the need to combine different artificial intelligence techniques or algorithms in order to design an optimized or versatile system.
Author
Design Optimization; Neural Nets; Aircraft Design; Aircraft Engines; Artificial Intelligence; Propulsion System Configurations

20020082952 NASA Glenn Research Center, Cleveland, OH USA
Monitoring the Microgravity Environment Quality On-Board the International Space Station Using Soft Computing Techniques, Part 2, Preliminary System Performance Results
Jules, Kenol, NASA Glenn Research Center, USA; Lin, Paul P., Cleveland State Univ., USA; Weiss, Daniel S., Harvard Univ., USA; August 2002; 20p; In English; 52nd International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; Sponsored by International Astronautical Federation, France; Original contains color illustrations
Contract(s)/Grant(s): RTOP 400-35-4C
Report No.(s): NASA/TM-2002-211813; NAS 1.15:211813; E-13509; IAF-01-J.5.01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents the preliminary performance results of the artificial intelligence monitoring system in full operational mode using near real time acceleration data downlinked from the International Space Station. Preliminary microgravity environment characterization analysis result for the International Space Station (Increment-2), using the monitoring system is presented. Also, comparison between the system predicted performance based on ground test data for the US laboratory "Destiny" module and actual on-orbit performance, using measured acceleration data from the U.S. laboratory module of the International Space Station is presented. Finally, preliminary on-orbit disturbance magnitude levels are presented for the Experiment of Physics of Colloids in Space, which are compared with on ground test data. The ground test data for the Experiment of Physics of Colloids in Space were acquired from the Microgravity Emission Laboratory, located at the NASA Glenn Research Center, Cleveland, Ohio. The artificial intelligence was developed by the NASA Glenn Principal Investigator Microgravity Services Project to help the principal investigator teams identify the primary vibratory disturbance sources that are active, at any moment of time, on-board the International Space Station, which might impact the microgravity environment their experiments are exposed to. From the Principal Investigator Microgravity Services' web site, the principal investigator teams can monitor via a dynamic graphical display, implemented in Java, in near real time, which event(s) is/are on, such as crew activities, pumps, fans, centrifuges, compressor, crew exercise, structural modes, etc., and decide whether or not to run their experiments, whenever that is an option, based on the acceleration magnitude and frequency sensitivity associated with that experiment. This monitoring system detects primarily the vibratory disturbance sources. The system has built-in capability to detect both known and unknown vibratory

disturbance sources. Several soft computing techniques such as Kohonen's Self-Organizing Feature Map, Learning Vector Quantization, Back-Propagation Neural Networks, and Fuzzy Logic were used to design the system.
Author
Microgravity; International Space Station; Performance Tests; Artificial Intelligence; Downlinking; Environmental Quality; Fuzzy Systems

20020083276 AMPTEk, Inc., Bedford, MA USA
Space Systems Environmental Interaction Studies
Morgan, M. A.; Huber, Alan C.; Sperry, David J.; Donkin, Alan N., Jr.; Moran, Scott J.; Aug. 30, 1999; 37p; In English
Contract(s)/Grant(s): F19628-96-C-0144; AF Proj. 2822
Report No.(s): AD-A405929; AFRL-VS-TR-2001-1610; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Final system testing, performance characterization and documentation of the Digital Ion Drift Meter (DIDM-2) instrument were carried out in the period immediately prior to delivery, which transpired under Task #1 of this contract. Some details of these activities are provided. Also, a summary of the activities performed under Task #2, with regard to the SPREE (Shuttle Potential and Return Electron Experiment) and OEDIPUS-C (Observations of Electric-field Distributions in the Ionosphere Plasma: a Unique Strategy) data sets, is also presented. The work was terminated in this report period. The principal focus of this report however, is to document the operation and functionality of DIDM-2. The material is excerpted from the instrument's Handbook of Commands, Functions & Operations manual.
DTIC
Telemetry; Plasma Drift; Electric Fields

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SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also 07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations; and 44 Energy Production and Conversion.

20020080860 NASA Goddard Space Flight Center, Greenbelt, MD USA
NiH2 Reliability Impact Upon Hubble Space Telescope Battery Replacement
Rao, Gopalakrishna M., NASA Goddard Space Flight Center, USA; Hollandsworth, Roger, Lockheed Martin Missiles and Space, USA; Armantrout, Jon, Lockheed Martin Corp., USA; [2002]; 6p; In English; 2002 IECE Conference, 29 Jul. - 1 Aug. 2002, Washington, DC, USA
Contract(s)/Grant(s): NAS8-32697; NAS5-5000
Report No.(s): Rept-20034; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The NASA Hubble Space Telescope (HST) was designed to be deployed and later serviced for maintenance and upgrades, as required, by the space shuttle fleet, with a Goodyear mission life for the batteries. HST was deployed 380 miles above the Earth, from Space Shuttle Discovery, on April 25, 1990. Four servicing missions, (SM1, SM2, SM3A, AND SM3B) have been performed. Astronauts have replaced or modified optics, solar arrays, a power control unit, and various science packages. A fifth Servicing Mission, SM4 scheduled for early 2004, is planned to replace the batteries for the first time. The HST is powered by solar array wings and nickel hydrogen (NiH2) Duracell batteries, which are grouped into two parallel battery modules of three parallel batteries each. With a design life of 7 years at launch, these batteries have surpassed 12 years in orbit, which gives HST the highest number of charge/discharge cycles of any NiH2 battery currently in low earth orbit (LEO) application. Being in a LEO orbit, HST has a 45-minute umbra period, during which spacecraft power requirements normally force the batteries into discharge, and a 60-minute sun period, which is available for battery recharge. The intent of this paper is to address the issue of NiH2 battery reliability and how battery capacity degradation can impact scheduling of a Servicing Mission to bring replacement batteries to HST, and extend mission life till deployment of Next Generation Space Telescope (NGST), planned for 2008 at the earliest.
Author
Nickel Hydrogen Batteries; Hubble Space Telescope; Low Earth Orbits; Electric Batteries; Solar Arrays

20020081255 NASA Marshall Space Flight Center, Huntsville, AL USA

Numerical Modeling of Drying Residual RP-1 in Rocket Engines

Majumdar, Alok, NASA Marshall Space Flight Center, USA; Polsgrove, Robert, NASA Marshall Space Flight Center, USA; Tiller, Bruce, NASA Marshall Space Flight Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 271-281; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper describes a numerical model of evaporative heat and mass transfer of liquid RP-1 in a stream of inert gas such as nitrogen or helium. A heat and mass transfer model was created using the Generalized Fluid System Simulation Program (GFSSP). GFSSP solves for time dependent mass, momentum, energy and specie conservation equation in a flow network. The heat and mass transfer model was developed using one of GFSSP's three modules, the User Subroutine. This paper provides results to parametric studies performed using the GFSSP model, which show that nitrogen is a better dryer than helium, and drying rate increases with reduced supply pressure and increases with increasing supply temperature and flowrate.

Author

Heat Transfer; Mathematical Models; Rocket Engines; Computerized Simulation; Drying; Mass Transfer; RP-1 Rocket Propellants

20020081266 NASA Glenn Research Center, Cleveland, OH USA

A Parametric Assessment of the Mission Applicability of Thin-Film Solar Arrays

Hoffman, David J., NASA Glenn Research Center, USA; August 2002; 12p; In English; Space Power Workshop 2002, 22-25 Apr. 2002, Redondo Beach, CA, USA; Sponsored by Air Force Research Lab., USA

Contract(s)/Grant(s): RTOP 755-1A-16

Report No.(s): NASA/TM-2002-211720; E-13471; NAS 1.15:211720; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results are presented from a parametric assessment of the applicability and spacecraft-level impacts of very lightweight thin-film solar arrays with relatively large deployed areas for representative space missions. The most and least attractive features of thin-film solar arrays are briefly discussed. A calculation is then presented illustrating that from a solar array alone mass perspective, larger arrays with less efficient but lighter thin-film solar cells can weigh less than smaller arrays with more efficient but heavier crystalline cells. However, a spacecraft-level systems assessment must take into account the additional mass associated with solar array deployed area: the propellant needed to desaturate the momentum accumulated from area-related disturbance torques and to perform aerodynamic drag makeup reboost. The results for such an assessment are presented for a representative low Earth orbit (LEO) mission, as a function of altitude and mission life, and a geostationary Earth orbit (GEO) mission. Discussion of the results includes a list of specific mission types most likely to benefit from using thin-film arrays. The presentation concludes with a list of issues to be addressed prior to use of thin-film solar arrays in space and the observation that with their unique characteristics, very lightweight arrays using efficient, thin film cells on flexible substrates may become the best array option for a subset of Earth orbiting and deep space missions.

Author

Solar Arrays; Thin Films; Spacecraft Power Supplies; Photovoltaic Cells; Solar Generators

20020081279 NASA Glenn Research Center, Cleveland, OH USA

Estimator Based Controller for High Speed Flywheel Magnetic Bearing System

Dever, Timothy P., QSS Group, Inc., USA; Brown, Gerald V., NASA Glenn Research Center, USA; Jansen, Ralph H., Ohio Aerospace Inst., USA; August 2002; 11p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): RTOP 755-1A-09

Report No.(s): NASA/TM-2002-211795; NAS 1.15:211795; IECEC-2002-20161; E-13490; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A flywheel system and its operator interface are described. Measurements of magnetic bearing negative stiffness are performed. Two digital magnetic bearing control algorithms (PD and estimator based) are defined and their implementations are described. Tuning of each controller is discussed. Comparison of the two controllers' stability, damping noise, and operating current are described. Results describing the superiority of the estimator-based controller are presented and discussed.

Author

Flywheels; Magnetic Bearings; Controllers; Algorithms

20020081293 NASA Glenn Research Center, Cleveland, OH USA

Comparison of ISS Power System Telemetry With Analytically Derived Data for Shadowed Cases

Fincannon, H. James, NASA Glenn Research Center, USA; July 2002; 11p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): RTOP 575-15-69

Report No.(s): NASA/TM-2002-211715; E-13467; IECEC-2002-20113; NAS 1.15:211715; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Accurate International Space Station (ISS) power prediction requires the quantification of solar array shadowing. Prior papers have discussed the NASA Glenn Research Center (GRC) ISS power system tool SPACE (System Power Analysis for Capability Evaluation) and its integrated shadowing algorithms. On-orbit telemetry has become available that permits the correlation of theoretical shadowing predictions with actual data. This paper documents the comparison of a shadowing metric (total solar array current) as derived from SPACE predictions and on-orbit flight telemetry data for representative significant shadowing cases. Images from flight video recordings and the SPACE computer program graphical output are used to illustrate the comparison. The accuracy of the SPACE shadowing capability is demonstrated for the cases examined.

Author

International Space Station; Telemetry; Space Station Power Supplies; Solar Arrays; Performance Prediction; Shadows

20020081342 NASA Glenn Research Center, Cleveland, OH USA

Radioisotope Electric Propulsion for Fast Outer Planetary Orbiters

Oleson, Steven, NASA Glenn Research Center, USA; Benson, Scott, NASA Glenn Research Center, USA; Gefert, Leon, NASA Glenn Research Center, USA; Patterson, Michael, NASA Glenn Research Center, USA; Schreiber, Jeffrey, NASA Glenn Research Center, USA; September 2002; 18p; In English; 38th Joint Propulsion Conference and Exhibit, 7-10 Jul. 2002, Indianapolis, IN, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 344-96-8D

Report No.(s): NASA/TM-2002-211893; NAS 1.15:211893; E-13575; AIAA Paper 2002-3967; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent interest in outer planetary targets by the Office of Space Science has spurred the search for technology options to enable relatively quick missions to outer planetary targets. Several options are being explored including solar electric propelled stages combined with aerocapture at the target and nuclear electric propulsion. Another option uses radioisotope powered electric thrusters to reach the outer planets. Past work looked at using this technology to provide faster flybys. A better use for this technology is for outer planet orbiters. Combined with medium class launch vehicles and a new direct trajectory these small, sub-kilowatt ion thrusters and Stirling radioisotope generators were found to allow missions as fast as 5 to 12 years for objects from Saturn to Pluto, respectively. Key to the development is light spacecraft and science payload technologies.

Author

Nuclear Electric Propulsion; Radioactive Isotopes; Gas Giant Planets; Grand Tours; Aerocapture

20020082899 NASA Glenn Research Center, Cleveland, OH USA

Ozone Correction for AM0 Calibrated Solar Cells for the Aircraft Method

Snyder, David B., NASA Glenn Research Center, USA; Scheiman, David A., Ohio Aerospace Inst., USA; Jenkins, Phillip P., Ohio Aerospace Inst., USA; Rieke, William J., NASA Glenn Research Center, USA; Blankenship, Kurt S., NASA Glenn Research Center, USA; September 2002; 10p; In English; 29th Photovoltaic Specialists Conference, 18-25 May 2002, New Orleans, LA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): RTOP 755-1A-03

Report No.(s): NASA/TM-2002-211714; NAS 1.15:211714; E-13465; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The aircraft solar cell calibration method has provided cells calibrated to space conditions for 37 years. However, it is susceptible to systematic errors due to ozone concentrations in the stratosphere. The present correction procedure applies a 1 percent increase to the measured I(sub SC) values. High band-gap cells are more sensitive to ozone absorbed wavelengths (0.4 to 0.8 microns) so it becomes important to reassess the correction technique. This paper evaluates the ozone correction to be 1+O3xFo, where O3 is the total ozone along the optical path, and Fo is 29.8 x 10(exp -6)/du for a Silicon solar cell, 42.6 x 10(exp

-6)/du for a GaAs cell and 57.2 x 10(exp -6)/du for an InGaP cell. These correction factors work best to correct data points obtained during the flight rather than as a correction to the final result.
Author
Ozone; Solar Cells; Mathematical Models; Aircraft Industry; Air Masses; Calibrating

20020082920 Boeing Co., Canoga Park, CA USA
Space Shuttle Main Engine (SSME) Options for the Future Shuttle
Jue, Fred, Boeing Co., USA; Kuck, Fritz, Boeing Co., USA; [2002]; 7p; In English; AIAA Conference, 18 Jul. 2002, Indianapolis, IN, USA
Contract(s)/Grant(s): NAS8-45000
Report No.(s): AIAA Paper 2002; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The main engines for the Future Shuttle will focus on improved safety and operability. Performance enhancements may also be required for vehicle safety purposes to achieve more desirable abort scenarios. This paper discusses the potential improvements that will be considered for implementation into the Future Shuttle. Integrated engine and vehicle health management systems will achieve additional system-level reliability improvements over those currently in development. Advanced instrumentation for detecting leaks, analyzing component wear and degradation, and providing sophisticated operational data will be used for reliable engine control and scheduling maintenance operations. A new nozzle and main combustion chamber (MCC) will reduce failure probability by 50% and allow for higher thrust capability without requiring the entire engine to be redesigned. Turbopump improvements may range from minor component improvements to using 3rd-generation pumps built on the advanced concepts demonstrated by the Integrated Powerhead Development (IPD) program and the Space Launch Initiative (SLI) prototype engines.The main engines for the Future Shuttle will focus on improved safety and operability. Performance enhancements may also be required for vehicle safety purposes to achieve more desirable abort scenarios. This paper discusses the potential improvements that will be considered for implementation into the Future Shuttle. Integrated engine and vehicle health management systems will achieve additional system-level reliability improvements over those currently in development. Advanced instrumentation for detecting leaks, analyzing component wear and degradation, and providing sophisticated operational data will be used for reliable engine control and scheduling maintenance operations. A new nozzle and main combustion chamber (MCC) will reduce failure probability by 50% and allow for higher thrust capability without requiring the entire engine to be redesigned. Turbopump improvements may range from minor component improvements to using 3rd-generation pumps built on the advanced concepts demonstrated by the Integrated Powerhead Development (IPD) program and the Space Launch Initiative (SLI) prototype engines.
Author
Space Shuttle Main Engine; Engine Control; Maintenance; Combustion Chambers

20020082927 NASA Goddard Space Flight Center, Greenbelt, MD USA
LWS/SET Technology Experiment Carrier
Sherman, Barry, NASA Goddard Space Flight Center, USA; Giffin, Geoff, Superhighway Systems; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

This paper examines the approach taken to building a low-cost, modular spacecraft bus that can be used to support a variety of technology experiments in different space environments. It describes the techniques used and design drivers considered to ensure experiment independence from as yet selected host spacecraft. It describes the technology experiment carriers that will support NASA's Living With a Star Space Environment Testbed space missions. NASA has initiated the Living With a Star (LWS) Program to develop a better scientific understanding to address the aspects of the connected Sun-Earth system that affect life and society. A principal goal of the program is to bridge the gap between science, engineering, and user application communities. The Space Environment Testbed (SET) Project is one element of LWS. The Project will enable future science, operational, and commercial objectives in space and atmospheric environments by improving engineering approaches to the accommodation and/or mitigation of the effects of solar variability on technological systems. The SET Project is highly budget constrained and must seek to take advantage of as yet undetermined partnering opportunities for access to space. SET will conduct technology validation experiments hosted on available flight opportunities. The SET Testbeds will be developed in a manner that minimizes the requirements for accommodation, and will be flown as flight opportunities become available. To access the widest range of flight opportunities, two key development requirements are to maintain flexibility with respect to accommodation constraints and to have the capability to respond quickly to flight opportunities. Experiments, already developed to the technology readiness level of needing flight validation in the variable Sun-Earth environment, will be selected on the basis of the need for the subject technology, readiness for flight, need for flight resources and particular orbit. Experiments will be accumulated by the Project and manifested for specific flight opportunities as they become available. The SET Carrier is designed to present a standard set of

interfaces to SET technology experiments and to be modular and flexible enough to interface to a variety of possible host spacecraft. The Carrier will have core components and mission unique components. Once the core carrier elements have been developed, only the mission unique components need to be defined and developed for any particular mission. This approach will minimize the mission specific cost and development schedule for a given flight opportunity. The standard set of interfaces provided by SET to experiments allows them to be developed independent of the particulars of a host spacecraft. The Carrier will provide the power, communication, and the necessary monitoring features to operate experiments. The Carrier will also provide all of the mechanical assemblies and harnesses required to adapt experiments to a particular host. Experiments may be hosted locally with the Carrier or remotely on the host spacecraft. The Carrier design will allow a single Carrier to support a variable number of experiments and will include features that support the ability to incrementally add experiments without disturbing the core architecture.
Author
Solar Activity; Solar Cycles; Spacecraft Design; Test Stands; Design Analysis

20020082939 NASA Glenn Research Center, Cleveland, OH USA
Sputtering Erosion Measurement on Boron Nitride as a Hall Thruster Material
Britton, Melissa, QSS Group, Inc., USA; Waters, Deborah, QSS Group, Inc., USA; Messer, Russell, QSS Group, Inc., USA; Sechkar, Edward, QSS Group, Inc., USA; Banks, Bruce, NASA Glenn Research Center, USA; September 2002; 11p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-B4-05
Report No.(s): NASA/TM-2002-211837; NAS 1.15:211837; E-13537; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The durability of a high-powered Hall thruster may be limited by the sputter erosion resistance of its components. During normal operation, a small fraction of the accelerated ions will impact the interior of the main discharge channel, causing its gradual erosion. A laboratory experiment was conducted to simulate the sputter erosion of a Hall thruster. Tests of sputter etch rate were carried out using 300 to 1000 eV Xenon ions impinging on boron nitride substrates with angles of attack ranging from 30 to 75 degrees from horizontal. The erosion rates varied from 3.41 to 14.37 Angstroms/[sec(mA/sq cm)] and were found to depend on the ion energy and angle of attack, which is consistent with the behavior of other materials.
Author
Hall Thrusters; Boron Nitrides; Corrosion Resistance; Erosion

20020082945 NASA Glenn Research Center, Cleveland, OH USA
Single Axis Attitude Control and DC Bus Regulation With Two Flywheels
Kascak, Peter E., Toledo Univ., USA; Jansen, Ralph H., Toledo Univ., USA; Kenny, Barbara, NASA Glenn Research Center, USA; Dever, Timothy P., QSS Group, Inc., USA; August 2002; 13p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jun. - 2 Aug. 2002, Washington, DC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-1A-09
Report No.(s): NASA/TM-2002-211812; NAS 1.15:211812; E-13507; IECEC-2002-20078; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A computer simulation of a flywheel energy storage single axis attitude control system is described. The simulation models hardware which will be experimentally tested in the future. This hardware consists of two counter rotating flywheels mounted to an air table. The air table allows one axis of rotational motion. An inertia DC bus coordinator is set forth that allows the two control problems, bus regulation and attitude control, to be separated. Simulation results are presented with a previously derived flywheel bus regulator and a simple PID attitude controller.
Author
Flywheels; Energy Storage; Regulators; Attitude Control; Controllers; Attitude (Inclination)

20020083008 Air Force Research Lab., Edwards AFB, CA USA
Fracture Mechanics and Service Life Prediction Research
Liu, C. T.; Aug. 2002; 27p; In English
Report No.(s): AD-A405750; AFRL-PR-ED-AB-2002-208; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this program is to develop a basis for developing advanced crack growth and service life prediction technologies for predicting the service life of solid rocket motors. The objectives of this program are to: (1) gain a fundamental understanding of fracture and crack growth behavior in solid rocket motors; (2) investigate the effects of damage, material nonlinearity, pressure,

and loading rate on crack growth behavior in a solid propellant; (3) simulate crack growth behavior and gain insight for improving crack growth resistance in solid propellants; and (4) determine the strain rate effect on the constitutive and fracture behavior of bi-material bond systems. The main issues in service life prediction of solid rocket motors are the lack of a fundamental understanding of crack growth behavior under service loading conditions and a reliable methodology to predict crack growth. The main technical challenges are microstructural effects on damage initiation and evolution, large and time dependent deformation, short crack and stress raiser interaction, and multi-layer structures with time-dependent material properties and property gradients. The program's basic approach involves a blend of analytical and experimental studies. In general, mechanisms and mechanics involved in cohesive fracture in a solid propellant and adhesive fracture in bond systems are emphasized. In this program, nonlinear viscoelasticity, fracture mechanics, experimental mechanics, damage mechanics, nondestructive testing and evaluation, and numerical modeling techniques will be used. These research studies address a number of important subjects such as cumulative damage and crack growth behavior in solid propellants, statistical nature of crack growth, and bonded interface failure. The results of these studies have the potential of becoming some of the most significant contributions to the rocket industry and research community.
DTIC
Cracks; Solid Propellant Rocket Engines; Fracturing; Fracture Mechanics

20020083035 Air Force Research Lab., Edwards AFB, CA USA
Overview of USAF Electric Propulsion Program
Spores, Ron; Birkan, Mitat; Jul. 22, 2002; 2p; In English
Report No.(s): AD-A406215; AFRL-PR-ED-AB-2002-189; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
An overview of current electric propulsion research and development efforts within the USA Air Force is presented. The Air Force supports electric propulsion primarily through the Air Force Office of Scientific Research (AFOSR) , the Air Force Research Laboratory (AFRL) and the AFOSR European Office of Aerospace Research and Development (EOARD). Overall direction for the programs comes from Air Force Space Command (AFSPC), with AFRL mission analysis used to define specific technological advances needed to meet AFSPC priorities. AFOSR funds basic research in electric propulsion throughout the country in both academia and industry. The AFRL Propulsion Directorate conducts electric propulsion efforts in basic research, engineering development, and space flight experiments. EOARD supports research at foreign laboratories that feeds directly into AFSR and AFRL research programs. Current research efforts fall into 3 main categories defined loosely by the thruster power level. All three agencies are conducting research at the low-power regime (P is less than 200 W), in support of emerging USAF microsatellite missions. Efforts in the mid-power range (500 W to 5 kW) are being shifted from research and development to thruster/spacecraft integration issues. The high power regime (P is greater than 30 kW) is realizing increased emphasis.
DTIC
Electric Propulsion; Product Development; Spaceborne Experiments

20020083039 NASA Glenn Research Center, Cleveland, OH USA
Efficient Design in a DC to DC Converter Unit
Bruemmer, Joel E., Boeing Co., USA; Williams, Fitch R., Boeing Co., USA; Schmitz, Gregory V., NASA Glenn Research Center, USA; August 2002; 10p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 478-29-10
Report No.(s): NASA/TM-2002-211804; E-13499; NAS 1.15:211804; IECEC-2002-20032; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Space Flight hardware requires high power conversion efficiencies due to limited power availability and weight penalties of cooling systems. The International Space Station (ISS) Electric Power System (EPS) DC-DC Converter Unit (DDCU) power converter is no exception. This paper explores the design methods and tradeoffs that were utilized to accomplish high efficiency in the DDCU. An isolating DC to DC converter was selected for the ISS power system because of requirements for separate primary and secondary grounds and for a well-regulated secondary output voltage derived from a widely varying input voltage. A flyback-current-fed push-pull topology or improved Weinberg circuit was chosen for this converter because of its potential for high efficiency and reliability. to enhance efficiency, a non-dissipative snubber circuit for the very-low-Rds-on Field Effect Transistors (FETs) was utilized, redistributing the energy that could be wasted during the switching cycle of the power FETs. A unique, low-impedance connection system was utilized to improve contact resistance over a bolted connection. For improved consistency in performance and to lower internal wiring inductance and losses a planar bus system is employed. All of these choices contributed to the design of a 6.25 KW regulated dc to dc converter that is 95 percent efficient. The methodology used

in the design of this DC to DC Converter Unit may be directly applicable to other systems that require a conservative approach to efficient power conversion and distribution.
Author
International Space Station; Voltage Converters (DC to DC); Space Station Power Supplies; Circuits; Electric Potential; Mechanical Engineering

20020083053 Pratt and Whitney Aircraft, West Palm Beach, FL USA
Design and Development of an Advanced Liquid Hydrogen Turbopump
Minick, A.; Peery, S.; Jul. 1998; 13p; In English
Contract(s)/Grant(s): F04611-94-C-0008; Proj-3058
Report No.(s): AD-A406213; AFRL-PR-ED-TP-1998-132; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper discusses design and development of an Advanced Liquid Hydrogen Turbopump for a 50,000 pound (22,6?9 kg) thrust Upper Stage Expander Cycle Engine being developed by Pratt & Whitney Liquid Space Propulsion under contract for the USA Air Force Research Laboratory (AFRL) to support the Integrated High Payoff Rocket Technology (IHPRPT) program. The Advanced Liquid Hydrogen Turbopump is designed to provide improved system thrust to weight, decreased hardware/support costs, and increased reliability. These benefits will be accomplished and demonstrated through design, development, and test of this high speed, high efficiency, two stage hydrogen turbopump capable of supplying 16 lbm/sec (7.3 kg/sec.) of liquid hydrogen at 4600 psia (323.4 kg/sq cm).
DTIC
Liquid Propellant Rocket Engines; Turbine Pumps; Reliability; Hydrogen

20020083055 Air Force Research Lab., Edwards AFB, CA USA
Performance Comparisons of Underexpanded Orifices and DeLaval Nozzles at Low Reynolds Numbers
Jamison, Andrew; Ketsdever, Andrew D.; Jul. 12, 2002; 17p; In English; Prepared in collaboration with Univ. of Southern California at Los Angeles
Report No.(s): AD-A406211; AFRL-PR-ED-TP-2002-179; AFRL-PR-ED-TP-2002-179; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The popularity of micropropulsion system development has led to renewed interest in the determination of propulsive properties of orifice flows since micronozzle expansions may suffer high viscous losses at low pressure operation. The mass flow and relative thrust for an under expanded orifice is measured as a function of orifice stagnation pressure from 0.1 to 3.5 Torr. Nitrogen, argon, and helium propellant gases are passed through a 1.0 mm diameter orifice with a wall thickness of 0.015 mm Near-free molecule, transitional and continuum flow regimes are studied. The relative thrust is determined by a novel thrust stand designed primarily for low operating pressure, micropropulsion systems. It is shown that the thrust indications obtained from the stand are a function of the facility background pressure, and corrections are made to determine the indicated thrust for a zero background pressure with nitrogen as propellant. Highly repeatable (within 1%) indicated thrust measurements are obtained in the thrust range from 5 to 500 Micro-N.
DTIC
Continuum Flow; Thrust Measurement; Spacecraft Propulsion; Low Thrust Propulsion

20020083186 Boeing North American, Inc., Rocketdyne Div., Canoga Park, CA USA
Injector and Combustion Chamber Advances Demonstrated on the Thrust Cell Technologies Program
Wherley, Brian; Ulmer, Don; Claflin, Scott; Jun. 08, 1999; 13p; In English
Report No.(s): AD-A405893; AFRL-PR-ED-TP-FY99-0142; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report covers achievements on the Thrust Cell Technologies Program (TCTP) from 1 September 1992 to 3 December 1998. The Thrust Cell Technologies Program was initiated by the Air Force Research Lab (AFRL) to: (1) develop the materials and fabrication technologies needed to produce reliable, high-performance liquid oxygen/liquid hydrogen (LOX/LH2) thrust cells for advanced upper stage engines and multi-cell booster applications, and (2) quantify the performance of modular thrust cells through computational fluid dynamics (CFD) analysis and cold-flow testing. The developed technologies were to be suitable and applicable to a variety of contemporaneous engine applications, specifically the Integrated Modular Engine (IME) upper stage, as well as the Advanced Upper Stage (AUS), Single-Stage-to-Orbit (SSTO), and National Aerospace Plane (NASP) vehicles and missions.
DTIC
Liquid Propellant Rocket Engines; Computational Fluid Dynamics

20020083249 Ohio State Univ., Dept. of Mechanical Engineering, Columbus, OH USA

Experimental and Analytical Development of Kinetic Rate Data for Radiating Rocket Plume Species ***Final Report, 1 May 1999-30 Sep. 2001***

Ploenjes, E.; Palm, P.; Adamovich, I.; Lempert, W.; Subramaniam, V.; Jul. 01, 2002; 86p; In English

Contract(s)/Grant(s): F49620-99-1-0119

Report No.(s): AD-A406003; AFRL-SR-AR-TR-02-0260; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

The report presents results of experimental and analytical studies of certain energy transfer mechanisms and rates in high-energy gas flows. The immediate application is to generate kinetic data to aid in the prediction of the radiation emitted by hypervelocity vehicle flowfields, radiation from high altitude rocket plumes, how shocks, and shock layers around the vehicles. The present report gives data on a newly discovered vibration-to-electronic (V-E) energy transfer process in CO, creating strong UV signal on the CO 4th Positive Bands. This process has been found to be mediated by small amount of free electrons in the flow. Analogous processes populating radiating excited electronic states of NO, CN, and C2 are also presented. In a complementary phase of the work, production of highly vibrationally excited N2 in cold plasmas and the measurement of vibrational level populations by spontaneous Raman spectroscopy is reported.

DTIC

Emission Spectra; Rocket Exhaust; Hypervelocity Flow; Shock Waves

20020083253 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA

Electric Propulsion: An Introduction and Development Status

Fife, J. M.; Sep. 09, 2002; 40p; In English; Prepared in collaboration with Virginia Polytechnic Inst. Blacksburg

Report No.(s): AD-A405974; AFRL-PR-ED-VG-2002-207; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Electric Propulsion (EP): (1) Decreases spacecraft fuel fraction; (2) Increases spacecraft capability; (3) Enables new missions. USAF (USA Air Force) has selected Hall thrusters for intensive development due to optimum I(sub sp) for many AF missions. Integration issues are a concern, and the focus of current research.

DTIC

Electric Propulsion; Hall Thrusters; Propulsion System Performance

20020083279 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA

Radiometric Analysis from the 26-kW Electric Propulsion Space Experiment (ESEX) Flight

Spanjers, GG. G.; Schilling, J. H.; Bromaghim, D. R.; Jan. 11, 2001; 19p; In English

Report No.(s): AD-A405912; AFRL-PR-ED-TP-2001-010; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USA Air Force Research Laboratory's Electric Propulsion Space Experiment (ESEX) was launched and operated in early 1999 in order to demonstrate the compatibility and readiness of a 30 kW class ammonia arcjet for satellite propulsion applications. As part of this flight, an array of on-board contamination sensors was used to assess the effect of the arcjet and other environments on the spacecraft. The sensors consisted of microbalances to measure material deposition, radiometers to assess material degradation due to thermal radiation, and solar cell segments to investigate solar array degradation. Over eight firings of the ESEX arcjet, (3 minutes, 26 seconds operating time) the radiometer near the thruster, viewing the arcjet plume and body, experienced a change in the thermal properties of its coating (repetitive) Radiometers with no view of the arcjet, or a view of only the plume, show no change. In general, contamination effects are observed only on sensors near the thruster exhaust nozzle, a location unlikely to be used in an operational high-power electric propulsion system. No contamination effects are observed in the backplane of the thruster. For future programs, while engineering measures may be needed for spacecraft equipment in the immediate vicinity of the thruster body, the arcjet environment is generally benign.

DTIC

Arc Jet Engines; Combustion Products

20020083323 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA

Gas Dynamic Calibration of a Nano-Newton Thrust Stand

Jamison, Andrew J.; Ketsdever, Andrew D.; Muntz, E. P.; Jul. 2002; 34p; In English; Prepared in collaboration with Univ of Southern California, Los Angeles

Report No.(s): AD-A405713; AFRL-PR-ED-TP-2002-181; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The ability to measure extremely low thrust levels with unusual precision is becoming more critical as attempts are made to characterize the performance of emerging micropropulsion systems. Many new attitude control concepts for nanospacecraft involve the production of thrust below 1 micro-N. A simple, but uniquely successful thrust stand has been developed and used to measure thrust levels as low as 86.2 nano-Newtons with an estimated accuracy of +/- 11%. Thrust levels in the range of 712

nano-Newtons to 1 micro-N have been measured with an estimated accuracy of +/- 2%. Thrust is measured from an underexpanded orifice operating in the free molecule flow regime with helium, argon, and nitrogen propellants. The thrust stand is calibrated using results from Direct Simulation Monte Carlo numerical models and analytical solutions for free molecule orifice flow. The accuracy of the gas dynamic calibration technique, using free molecule orifice flow, has also been investigated. It is shown that thrust stand calibration using high Knudsen number helium flow can be accurate to within a few percent in the 80 nN to 1 micro-N thrust range for thin walled orifices when the stagnation pressure is accurately measured. The thrust stand and calibration technique exhibit significant improvement for accurate, low thrust measurements compared to currently published results.
DTIC
Low Thrust; Mathematical Models; Thrust Measurement; Gas Dynamics; Control Systems Design

20020083328 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Multiphase Detonations for Pulse Detonation Rocket Engines
Talley, Douglas G.; Coy, Edward B.; Watts, Jonathan M.; Aug. 2002; 10p; In English
Report No.(s): AD-A405724; AFRL-PR-ED-TP-2002-200; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Recent efforts in PDRE research at AFRL-West have focused on basic studies of the detonation or constant-volume combustion of multiphase mixtures. A collaborative effort is under way for developing models appropriate for PDRE application studies. This effort includes a new facility for the collection of data on liquid oxygen/gaseous fuel detonations. The facility has been designed to provide accurate and flexible control over the initial conditions of the multiphase mixtures and complete characterization of detonation parameters including initiation energies, wave speeds, pressures and rates of heat transfer. Model development is being performed by Metacomp Technologies and University of Colorado. A second experimental effort is examining the feasibility of a monopropellant-fueled pulse combustor. Analytical and numerical studies have shown the performance benefits of this approach and a preliminary system study has shown that there are significant benefits in satellite applications. An experimental demonstration of the concept is under way.
DTIC
Pulse Detonation Engines; Rocket Engines; Pulsejet Engines; Multiphase Flow

20020083336 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
The History of the BATES Motors at the Air Force Rocket Propulsion Laboratory
Geisler, R.; Beckman, C.; Jul. 1998; 12p; In English; Prepared in collaboration with Geisler Enterprises, Tehachapi, CA
Report No.(s): AD-A405742; AFRL-PR-ED-TP-1998-110; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper presents the history of the Ballistic Test and Evaluation System (BATES) at what was then the Air Force Rocket Propulsion Laboratory (AFRPL) over the past 40 years. The system maintains the highest accuracy possible (0.2% on thrust) and has become the equivalent of Bureau of Standards for measuring and comparing solid propellant performance. The BATES database covers several thousand firings with several hundred parameters reported per firing. The paper also discusses methodologies developed with the system, scientific discoveries made with the system, and the key role it has played in shaping the entire ballistic testing and analysis efforts in this and other countries.
DTIC
Ballistics; Solid Rocket Propellants; Thrust Control; Motors; Flight Tests

20020083344 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
On-Orbit Optical Observations of the ESEX 26kW Ammonia Arcjet
Johnson, L. K.; Spanjers, G. G.; Bromaghim, D. R.; Dulligan, M. W.; Jan. 11, 2001; 23p; In English; Prepared in collaboration with Aerospace Corp., El Segundo, CA and ERC Inc. , Edwards AFB, CA
Report No.(s): AD-A405823; AFRL-PR-ED-TP-2001-006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
During the course of eight flight firings of the ESEX 26 kW arcjet in March and April, 1999, optical observations from on-board and ground-based sensors were obtained. Images from the on-board still camera indicate that the nozzle temperature distribution is consistent with arcjet heating models and ground observations. Images of the thruster plume at 656 nm confirm predictions that the luminescent plume in the space environment is more diffuse and compact than the plume from a thruster operated in the laboratory at a higher background pressure. Finally, observations using a ground-based telescope reveal a mixed greybody/line emission spectrum over the range 325-675 nm. The spectral features and line ratios are similar to those observed in ground-based measurements.
DTIC
Emission Spectra; Arc Jet Engines; Aerospace Environments; Line Spectra; Visual Observation

20020083345 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA

Preliminary Orbital Performance Analysis of the Air Force Electric Propulsion Space Experiment (ESEX) Ammonia Arcjet

Fife, J. M.; LeDuc, J. R.; Sutton, A. M.; Bromaghim, D. R.; Johnson, L. K.; Jun. 02, 1999; 10p; In English; Prepared in collaboration with Aerospace Corp., El Segundo, CA and Primex Redmond, WA

Report No.(s): AD-A405828; AFRL-PR-ED-TP-FY99-0126; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the Electric Propulsion Space Experiment (ESEX) mission, eight firings of the 26 kW ammonia arcjet were performed. Data from on-board systems, GPS, and radar ranging taken during these firings are used in this paper to determine thruster performance. The on-board Servo Accelerometer Assembly (SAA) measured spacecraft acceleration continually at 10 Hz. Although the design prohibited precise acceleration measurement in the range nominally expected during the firings, estimates of acceleration were obtained. The uncertainties of the acceleration estimates are on the order of 5% of nominal due primarily to the discretization error of the A/D converter. Mean performance figures are calculated based on acceleration and other on-board measurements. The final estimates of specific impulse and thrust efficiency are 787.0 +/- 49.8 seconds and 0.284 +/- 0.029, respectively.

DTIC

Arc Jet Engines; Performance Tests; Electric Propulsion; Reliability Analysis; Spaceborne Experiments

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see categories 24 through 29. For astrochemistry see category 90 Astrophysics.

20020080720 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA USA

Formation of Amino Acid Thioesters for Prebiotic Peptide Synthesis: Catalysis by Amino Acid Products

Weber, Arthur L., Search for Extraterrestrial Intelligence Inst., USA; [1999]; 1p; In English; 12th International Conference on the Origin of Life, 11-16 Jul. 1999, San Diego, CA, USA

Contract(s)/Grant(s): NCC2-1075; No Copyright; Avail: Issuing Activity; Abstract Only

The origin of life can be described as a series of events in which a prebiotic chemical process came increasingly under the control of its catalytic products. In our search for this prebiotic process that yielded catalytic takeover products (such as polypeptides), we have been investigating a reaction system that generates peptide-forming amino acid thioesters from formaldehyde, glycolaldehyde, and ammonia in the presence of thiols. As shown below, this model process begins by aldol condensation of formaldehyde and glycolaldehyde to give trioses and releases. These sugars then undergo beta-dehydration yielding their respective alpha-ketoaldehydes. Addition of ammonia to the alpha-ketoaldehydes yields imines which can either: (a) rearrange in the presence of thesis to give amino acid thioesters or (be react with another molecule of aldehyde to give imidazoles. This 'one-pot' reaction system operates under mild aqueous conditions, and like modem amino acid biosynthesis, uses sugar intermediates which are converted to products by energy-yielding redox reactions. Recently, we discovered that amino acids, such as the alanine reaction product, catalyze the first and second steps of the process. In the presence of ammonia the process also generates other synthetically useful products, like the important biochemical -- pyruvic acid.

Author

Amino Acids; Ammonia; Biochemistry; Biosynthesis; Chemical Reactions; Dehydration; Formaldehyde; Thiols

20020080776 Technische Univ., Faculty of Applied Mathematics, Twente, Netherlands

Drying a Liquid Paint Layer

Susanto, H.; vandeFliert, B. W.; May 2001; 24p; In English

Report No.(s): PB2002-105938; MEMO-1583; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Subject of this study is the free boundary problem of a liquid layer that is dried by evaporation. Using a Stefan type problem, we model the diffusion driven drying of a layer of liquid paint consisting of resin and solvent. The effect of a small perturbation of the flat boundary is considered. We include the discussion of evaporation constant as a free parameter. For both small and big wavenumber, the high speed of evaporation can lead to instability. We first recognize this instability in the linearized equation. Using numerical calculations, we show that the instability also happens in the full equation.

NTIS

Paints; Layers; Free Boundaries; Boundary Value Problems

20020080890 Physical Sciences, Inc., Andover, MA USA

Material Testing Device

Spinoff 1993; 1993, pp. 99; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Small Business Innovation Research (SBIR) contracts led to two commercial instruments and a new subsidiary for Physical Sciences, Inc. (PSI). The FAST system, originally developed for testing the effect of space environment on materials, is now sold commercially for use in aging certification of materials intended for orbital operation. The Optical Temperature Monitor was designed for precise measurement of high temperatures on certain materials to be manufactured in space. The original research was extended to the development of a commercial instrument that measures and controls fuel gas temperatures in industrial boilers. PSI created PSI Environmental Instruments to market the system. The company also offers an Aerospace Measurement Service that has evolved from other SBIR contracts.

Author

Materials Tests; Vacuum Chambers; Pyrometers; Aerospace Environments

20020080929 NASA Ames Research Center, Moffett Field, CA USA

Aerogel Composites: Strong and Waterproof

White, Susan, NASA Ames Research Center, USA; Hsu, Ming-ta, NASA Ames Research Center, USA; [1999]; 1p; In English; 36th Space Congress, 27-30 Apr. 1999, Cape Canaveral, FL, USA

Contract(s)/Grant(s): RTOP 242-82-10; No Copyright; Avail: Issuing Activity; Abstract Only

Aerogels are exotic materials having superior thermal and physical properties with great potential for both space and industrial uses. Although aerogels are excellent low-density insulators with unique acoustic and optical properties, their commercialization potential is currently limited by moisture absorption, fragility, and cost. This paper describes useful, easily scaled-up solutions to the first two of these three problems. The waterproofing and water-repellent method described here is a cheaper and simpler improvement over previous permanent methods.

Author

Aerogels; Commercialization; Durability; Waterproofing

20020081333 NASA Glenn Research Center, Cleveland, OH USA

The Effects of Substrate Material and Thermal Processing Atmosphere on the Strength of PS304: A High Temperature Solid Lubricant Coating

DellaCorte, Christopher, NASA Glenn Research Center, USA; September 2002; 24p; In English

Contract(s)/Grant(s): RTOP 708-18-13

Report No.(s): NASA/TM-2002-211483; NAS 1.15:211483; E-13251; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

PS304, a plasma spray deposited solid lubricant coating developed for high temperature sliding contacts was deposited on nine different substrate metals, heat treated at 650C in either air or argon and subsequently tested for strength using a commercially available pull-off adhesion test. Some samples were examined metallographically to help elucidate and explain the results. As deposited coatings exhibit pull-off strengths typically between 16 and 20 MPa with failure occuring (cohesively) within the coating. Heat treatment in argon at 650 C results in a slight increase in coating (cohesive) strength of about 30 percent to 21 to 27 MPa. Heat treatment in air at 650 C results in a dramatic increase in strength to over 30 MPa, exceeding the strength of the epoxy used in the pull test. Cross section metallographic analyses show that no microstructural coating changes occur following the argon heat treatments, however, exposure to air at 650C gives rise to the formation of a second chromium-rich phase precipitate within the PS304 NiCr constituent which provides a strengthening effect and a slight (approximately 5 percent) coating thickness increase. Subsequent heat treatments do not result in any further coating changes. Based upon these studies, PS304 is a suitable coating for use on a wide variety of high temperature substrates and must be heat treated following deposition to enhance strength and ensure dimensional stability.

Author

Coating; Solid Lubricants; Adhesion Tests; Fractures (Materials); Failure Analysis; Metals; Plasma Spraying

20020082977 Massachusetts Inst. of Tech., Cambridge, MA USA

Direct and Indirect Photoreactions of Chromophoric Dissolved Organic Matter: Roles of Reactive Oxygen Species and Iron

Goldstone, Jared V.; Feb. 2002; 259p; In English; Original contains color images; Original contains color plates: All DTIC reproductions will be in black and white. Sponsored in part by Grant OCE-9811208 and OCE-9819089. Prepared in cooperation with Woods Hole Oceanographic Institution, MA

Contract(s)/Grant(s): OCE-9529448; OCE-9521628

Report No.(s): AD-A405886; MIT/WHOI-2002-05; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Photochemical transformations of chromophoric dissolved organic matter (CDOM) are one of the principal processes controlling its fate in coastal waters. Photoreactions ultimately lead to the destruction of the chromophores and hence to the loss of absorption and fluorescence (bleaching), thus acting as a sink for CDOM and photodecomposition may proceed both via direct photochemical reactions or via indirect processes, involving photochemically generated intermediates such as reactive oxygen species (ROS). Superoxide (O2) reactions with CDOM did not appear to degrade the CDOM. Instead, CDOM catalysed the dismutation of O2 to O2 and HOOH. This reactivity has the effect of limiting the steady-state concentration of O2 in most coastal waters. Reactions of CDOM with radiolytically produced hydroxyl radical (OH.) formed CO2 and several low molecular weight carboxylic acids, as well as bleached both the absorption and fluorescence at slow rates. These reactions did not increase the bioavailability of this material to a microbial consortium. Addition of iron to several coastal seawater samples and to solutions of Suwannee River Fulvic Acid neither increased the rate of photobleaching nor the apparent quantum yield (AQY) of CO. Similarly, the addition of the siderophore desferrioxamine B did not change the photobleaching rates or the CO AQYs. In combination with prior results, these findings suggest that indirect photoreactions do not increase the photobleaching rates of CDOM in coastal systems. A model of CDOM photobleaching based on the assumption of negligible indirect photobleaching processes and multiple non-interacting chromophores was created utilizing photobleaching data produced with monochromatic light to calculate the spectra and exponential decay rates of independent components. These components were then used to calculate bleaching spectra for broadband light and compared with actual bleaching spectra.

DTIC

Photochemical Reactions; Organic Materials; Marine Biology

20020083002 Corps of Engineers, Washington, DC USA

Engineering and Design. Containment and Disposal of Aqueous Film-Forming Foam Solution

Cheung, Kisuk; May 23, 1997; 18p; In English

Report No.(s): AD-A406054; ETL-1110-3-481; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This letter provides design guidance for containment and disposal of aqueous film-forming foam (AFFF) discharges from AFFF fire extinguishing systems.

DTIC

Waste Disposal; Foams; Fire Extinguishers

20020083034 Engineering Research and Consulting, Inc., Edwards AFB, CA USA

Kinetics of CH Radicals With O2: Evidence for CO-Chemiluminescence in the Gas Phase Reaction

Vaghjiani, Ghanshyam; Jun. 18, 2002; 33p; In English

Contract(s)/Grant(s): F04611-99-C-0025

Report No.(s): AD-A406218; AFRL-PR-ED-TP-2002-150; AFRL-PR-ED-TP-2002-150; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Production of CO vis-uv-chemiluminescence has been observed for the first time in the gas phase reaction of photolytic-methylidyne radicals with molecular oxygen. A trace amount of CMBr3 vapor was photo-decomposed in a pulsed-photolysis reactor using a 248-nm laser under multi-photon-dissociation conditions to produce the CH(X(sup 2)H) radicals in an excess of O2 in diluent helium carrier gas at 2.0 torr and 298 K. The time resolved chemiluminescent traces due to characteristic CO(A-X), CO(a-X) and CO(d-a) vibronic emissions were recorded at several band positions. 147.8 nm was the shortest wavelength at which CO emission was recordable. The integrated intensities of the CO emissions showed a quadratic dependence on the photolysis fluence employed as did the OH(A-X) emission in the (1-0) band. The dependence of the OH and CO chemiluminescence on O2 was studied to obtain the rate coefficient(s) for the chemiluminescent reaction(s). The data is best

interpreted by postulating that CM(v" is greater than - O) reactions with O2 lead to the observed CO-emissions as well as the well-known OH-chemiluminescence.
DTIC
Carbon Monoxide; Chemiluminescence; Diluents; Vapor Phases; Fluence; Dissociation

20020083105 Colorado School of Mines, Golden, CO USA
Preparation of Novel Polyazetes ***Final Report, 15 Jun. 1998-29 Dec. 2001***
Radziszewski, J. G.; Dec. 2001; 55p; In English
Contract(s)/Grant(s): F49620-98-1-0483; Proj-G611
Report No.(s): AD-A406194; AFRL-SR-AR-TR-02-0254; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
We have investigated several ways to prepare and characterize spectroscopically novel compounds of pure nitrogen: tetrazete N4 and pentazole anion N5. They are of interest to DARPA/AFOSR as potential new high energy density materials (HEDM)s and attractive propellants. Results of earlier, extensive theoretical work (quantum mechanical computations) consistently suggest that tetrazete should be a metastable compound with decomposition barrier of 60 kcal/mol, and it should contain 180 kcal/mol of energy with respect to the two dinitrogen molecules. We have carefully scrutinized several methods to prepare tetrazete and for its subsequent detection we have employed a number of spectroscopic techniques. Microwave, electrical discharge of gaseous nitrogen or fast atom bombardment of nolid N2 (at 10 K) produces highly reactive neutral and charged nitrogen fragments: N-atoms, N3 radicals and variety of ions. Majority of them recombine among themselves to form back dinitrogen or react with always-present trace amounts of impurities (mostly oxygen atoms) to produce nitrogen oxides.
DTIC
Nitrogen Atoms; Oxygen Atoms; Potential Energy; Decomposition

20020083244 Army Armament Research, Development and Engineering Center, Benet Labs., Watervliet, NY USA
Detrended Fluctuation Analysis of UV Degradation in a Polyurethane Coating ***Final Report***
Johnson, Mark A.; Cote, Paul J.; Aug. 2002; 21p; In English
Report No.(s): AD-A406089; ARCCB-TR-02012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Changes in the intrinsic structure of paint surfaces resulting from extended UV exposure can significantly alter the appearance of the paint due to a breakdown in the resin that binds the fine paint particulates. In this study, the coating structure of a solvent-based polyurethane was analyzed to establish correlations between the intrinsic spatial scaling properties of the coating and UV exposure time, Atomic force microscopy (AFM) and laser scanning confocal microscopy (LSCM) were employed to map surface structures over a range of scales from 100 nm to 100 square m. The roughness of the polyurethane surface was characterized in terms of scaling exponents by quantifying the local roughness using detrended fluctuation analysis (DFA) to identify long-range power-law correlations and correct for inhomogeneities in the surface structure. This approach provides a means to directly compare AFM and LSCM results over a range of scales consistent with those of a self-affine fractal. The time-dependent dynamics of the roughening process was also determined in order to provide a metric for characterizing the evolving surface morphology. The results provide fresh insight into the mechanisms of polyurethane coating degradation under UV exposure.
DTIC
Paints; Polyurethane Resins; Photodecomposition; Ultraviolet Radiation

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COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20020080915 NASA Ames Research Center, Moffett Field, CA USA
Subsurface Microsensors for Assisted Recertification of TPS (SmarTPS)
Pallix, Joan B., Eloret Corp., USA; Milos, Frank S., NASA Ames Research Center, USA; Huestis, Dave, SRI International Corp., USA; [1999]; 1p; In English; Sixth International Conference on Composites Engineering, 27 Jun. - 3 Jul. 1999, Orlando, FL, USA
Contract(s)/Grant(s): RTOP 242-82-85; No Copyright; Avail: Issuing Activity; Abstract Only
Commercialization of a competitive reusable launch vehicle (RLV) is a primary goal for both NASA and the U.S. aerospace industry. to expedite achievement of this goal, the Bantam-X Technology Program is funding development of innovative technologies to lower costs for access to space. Ground operations is one area where significant cost reduction is required. For the Shuttle fleet, ground operations account for over 80% of the life cycle costs, and TPS recertification accounts for 27% of the

operation costs ($4.5M per flight). Bantam Task TPS-7, Subsurface Microsensors for Assisted Recertification of TPS (SmarTPS), is a joint effort between NASA centers and industry partners to develop rapid remote detection and scanning technology for inspection of TPS and detection of subsurface defects. This short paper will provide a general overview of the SmarTPS concept. Author

Reusable Launch Vehicles; Microinstrumentation; Spacecraft Maintenance; Ground Support Equipment

20020082891 NASA Glenn Research Center, Cleveland, OH USA

Microstructure and Tensile Properties of BN/SiC Coated Hi-Nicalon, and Sylramic SiC Fiber Preforms

Bhatt, Ramakrishna T., Army Research Lab., USA; Chen, Yuan L., DYNACS Engineering Co., Inc., USA; Morscher, Gregory N., Ohio Aerospace Inst., USA; August 2002; 16p; In English

Contract(s)/Grant(s): RTOP 714-04-30

Report No.(s): NASA/TM-2001-210695/REV1; E-12626-1/REV1; NAS 1.15:210695/REV1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Batch to batch and within batch variations, and the influence of fiber architecture on room temperature physical and tensile properties of BN/SiC coated Hi-Nicalon and Sylramic SiC fiber preform specimens were determined. The three fiber architectures studied were plain weave (PW), 5-harness satin (5HS), and 8-harness satin (8HS). Results indicate that the physical properties vary up to 10 percent within a batch, and up to 20 percent between batches of preforms. Load-reload (Hysteresis) and acoustic emission methods were used to analyze damage accumulation occurring during tensile loading. Early acoustic emission activity, before observable hysteretic behavior, indicates that the damage starts with the formation of nonbridged tunnel cracks. These cracks then propagate and intersect the load bearing ”0 deg” fibers giving rise to hysteretic behavior. For the Hi-Nicalon preform specimens, the onset of ”0 deg” bundle cracking stress and strain appeared to be independent of the fiber architecture. Also, the ”0 deg” fiber bundle cracking strain remained nearly the same for the preform specimens of both fiber types. TEM analysis indicates that the CVI BN interface coating is mostly amorphous and contains carbon and oxygen impurities, and the CVI SiC coating is crystalline. No reaction exists between the CVI BN and SiC coating.
Author

Coatings; Fiber Composites; Silicon Carbides; Stress-Strain Relationships; Tensile Properties; Cracks; Microstructure

20020082957 NASA Glenn Research Center, Cleveland, OH USA

Design Considerations for Lightweight Space Radiators Based on Fabrication and Test Experience With a Carbon-Carbon Composite Prototype Heat Pipe

Juhasz, Albert J., NASA Glenn Research Center, USA; September 2002; 26p; In English; 10th International Heat Pipe Conference, 22-25 Sep. 1997, Stuttgart, Germany; Original contains color illustrations

Contract(s)/Grant(s): NAS3-25209; RTOP 253-02-90

Report No.(s): NASA/TP-1998-207427/REV1; E-11139-2/REV1; NAS 1.60:207427/REV1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report discusses the design implications for spacecraft radiators made possible by the successful fabrication and proof-of-concept testing of a graphite-fiber-carbon-matrix composite (i.e., carbon-carbon (C-C)) heat pipe. The prototype heat pipe, or space radiator element, consists of a C-C composite shell with integrally woven fins. It has a thin-walled furnace-brazed metallic (Nb-1%Zr) liner with end caps for containment of the potassium working fluid. A short extension of this liner, at increased wall thickness beyond the C-C shell, forms the heat pipe evaporator section which is in thermal contact with the radiator fluid that needs to be cooled. From geometric and thermal transport properties of the C-C composite heat pipe tested, a specific radiator mass of 1.45 kg/sq m can be derived. This is less than one-fourth the specific mass of present day satellite radiators. The report also discusses the advantage of segmented space radiator designs utilizing heat pipe elements, or segments, in their survivability to micrometeoroid damage. This survivability is further raised by the use of condenser sections with attached fins, which also improve the radiation heat transfer rate. Since the problem of heat radiation from a fin does not lend itself to a closed analytical solution, a derivation of the governing differential equation and boundary conditions is given in appendix A, along with solutions for rectangular and parabolic fin profile geometries obtained by use of a finite difference computer code written by the author. Author

Spacecraft Radiators; Heat Pipes; Graphite; Composite Materials; Design Analysis; Fabrication

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also 34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics.

20020080759 Department of Energy, Washington, DC USA
Impact of Aluminum on Anticipated Corrosion in a Flooded SNF Multi Canister Overpack (MCO)
Duncan, D. R.; Jul. 06, 1999; 92p; In English
Report No.(s): DE2002-797536; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Corrosion reactions in a flooded MCO are examined to determine the impact of aluminum corrosion products (from aluminum basket grids and spacers) on bound water estimates and subsequent fuel/environment reactions during storage. The mass and impact of corrosion products were determined to be insignificant, validating the choice of aluminum as an MCO component and confirming expectations that no changes to the Technical Databook or particulate mass or water content are necessary.
NTIS
Aluminum; Corrosion; Spent Fuels; Cans

20020080763 Department of Energy, Washington, DC USA
Engineering Task Plan for the 241-AN-105 Multi-Function Corrosion Monitoring System
Edgemon, G. L.; Aug. 25, 1999; 8p; In English
Report No.(s): DE2002-797684; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This Engineering Task Plan (ETP) describes the activities associated with the installation of the corrosion probe assembly into riser WST-RISER-016 of tank 241-AN-105. The corrosion monitoring system utilizes the technique of electrochemical noise for monitoring waste tank corrosion.
NTIS
Corrosion; Probes; Risers

20020080771
Hazards evaluation of plutonium metal opening and stabilization
Johnson, L. E.; Aug. 31, 1999; 27p; In English
Report No.(s): DE2002-797740; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Hazards evaluation is the analysis of the significance of hazardous situations associated with an activity OK process. The HE used qualitative techniques of Hazard and Operability (HazOp) analysis and What-If analysis to identify those elements of handling and thermal stabilization processing that could lead to accidents.
NTIS
Safety; Assessments; Plutonium; Radioactive Wastes; Packaging; Thermal Stability

20020080774
Status of Database for Electrochemical Noise Based Corrosion Monitoring
Edgemon, G. L.; Aug. 03, 1999; 11p; In English
Report No.(s): DE2002-797750; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Corrosion probe database status. This document meets the requirements of Milestone El of FY 1999 TTP No. RLO-8-WT-21.
NTIS
Corrosion Prevention; Electrochemistry; Data Bases

20020080874 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden
N4 Project: Activity Report for the Third Quarter of 2001
Oestmark, H.; Bittererova, M.; Brinck, T.; Hore, N.; Claridge, R.; Oct. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-107192; FOI-R-0223-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The main emphasis during the rest of the year 2001 will be on continued N4 synthesis experiments with long integration times. The experiments will be carried out on liquid nitrogen samples, solid nitrogen matrices and samples containing heterocyclic high-nitrogen compounds at cryogenic and room temperatures.
NTIS
Cryogenics; Heterocyclic Compounds; Nitrogen Compounds; Synthesis (Chemistry)

20020080955 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Selected Library of Transport Coefficients for Combustion and Plasma Physics Applications
Cloutman, L. D.; Aug. 01, 2000; 29p; In English
Report No.(s): DE2002-793685; UCRL-ID-139893; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
COYOTE and similar combustion programs based on the multicomponent Navier-Stokes equations require the mixture viscosity, thermal conductivity, and species transport coefficients as input. This report documents a model of these molecular transport coefficients that is simpler than the general theory, but which provides adequate accuracy for many purposes. This model leads to a computationally convenient, self-contained, and easy-to-use source of such data in a format suitable for use by such programs. We present the data for various neutral species in two forms. The first form is a simple functional fit to the transport coefficients. The second form is the use of tabulated Lennard-Jones parameters in simple theoretical expressions for the gas-phase transport coefficients. The model then is extended to the case of a two temperature plasma. Lennard-Jones parameters are given for a number of chemical species of interest in combustion research.
NTIS
Combustion Physics; Transport Properties; Thermal Conductivity; Plasma Physics

20020080983 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Development of Experimental and Experimental Equipment for Combustion Studies *Utveckling av Experimentella Tekniker och Experiment-Anlaeggning foer Foerbraenningsstudier del 2*
Carlsson, T.; Dec. 2001; In Swedish; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-107230; FOI-R-0306-SE; No Copyright; Avail: National Technical Information Service (NTIS)
This report describes the development of an experimental facility for combustion studies. The aim is to develop experimental methods for comparison with computer based simulations.
NTIS
Combustion; Research Facilities; Experimentation

20020082956 NASA Glenn Research Center, Cleveland, OH USA
Thin-Film Organic-Based Solar Cells for Space Power
Bailey, Sheila G., NASA Glenn Research Center, USA; Harris, Jerry D., Cleveland State Univ., USA; Hepp, Aloysius F., NASA Glenn Research Center, USA; Anglin, Emily J., Ohio Aerospace Inst., USA; Raffaelle, Ryne P., Rochester Inst. of Tech., USA; Clark, Harry R., Jr., Townsend Science and Engineering, USA; Gardner, Susan T. P., Physical Sciences, Inc., USA; Sun, Sam S., Norfolk State Univ., USA; August 2002; 11p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-A4-01
Report No.(s): NASA/TM-2002-211833; NAS 1.15:211833; IECEC-2002-20154; E-13527; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Recent advances in dye-sensitized and organic polymer solar cells have lead NASA to investigate the potential of these devices for space power generation. Dye-sensitized solar cells were exposed to simulated low-earth orbit conditions and their performance evaluated. All cells were characterized under simulated air mass zero (AM0) illumination. Complete cells were exposed to pressures less than 1 x 10(exp -7) torr for over a month, with no sign of sealant failure or electrolyte leakage. Cells from Solaronix SA were rapid thermal cycled under simulated low-earth orbit conditions. The cells were cycled 100 times from -80 C to 80 C, which is equivalent to 6 days in orbit. The best cell had a 4.6 percent loss in efficiency as a result of the thermal cycling. In a separate project, novel -Bridge-Donor-Bridge- Acceptor- (-BDBA-) type conjugated block copolymer systems have been synthesized and characterized by photoluminescence (PL). In comparison to pristine donor or acceptor, the PL emissions of final -B-D-B-A- block copolymer films were quenched over 99 percent. Effective and efficient photo induced electron transfer and charge separation occurs due to the interfaces of micro phase separated donor and acceptor blocks. The system is very promising for a variety high efficiency light harvesting applications. Under an SBIR contract, fullerene-doped polymer-based

photovoltaic devices were fabricated and characterized. The best devices showed overall power efficiencies of approx. 0.14 percent under white light. Devices fabricated from 2 percent solids content solutions in chlorobenzene gave the best results. Presently, device lifetimes are too short to be practical for space applications.
Author
Photovoltaic Cells; Thin Films; Solar Cells; Organic Compounds; Electrolytes

20020083019 Northeast Consortium for Engineering Education, Port Royal, VA USA
Air Plasma Ion Reactions With Acetylene, Benzene and Naphthalene from 298-1400K ***Interim Report***
Midey, Anthony; Jun. 22, 1999; 28p; In English
Contract(s)/Grant(s): F19628-98-C-0029; Proj-9993
Report No.(s): AD-A405780; AFRL-VS-TR-2002-1590; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A variable temperature-selected ion flow drift tube (VT-SIFDT) and a high temperature flowing afterglow (HTFA) have been used to study ion-molecule reactions in the 163 - 1400 K temperature range. The effects of electronic, vibrational and rotational energy on the kinetics of a wide range of reactions important in combustion chemistry have been investigated.
DTIC
Benzene; Combustion; Acetylene; Naphthenes; Absorption Spectra; Combustion Chemistry

20020083094 Sandia National Labs., Albuquerque, NM USA
Kinetics of Supercritical Water Oxidation-SERDP Compliance Technical Thrust Area ***Final Report, Jan. 1993-Aug. 2000***
Rice, Steven F.; Jun. 2001; 162p; In English; Prepared in cooperation with Massachusetts Inst. of Technology, Cambridge, MA and Princeton Univ., Princeton, NJ
Contract(s)/Grant(s): Proj-364-DOE
Report No.(s): AD-A406128; SAND-2001-8274; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
This final report has two purposes. The first is to provide a single document that contains a description of this project's goals, activities, and accomplishments over the 8 year period of performance from January, 1993 to August, 2000. The second purpose is to provide an overview of the technical results that have been obtained and to submit a roadmap that identifies the publications and reports where the details of these technical results can be found. This report is not intended to republish the complete contents of the quarterly progress reports of the several dozen reviewed publications and Sandia reports that have resulted from this project. However, sufficient detail of the experimental and modeling results is included to illustrate the most important technical conclusions. Specifically, detailed results are presented here that answer the two fundamental questions that have motivated this work. They are: (1) what are the rate-controlling processes in the oxidation of a variety of organic compounds in supercritical water; and (2) how does this oxidation chemistry compare to combustion chemistry and, if so, can the same elementary reaction modeling approaches that have met with success.
DTIC
Combustion Chemistry; Oxidation; Reaction Kinetics; Supercritical Fluids

20020083187 Northeast Consortium for Engineering Education, Port Royal, VA USA
Ion-Molecular Reactions With Organic and Atmospheric Compounds from 150-1400K ***Interim Report***
Midey, Anthony; Jun. 2000; 28p; In English
Contract(s)/Grant(s): F19628-98-C-0029; AF Proj. 9993
Report No.(s): AD-A405891; AFRL-VS-TR-2002-1591; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A variable temperature-selected ion flow drift tube (VT-SIFDT) and a high temperature flowing afterglow (HTFA) have been used to study ion-molecule reactions in the 220 - 1400 K temperature range. The effects of electronic, vibrational, and rotational energy on the kinetics of a wide range of reactions important in combustion chemistry have been investigated.
DTIC
Combustion; Ion Atom Interactions

20020083213 Naval Academy, Dept. of Physics, Annapolis, MD USA
The Need to Reconsider Traditional Free Volume Theory for Polymer Electrolytes
Bendler, J. T.; Fontanella, J. J.; Shlesinger, M. F.; Wintersgill, M. C.; Jul. 01, 2002; 20p; In English
Contract(s)/Grant(s): N00014-02-AF-00002; Proj-02PRO-2263-00
Report No.(s): AD-A406254; 30; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Pressure-temperature-volume (PVT) data have been obtained for poly(propylene glycol) of molecular weight 1025 containing LiCF3SO3 in the mole ratio 20:1. The PVT data were used to calculate the specific volumes, V/V(sub P = 0, TAU =

296 K), associated with the pressures and temperatures for previously published variable temperature, high-pressure electrical conductivity data. It is found that the electrical conductivity depends strongly on temperature at a constant volume. Consequently, traditional free volume theory is not consistent with the data. Finally, it is shown that the features of the electrical conductivity data can be accounted for by a recently developed generalized Vogel theory.
DTIC
Equations of State; Propylene; Electrolytes; Polymers; Glycols

20020083247 Engineering Research and Consulting, Inc., Edwards AFB, CA USA
Gas-Surface Interaction Model Evaluation for DSMC Applications
Wadsworth, Dean C.; VanGilder, Douglas B.; Dogra, Virendra K.; Jul. 2002; 10p; In English; Prepared in cooperation with John Hopkins Univ., Applied Physics Lab., Laurel, MD
Contract(s)/Grant(s): F04611-99-C-0025
Report No.(s): AD-A406005; AFRL-PR-ED-TP-2002-191; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The general gas surface interaction event is considered to be parameterized by the molecule's incident energy magnitude and incident angle relative to the surface normal. These parameters are used to estimate the degree of nonequilibrium that arises for typical applications, and the quality of scattering predictions made by common few-parameter models such as the Maxwell model. Experimental measurements and molecular dynamics simulations are evaluated as potential sources of data to develop or test improved models. An ad hoc model is used to quantify the effect that improved physical realism of nonequilibrium scattering events may have on typical surface quantities of interest for a realistic application in the rarefied regime. The model allows incremental or piecemeal incorporation of scattering data as they become available.
DTIC
Reaction Kinetics; Direct Numerical Simulation; Monte Carlo Method

20020083329 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
High Pressure and Supercritical Combustion: Interactions of Jets with Acoustic Waves
Chehroudi, B.; Talley, D. G.; Aug. 2002; 11p; In English
Report No.(s): AD-A405725; AFRL-PR-ED-AB-2002-202; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of this task is to determine the mechanisms which control the breakup, transport, mixing, and combustion of high pressure and supercritical droplets, jets, and sprays, both as these pertain to steady' conditions as well as acoustically excited conditions. Previous results pertaining to 'steady' conditions have now been augmented with the initiation of a study of the interaction of subcritical and supercritical jets with acoustic waves. Preliminary results suggest that supercritical jets do not couple with acoustic waves as strongly as near-critical and subcritical jets.
DTIC
Combustion; High Pressure; Supercritical Flow; Fuel Sprays

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METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20020080826 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden
Studies on Directional Tungsten-Rhenium Alloys *Studier av Riktade Voltram-Rhenium-Legeringar*
Skoglund, P.; Pettersson, A.; Nov. 2001; 25p; In Swedish
Report No.(s): PB2002-107228; FOI-R-0254-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
KE-projectiles are usually made of uranium or tungsten based alloys. Uranium alloy has better penetration due to the deformation behavior; it is said to be selfsharpening. to increase the penetration performance of tungsten alloys, two approaches have been proposed: 'flow-softening' and 'Flow-anisotropy.' The latter is based on the production of an anisotrop alloy with directionally oriented tungsten crystals, where the deformation behavior changes depending on the orientation.
NTIS
Tungsten Alloys; Rhenium Alloys; Projectiles

20020080828 Swedish National Testing and Research Inst., Boras, Sweden

Determination of Corrosion Protection Classes for Inorganic Coatings on Steel ***Korrosionsskyddsklasning av Organiska Ytbelaeggningar***

Carlsson, B.; Andersson, B.; Lejre, A.; 2000; 60p; In Swedish

Report No.(s): PB2002-106394; SP-RAPP-2000:20; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The objective of this project was to develop a method for quantitative rating of the corrosion protection capability of inorganic coatings on steel by making use of results from accelerated corrosion testing. A model was developed for quantitative rating of the corrosion protection capability in terms of the resistance of a coating to withstand 15 years of use in environments characterized by the corrosivity classes defined in ISO9223. The model makes use of zinc and carbon steel as reference materials. Three accelerated tests were studied for the rating of the corrosion protection capability, namely, the neutral salt spray test according to ISO 9227, cyclic salt spray and humidity testing according to VDA 621-415, and accelerated outdoor testing according to ISO 11474 (VOLVO-SCAB). Altogether 18 different inorganic coating systems were tested by the accelerated test methods and the results used to determine the corrosion protection class of the coatings.

NTIS

Inorganic Coatings; Steels; Corrosion Prevention

20020080984 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden

Vist at Kennametal Hertel AG ***Besoek vid Kennametal Hertel AG***

Petterson, A.; Nov. 2001; 18p; In Swedish

Report No.(s): PB2002-107227; FOI-R-0253-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Kennametal Hertel AG is part of the Kennametal Inc. with their head office in Latrobe in Pennsylvania, USA. This company was founded in 1938 by Philip M. McKenna to produce tungsten carbide. The heavy metal alloys at Kennametal are of tungsten base, and produced by powder metallurgical sintering processes.

NTIS

Projectiles; Heavy Metals; Powder (Particles)

20020081267 NASA Glenn Research Center, Cleveland, OH USA

Preliminary Study on Fatigue Strengths of Fretted Ti-48Al-2Cr-2Nb

Miyoshi, Kazuhisa, NASA Glenn Research Center, USA; Lerch, Bradley A., NASA Glenn Research Center, USA; Draper, Susan L., NASA Glenn Research Center, USA; August 2002; 20p; In English

Contract(s)/Grant(s): RTOP 708-24-13

Report No.(s): NASA/TM-2002-211718; E-13139; NAS 1.15:211718; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The fatigue behavior (stress-life curve) of gamma titanium aluminide (Ti-48Al-2Cr-2Nb, atomic percent) was examined by conducting two tests: first, a fretting wear test with a fatigue specimen in contact with a typical nickel-based superalloy contact pad in air at temperatures of 296 and 823 K and second, a high-cycle fatigue test of the prefretted Ti-48Al-2Cr-2Nb fatigue specimen at 923 K. Reference high-cycle fatigue tests were also conducted with unfretted Ti-48Al-2Cr-2Nb specimens at 923 K. All Ti-48Al-2Cr-2Nb fatigue specimens were machined from cast slabs. The results indicate that the stress-life results for the fretted Ti-48Al-2Cr-2Nb specimens exhibited a behavior similar to those of the unfretted Ti-48Al-2Cr-2Nb specimens. The values of maximum stress and life for the fretted specimens were almost the same as those for the unfretted specimens. The resultant stress-life curve for the unfretted fatigue specimens was very flat. The flat appearance in the stress-life curve of the unfretted specimens is attributed to the presence of a high density of casting pores. The fatigue strengths of both the fretted and unfretted specimens can be significantly affected by the presence of this porosity, which can decrease the fatigue life of Ti-48Al-2Cr-2Nb. The presence of the porosity made discerning the effect of fretting damage on fatigue strength and life of the specimens difficult. Author

Fatigue Tests; Fretting; Porosity; Titanium Aluminides; Wear Tests

20020082940 NASA Glenn Research Center, Cleveland, OH USA

Burst Testing of a Superalloy Disk With a Dual Grain Structure

Gayda, John, NASA Glenn Research Center, USA; Kantzos, Pete, Ohio Aerospace Inst., USA; August 2002; 14p; In English; Original contains color illustrations

Report No.(s): NASA/TM-2002-211868; NAS 1.15:211868; E-13550; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Room temperature burst testing of an advanced nickel-base superalloy disk with a dual grain structure was conducted. The disk had a fine grain bore and a coarse grain rim. The results of this test showed that the disk burst at 39,100 rpm in line with predictions based on a 2-D finite element analysis. Further, significant growth of the disk was observed before failure which was also in line with predictions.
Author
Finite Element Method; Heat Resistant Alloys; Nickel Alloys; Room Temperature

20020083075 Army Armament Research, Development and Engineering Center, Benet Labs., Watervliet, NY USA
Characterization of Steels Using a Revised Kinematic Hardening Model Incorporating Bauschinger Effect ***Final Report***
Parker, Anthony P.; Troiano, Edward; Underwood, John H.; Mossey, Charles; Aug. 2002; 22p; In English
Contract(s)/Grant(s): Proj-TU1G1F261ABJ
Report No.(s): AD-A405842; ARCCB-TR-02009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A new variant of the nonlinear kinematic hardening model is proposed that accommodates both nonlinear and linear strain hardening during initial tensile loading and reduced elastic modulus during initial load reversal. It also incorporates the Bauschinger effect, as a function of prior tensile plastic strain, during the nonlinear compressive loading phase. The model is shown to fit experimental data from a total of five candidate gun steels. The numerical fits will be employed in subsequent work to predict residual stresses and fatigue lifetimes for autofrettaged tubes manufactured from the candidate steels.
DTIC
Strain Hardening; Bauschinger Effect; Steels; Modulus of Elasticity

20020083188 Notre Dame Univ., Dept. of Chemistry and Biochemistry, IN USA
Reactions of Energetic Ions with Thin Film Surfaces ***Final Report, 1 Mar. 2001-28 Feb. 2002***
Jacobs, Dennis C.; Jun. 28, 2002; 10p; In English
Contract(s)/Grant(s): F49620-01-1-0203; AF Proj. 3484
Report No.(s): AD-A405890; AFRL-SR-AR-TR-02-0237; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The PI (Principal Investigator) has designed and constructed a multi function vacuum chamber for evaporating metal films and depositing insulating layers. The chamber is to be used for fabricating metal-insulator-metal (M-I-M) devices that function as novel solid-state electron emitters. Nanoscale M-I-M devices deliver hot electrons to the metal/vacuum interface from within the solid. These hot electrons can stimulate nonthermal chemical reactions at the gas/surface interface or supplement the charge density of a plasma above the device. The chamber houses an electron analyzer for testing the devices in situ. Moreover a load-lock permits easy introduction of samples and transference to an adjoining ultrahigh vacuum (UHV) chamber so that more detailed surface analyses can be performed.
DTIC
Ions; Metal Films; Thin Films; Chemical Reactions

20020083326 Oklahoma State Univ., Stillwater, OK USA
Sol-Gel Derived Surface Treatments for Aircraft Aluminum Alloys ***Final Report, Sep. 1998-Mar. 2002***
Knobbe, Edward T.; Mar. 2002; 39p; In English
Contract(s)/Grant(s): F49620-98-1-0502; Proj-3484
Report No.(s): AD-A405721; AFRL-SR-AR-TR-02-0238; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Technologies for providing enhanced corrosion resistance for 2024-T3 aluminum alloy were investigated. This program investigated: (a) laser processing of metal surfaces to obtain optimum corrosion resistance and (b) the development of sol-gel derived coatings specifically targeted for use on aircraft aluminum alloys. Specifically, a nanosecond excimer laser was used for the surface modification of structure and composition of 2024-T3 aluminum alloy. Environmental scanning electron microscopy (ESEM) was used to characterize the alloy surface structural modification and composition as a function of laser fluence and pulse number. Potentiogynamic scan (PDS) and electrochemical impedance spectroscopy (EIS) were used to analyze corrosion resistance properties of the pre- and post-treated alloys. The ablation process was found to result in the removal of second phase elements, i.e., copper, and growth of the barrier aluminum oxide layer on the surface. These two complementary effects were found to enhance the corrosion resistance properties of the aluminum alloy surface. Additionally, various organically-modified silicate (Ormosil) coatings were investigated and found to provide good corrosion resistance characteristics for 2024-T3 aluminum alloys as determined using potentiodynamic polarization scans and accelerated salt spray testing. Ormosil structures were investigated using solid state NMR. Structure/property relationships were developed based on a correlation of NMR and

salt spray/electrochemical data. The incorporation of a curing agent was found to enhance the corrosion resistance characteristics of the Ormosil coating.
DTIC
Aluminum Alloys; Sol-Gel Processes; Surface Treatment; Silicates; Metal Surfaces

20020083327 Atomics International Div., Atomics International Div., Canoga Park, CA USA
Helium Embrittlement of Type 316 Stainless Steel
Kramer, D.; Garr, K. R.; Rhodes, C. G.; Pard, A. G.; Apr. 30, 1968; 32p; In English
Contract(s)/Grant(s): AT(04-3)-701
Report No.(s): AD-A405722; AI-AEC-12670; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Helium was injected into small tensile samples of Type 316 stainless steel by alpha-particle irradiation from a cyclotron. Subsequent tensile testing in the temperature range 540 to 815 deg C revealed a loss of ductility, as measured by elongation at failure. The lowest temperature at which a ductility loss was manifest depended upon the microstructure of the samples. A fine dispersion of sigma particles within the matrix was capable of raising this temperature by retarding the accumulation of helium at grain boundaries. Reduced ductility was always accompanied by partial or complete intergranular failure and the presence of intergranular cracks. These cracks originated as small voids adjacent to grain-boundary carbide particles, presumably through the action of grain-boundary sliding. Large helium bubbles found attached to carbide particles are responsible for the relative ease of void formation, as compared to samples without helium.
DTIC
Embrittlement; Helium; Irradiation; Microstructure; Stainless Steels; Tensile Tests

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

20020080855 Murray United Development Corp., Landing, NJ USA
Engine Lubricant
Spinoff 1993; 1993, pp. 129; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

PS 212, a plasma-sprayed coating developed by NASA, is used to coat valves in a new rotorcam engine. The coating eliminates the need for a liquid lubricant in the rotorcam, which has no crankshaft, flywheel, distributor or water pump. Developed by Murray United Development Corporation, it is a rotary engine only 10 inches long with four cylinders radiating outward from a central axle. Company officials say the engine will be lighter, more compact and cheaper to manufacture than current engines and will feature cleaner exhaust emissions. A licensing arrangement with a manufacturer is under negotiation. Primary applications are for automobiles, but the engine may also be used in light aircraft.
Author
Lubricants; Plasmas (Physics); Rotary Engines; Sprayed Coatings

20020080940 Radiant Technologies, Inc., Richmond, VA USA
Radiation Insulation
Spinoff 1993; 1993, pp. 72-73; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

An aluminized polymer film is a highly effective radiation barrier for both manned and unmanned spacecraft. Variations of this space-devised material are also used as an energy conservation technique for homes and offices. One commercial company, Tech 2000 (formerly Buckeye Radiant Barrier), markets 'Super R' Radiant Barrier, which finds its origins in the Apollo Mission programs. The material is placed between wall studs and exterior facing before siding or in new roof installation, between roof support and roof sheathing. Successful retrofit installations have included schools and shrink wrap ovens. The radiant barrier blocks 95 percent of radiant energy, thus retaining summer heat and blocking winter cold. Suppliers claim utility bill reductions of 20 percent or more.
Author
Insulation; Heat Shielding; Energy Conservation; Radiation

20020080952 Kroma, Inc., Santa Fe, NM USA

High Tech Art: Chameleon Glass

Spinoff 1993; 1993, pp. 74-75; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Dichroic Glass is a technology wherein extremely thin films of metal are vacuum deposited on a glass surface. The coated glass shields spacecraft instruments from cosmic radiation and protects human vision from unfiltered sunlight in space. Because the coating process allows some wavelengths of light and color to reflect and others to pass through, a chameleon effect is produced. Murray Schwartz, a former aerospace engineer, has based his business KROMA on this NASA optical technology. He produces dichroic stained glass windows, mobiles and jewelry. The technique involves deposition of super thin layers of metal oxides applied one layer at a time in a specific order and thickness for the desired effect. His product line is unique and has been very successful.

Author

Dichroism; Glass; Surface Geometry; Thin Films; Glass Coatings

20020080957 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Corrosion Behavior of Titanate Ceramics in Short-Term MCC-1 Tests: The Effects of Surface Finish

Bakel, A. J.; Basco, J. K.; Nole, M. K.; Chamberlain, D. B.; Jul. 28, 2000; 45p; In English

Report No.(s): DE2002-793683; UCRL-ID-139845; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Two series of MCC-1 tests were designed and conducted to describe the effects of surface finish on the corrosion behavior of titanate ceramics. These effects are important for the comparison of short-term test results from different laboratories. Test samples were prepared with 240- and 600-grit finishes. Tests, conducted for 1, 3, 7, and 14 days at 90 deg C, were carried out in Teflon vessels. Two different ceramics were used in this study: a Hf-Ce-Ce ceramic containing pyrochlore, perovskite, rutile and a small amount of a silicate phase, and a Hf-Ce-U ceramic containing pyrochlore and rutile. This study shows no detectable difference in the results of tests with ceramics finished to 240-grit and 600-grit; therefore, tests conducted at these two surface finishes can be directly compared. Due to its broader use, we recommend that short-term tests be conducted with monoliths finished to 600-grit. Comparison of data from blank tests in Teflon and stainless steel vessels shows that the background associated with Teflon vessels is lower. Therefore, we recommend that short-term tests be conducted in Teflon vessels.

NTIS

Corrosion; Surface Finishing; Titanates; Ceramics; Minerals

20020080986 Caterpillar, Inc., Peoria, IL USA

Thermal Barrier Coatings

Spinoff 1993; 1993, pp. 126; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

In order to reduce heat transfer between a hot gas heat source and a metallic engine component, a thermal insulating layer of material is placed between them. This thermal barrier coating is applied by plasma spray processing the thin films. The coating has been successfully employed in aerospace applications for many years. Lewis Research Center, a leader in the development engine components coating technology, has assisted Caterpillar, Inc. in applying ceramic thermal barrier coatings on engines. Because these large engines use heavy fuels containing vanadium, engine valve life is sharply decreased. The barrier coating controls temperatures, extends valve life and reduces operating cost. Additional applications are currently under development.

Author

Ceramic Coatings; Thermal Control Coatings; Thermal Insulation; Protective Coatings; Aerospace Engineering

20020081021 NASA Goddard Space Flight Center, Greenbelt, MD USA

Space and Atmospheric Environments

Barth, Janet L., NASA Goddard Space Flight Center, USA; [2002]; 14p; In English; 6th International Conference on Protection Materials and Structures from Space Environments, 1-3 May 2002, Toronto, Canada; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation provides information on space environments and the protection of materials and structures from their harsh conditions. Space environments are complex, and the complexity of spacecraft systems is increasing. Design accommodation must be realistic. Environmental problems can be limited at low cost relative to spacecraft cost.

Derived from text

Aerospace Environments; Aerospace Systems; Protection; Space Weathering; Earth Orbits; Radiation Damage

20020081032 NASA Goddard Space Flight Center, Greenbelt, MD USA

The CCDS Data Compression Recommendations: Development and Status

Yeh, Pen-Shu, NASA Goddard Space Flight Center, USA; Moury, Gilles, Centre National d'Etudes Spatiales, France; Armbruster, Philippe, European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; [2002]; 12p; In English; SPIE Application of Digital Image Processing, 7-10 Jul. 2002, Seattle, WA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Consultative Committee for Space Data Systems (CCSDS) has been engaging in recommending data compression standards for space applications. The first effort focused on a lossless scheme that was adopted in 1997. Since then, space missions benefiting from this recommendation range from deep space probes to near Earth observatories. The cost savings result not only from reduced onboard storage and reduced bandwidth, but also in ground archive of mission data. In many instances, this recommendation also enables more science data to be collected for added scientific value. Since 1998, the compression sub-panel of CCSDS has been investigating lossy image compression schemes and is currently working towards a common solution for a single recommendation. The recommendation will fulfill the requirements for remote sensing conducted on space platforms. Author

Data Acquisition; Data Compression; Data Systems; Ground Tests; Recommendations; Technology Utilization

20020081269 NASA Glenn Research Center, Cleveland, OH USA

In-Situ, On-Demand Lubrication System for Space Mechanisms

Marchetti, Mario, NASA Glenn Research Center, USA; Jones, William R., Jr., NASA Glenn Research Center, USA; Pepper, Stephen V., NASA Glenn Research Center, USA; Jansen, Mark J., Sest, Inc., USA; Predmore, Roamer E., NASA Goddard Space Flight Center, USA; July 2002; 20p; In English; 2002 Annual Meeting of the Society of Tribologists and Lubrication Engineers, 19-23 May 2002, Houston, TX, USA; Sponsored by Society of Tribologists and Lubrication Engineers, USA

Contract(s)/Grant(s): RTOP 274-00-00

Report No.(s): NASA/TM-2002-211706; E-13454; NAS 1.15:211706; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Many of today's spacecraft have long mission lifetimes. Whatever the lubrication method selected, the initial lubricant charge is required to last the entire mission. Fluid lubricant losses are mainly due to evaporation, tribo-degradation, and oil creep out of the tribological regions. In the past, several techniques were developed to maintain the appropriate amount of oil in the system. They were based on oil reservoirs (cartridges, impregnated porous parts), barrier films, and labyrinth seals. Nevertheless, all these systems have had limited success or have not established a proven record for space missions. The system reported here provides to the ball-race contact fresh lubricant in-situ and on demand. The lubricant is stored in a porous cartridge attached to the inner or the outer ring of a ball bearing. The oil is released by heating the cartridge to eject oil, taking advantage of the greater thermal expansion of the oil compared to the porous network. The heating may be activated by torque increases that signal the depletion of oil in the contact. The low surface tension of the oil compared to the ball bearing material is utilized and the close proximity of the cartridge to the moving balls allows the lubricant to reach the ball-race contacts. This oil resupply system can be used to avoid a mechanism failure or reduce torque to an acceptable level and extend the life of the component. Author

Ball Bearings; Lubrication Systems; Porosity; Thermal Expansion; Long Duration Space Flight; Lubricants

20020082889 NASA Glenn Research Center, Cleveland, OH USA

Relative Lifetimes of MAPLUB Greases for Space Applications

Marchetti, Mario, National Academy of Sciences - National Research Council, USA; Sicre, Jacques, Centre National d'Etudes Spatiales, France; Jones, William R., Jr., NASA Glenn Research Center, USA; September 2002; 18p; In English

Contract(s)/Grant(s): RTOP 274-00-00

Report No.(s): NASA/TM-2002-211875; NAS 1.15:211875; E-13557; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A Spiral Orbit Tribometer was employed to evaluate the tribological behavior and relative lifetimes of several commercially available greases under ultrahigh vacuum. These greases are either based on a multiply alkylated cyclopentane oil, or a perfluoropolyalkylether oil, and a thickener made of polytetrafluoroethylene (PTFE) telomer. The multiply alkylated cyclopentane (MAC) greases yielded long lifetimes, while perfluoropolyalkylether (PFPE) greases yielded short lifetimes. Author

Greases; Polytetrafluoroethylene; Technology Utilization; Tribology; Cyclic Hydrocarbons

20020082959 NASA Glenn Research Center, Cleveland, OH USA

Surface Analysis and Tools

Miyoshi, Kazuhisa, NASA Glenn Research Center, USA; August 2002; 23p; In English

Contract(s)/Grant(s): RTOP 297-60-10

Report No.(s): NASA/TM-2002-211815; NAS 1.15:211815; E-13165-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This article is a chapter of the book entitled, "Tribology of Mechanical Systems," to be published by ASME Press, New York, NY. It describes selected analytical techniques, which are being used in understanding phenomena and mechanisms of oxidation, adhesion, bonding, friction, erosion, abrasion, and wear, and in defining the problems. The primary emphasis is on microanalytical approaches to engineering surfaces.

Author

Adhesive Bonding; Microanalysis; Wear; Reaction Kinetics; Friction; Erosion; Abrasion

20020082979 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA

Polymeric Materials: Work Unit Directive (WUD) 43

Shinn, Elizabeth T.; Aug. 2002; 210p; In English

Contract(s)/Grant(s): Proj-2419

Report No.(s): AD-A405899; AFRL-ML-WP-TP-2002-400; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This final report is a bibliography of technical journal articles, presentations, patents, and reports generated by members of AFRL/MLBP and collaborators. The work was accomplished at Wright-Patterson AFB over a period of 22 years and covers such areas as structural polymers, nonlinear optical polymers, and electrically conductive polymers.

DTIC

Optical Materials; Bibliographies; Conducting Polymers

20020082993 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

Self-Assembling Nanomembranes Through Electrostatic Melt Processing of Copolymer Films ***Final Report, Oct. 2000-Oct 2001***

Wetzel, Eric D.; Beyer, Frederick L.; Aug. 2002; 30p; In English

Report No.(s): AD-A406016; ARL-TR-2800; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Polystyrene-polyisobutylene-polystyrene (SIBS) block copolymer films have been electrostatically melt processed in order to induce a preferential orientation in the material microstructure. The results show that electrostatic melt processing is inducing some change in the microstructure, but full reorientation is not being achieved. The low dielectric contrast of the SIBS blocks as well as the relatively short electrostatic processing times are the likely causes of incomplete alignment.

DTIC

Block Copolymers; Self Assembly; Melts (Crystal Growth); Polymeric Films; Membrane Structures

20020083189 Claunch and Miller, Inc., San Antonio, TX USA

Theoretical Study of Torsion Potentials in 2,2'-Dihydroxybiphenyl and 2, 2'Dihydroxy-5,5'-Dimethylbiphenyl: Modeling Torsions in Multi-Phenolic Systems ***Final Report, 1 Jul. 1995-30 Jun. 1999***

Wagner-Brown, Katrina B.; Ferris, Kim; Jun. 2002; 32p; In English

Contract(s)/Grant(s): F41622-96-D-0008; DAMD17-94-C-4069; AF Proj. 7757

Report No.(s): AD-A405882; AFRL-HE-BR-TR-2002-0128; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Using ab initio (6-31G(*)) and semiempirical (AM1, PM3) electronic structure calculations and force field (MM3) determinations, we have analyzed the molecular structure of 2,2'-dihydroxybiphenyl (BP), 2,2-dihydroxy-5,5'-dimethylbiphenyl (MBP), and 2,5-di(2-hydroxphenyl) phenol (TP). In both BP and MBP systems, there exist three predominant conformations for which the orientations of the of the hydroxyl groups are the distinguishing characteristic. Each method used determined that the optimized geometry of the cis structure was the overall lowest energy conformation. The phenyl groups in the systems show significant twist angles, psi, (42 - 55 degrees), depending upon the hydroxyl group orientation. We have examined the energy of the BP and MBP systems as a function of torsion angle using each of the methods described above. Each of the methods of calculation predicts, for all three conformations, a 10 - 12 kcal/mol barrier to the coplanar torsion angle. The 6-31G(*) calculations predict a total of five energy minima for the three conformations, with no 90 deg barrier in the cis structure. The appearance and size of a 90 deg barrier, as well as the torsion angle for the minimum energy geometry, is dependent upon the theoretical method

used. Examination of 2,5-di(2-hydroxyphenyl) phenol (TP) as a model for oligometric systems finds that pairwise interactions as demonstrated in BP and MBP dominate the relative energetic of their conformations.
DTIC
Torsion; Molecular Dynamics; Phenyls

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

20020080801 Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA USA
Assessment of Conventionally Recoverable Hydrocarbon Resources of the Gulf of Mexico and Atlantic Outer Continental Shelf as of January 1, 1999 (2000)
Lore, G. L.; Marin, D. A.; Batchelder, E. C.; Courtwright, W. C.; Desselles, R. P.; Oct. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-100326; OCS/MMS-2001/087; No Copyright; Avail: National Technical Information Service (NTIS)

This report presents the results of the 2000 assessment of the conventionally recoverable hydrocarbon resources for the northern Gulf of Mexico and U.S. Atlantic Outer Continental Shelf (OCS). Conventionally recoverable resources are hydrocarbons potentially amenable to conventional production regardless of the size, accessibility, and economics of the accumulations assessed. The OCS comprises the portion of the seabed of the USA whose mineral estate is subject to Federal jurisdiction. The Minerals Management Service (MMS) and the U.S. Geological Survey have previously completed several assessments of the undiscovered conventionally recoverable oil and gas resources of the USA OCS. This 2000 assessment considered data and information available as of January 1, 1999.
NTIS
Reserves; Oil Fields; Gulf of Mexico; Atlantic Ocean

20020080873 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden
Size Reduction of Propellents and Plastic-Bonded Explosives ***Finfoerdelning av Krut och Plastbundna Spraengaemnen***
Carlsson, T.; Dyhr, K.; Nov. 2001; 26p; In Swedish
Report No.(s): PB2002-107197; FOI-R-0248-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Due to armed forces' excess of ammunition today, large amounts of ammunition are sent to disposal. Valuable components e.g. metals and explosives, are recycled for civil applications. The recycle processes are not closed processes however, and generates industrial waste just like any conventional process. The difference is that this waste often is contaminated with explosives. Therefore it cannot be sent to a conventional waste incineration plant, but has to be disposed of on site. Today, this is achieved by open burning, hence resulting in uncontrolled emissions of air pollutants. The goal is to develop a process for closed burning to enable cleaning of the exhaust gases. In order to achieve this, the size of the explosive contaminated waste has to be reduced. In this report grinding tests with several different equipments are presented, along with their pros and cons. The results show that most materials can be size reduced if the right equipment is used. In the tests where explosive materials were size reduced, no sign of explosion was detected. Before the method is put in operation the risks have to be assessed. All size reduction should be carried out in a remotely controlled space to avoid any injuries in case on an accidental explosion.
NTIS
Ammunition; Plastic Propellants; Grinding (Material Removal); Size Separation; Industrial Wastes

20020080972 Wilcox (Ken) Associates, Inc., Grain Valley, MO USA
Standard Test Procedures for Evaluating Leak Detection Methods: Vapor-phase Out-of-tank Product Detectors
Mar. 1990; 96p; In English
Report No.(s): PB2002-109227; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Environmental Protection Agency's (EPA's) regulations for underground storage tanks require owners and operators to check for leaks on a routine basis using one of a number of detection methods (40 CFR Part 280, Subpart D). In order to ensure the effectiveness of these methods, EPA set minimum performance standards for equipment used to comply with the regulations.

It is up to tank owners and operators to select a method of leak detection that has been shown to meet the relevant performance standard.
NTIS
Underground Storage; Storage Tanks; Leakage; Fault Detection

20020080974 Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC USA
Musts for USTs: A Summary of Federal Regulations for Underground Storage Tank Systems
Jul. 1995; 42p; In English
Report No.(s): PB2002-109178; EPA/510/K-95/002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Contents include the following: What Are These Regulations About; Tables Showing Basic UST Requirements and Deadlines; What Do New Petroleum USTs Need; What Do Existing Petroleum USTs Need; What Do You Do About UST Releases; How Do You Close USTs; What Do You Need to Report; What Records Must You Keep; For Hazardous Substance USTs Only; Industry Codes and Standards; Organizations To Contact For UST Information; Publications and Videos About USTs; State Contacts For UST Information
NTIS
Regulations; Underground Storage; Storage Tanks

20020082994 United Technologies Research Center, East Hartford, CT USA
Endothermic Heat-Sink of Hydrocarbon Fuels for Scramjet Cooling AIAA 2002-3871
Huang, H.; Sobel, D. R.; Spadaccini, L. J.; Jul. 2002; 9p; In English
Contract(s)/Grant(s): F33615-97-D-2784; Proj-3048
Report No.(s): AD-A406019; AFRL-PR-WP-TP-2002-202; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Storable liquid hydrocarbon fuels, such as JP-7, JP-8+ 100, and JP-10, that can undergo endothermic reactions may provide sufficient heat sink to enable hypersonic flight without having to resort to cryogenic fuels. The objective of this research is to develop and demonstrate the endothermic potential of these fuels for hypersonic scramjet cooling. A high pressure bench-scale reactor was used to determine the overall heat sinks (including endotherm), endothermic reforming products, and coking rates for the fuels. A baseline fuel, n-octane, was also investigated for comparison. Tests were conducted in catalyst-coated tubes that simulate a single passage in a practical catalytic heat exchanger/ reactor under representative flow conditions.
DTIC
Hydrocarbons; Jet Engine Fuels; Endothermic Reactions

20020083007 Air Force Research Lab., Edwards AFB, CA USA
Green Propulsion - A USAF Overview
Hawkins, Tom; Aug. 2002; 30p; In English
Report No.(s): AD-A405749; AFRL-PR-ED-VG-2002-209; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract.
Author
Solid Rocket Propellants; Propulsion

20020083010 Schafer Corp., Calabasas, CA USA
Pressure Effects on Hydrogen Peroxide Decomposition Temperature
Walsh, Raymond F.; Sutton, Alan M.; Aug. 2002; 15p; In English
Contract(s)/Grant(s): F04611-02-C-0004
Report No.(s): AD-A405753; AFRL-PR-ED-TP-2002-203; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The use of very high concentration hydrogen peroxide (e.g., 98%) in rocket engines yields substantial specific impulse (Isp) gains when compared with traditional 90% peroxide engine systems. However, when used in pump-fed engines, 98% peroxide places a significant design burden on the turbine from a material strength and oxygen compatibility standpoint. The decomposition temperature for 98% peroxide is ^1240 K (^2230 R), a temperature regime in which most alloys show a precipitous decline in strength. Thus, accurate prediction of gas generator catalytic bed outlet temperature is necessary for confident life and structural margin assessment. Analytical computations of maximum decomposition temperature at low pressures should be quite accurate using industry equilibrium chemistry codes such as the NASA/Lewis CEA computer program. Reported historical articles predict that ^50 K (^90 R) increase in temperature due to real gas effects could be expected at pressures of 20.7 Mpa (3000 psi a) for 100% peroxide. A new analysis was performed to assess the validity of those estimates. The present calculations were made; (1) using recent water and oxygen real gas properties with two classical mixing rules, and (2) using two equation-of-state methods with

associated mixing rules. The new results indicate a real gas temperature effect of ^13 K (^23 R) at 20.7 Mpa (3000 psia). This smaller temperature increase should result in more manageable turbine design uncertainties.
DTIC
Oxidizers; Liquid Propellant Rocket Engines; Thermal Stresses; Temperature Effects; Pressure Effects

20020083095 United Technologies Research Center, East Hartford, CT USA
On-Line Fuel Deoxygenation for Coke Suppression ASME GT-2002-30071
Spadaccini, Louis J.; Huang, He; Jun. 2002; 9p; In English
Contract(s)/Grant(s): F33615-97-D-2784; Proj-3048
Report No.(s): AD-A406131; AFRL-PR-WP-TP-2002-201; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Fuel deoxygenation is being developed as a means for suppressing autoxidative coke formation in aircraft fuel systems, thereby increasing the exploitable cooling capacity of the fuel, enabling major increases in engine operating temperature and cycle efficiency. Reduced maintenance is an added benefit. A prototype membrane filter module for on-line removal of dissolved oxygen, which would otherwise react to form coke precursors, was constructed and successfully demonstrated. The fuel flows over the membrane, while oxygen diffuses through it at a rate that is proportional to the difference in oxygen partial pressures across the surface. Tests were conducted over a range of fuel flow rates (residence times) and temperatures. The filter was operated with air-saturated jet fuel for several hours at a steady-state condition, verifying the capability to remove essentially all of the dissolved oxygen (to less than 1 ppm) and proving the viability of the concept.
DTIC
Coke; Deoxygenation; Flow Velocity; Fuel Flow; Aircraft Fuel Systems

20020083322 Johns Hopkins Univ., Chemical Propulsion Information Agency, Columbia, MD USA
Evaluation of Methods for Solid Propellant Burning Rate Measurement
Fry, R. S.; DeLuca, L.; Frederick, R.; Gadiot, G.; Strecker, R.; Jan. 2002; 22p; In English
Report No.(s): AD-A405711; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NATO Research and Technology Organization (RTO), Advanced Vehicle Technology (AVI), Working Group (WG) 016 (formerly AGARD/PEP Working Group (27) undertook to evaluate methods in use within the NATO propulsion community to measure burning rate in solid propellant rocket systems, with the purpose of identifying similarities and differences between the participating nations. This WG was formed in 1996, consisting of active representatives from 6 of the 15 member nations of NATO, with inputs accepted from 4 other member nations and a couple non-member nations. The NATO RTO/AVT WG 016 sought to contribute to improvements in the burning rate tools to address issues that have plagued the solid propulsion industry for over 40 years. This paper reviews the final results of this study by summarizing the objectives, approach, findings, and recommendations of this working group based on activity from October 1997 to March 2001. Recommendations are reviewed on direct and non-intrusive burning rate measurement methods, data analysis, and performance scaling to support improved prediction of internal ballistics of a full-scale solid propellant motor. AVT WG 016 activities have identified that manufacturer burning rate data may not easily be compared without accounting for industry-wide differences in subscale devices, test methods and scaling analysis methods. The WG recommends the NATO propulsion community review these findings as a means of advancing their own burning rate measurement and analysis methods.
DTIC
Burning Rate; Nonintrusive Measurement; Solid Propellant Rocket Engines; Propulsion

20020083347 Thiokol Propulsion, Brigham City, UT USA
Furazan-Based Energetic Ingredients
Cannizzo, Louis F.; Hamilton, R. S.; Highsmith, Thomas K.; Sanderson, Andrew J.; Nov. 01, 1999; 13p; In English
Contract(s)/Grant(s): F04611-96-C-0005
Report No.(s): AD-A405840; AFRL-PR-ED-TP-1999-0207; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of furazan-based energetic materials derived from 3 ,4-diaminofurazan (DAF) were synthesized and characterized. These compounds included diaminoazoxyfurazan (DAAOF), diaminoazofurazan (DAAF), dinitroazoxyfurazan (DNAF), aminonitrofurazan (ANF), dinitrobisfurazanopyrazine (PIPER), and tetrazoxytetrafurazan (TATFO). Characterization testing included small scale safety testing (impact, friction, ESD, thermal stability), DSC analysis, vacuum thermal stability (VTS), and ingredient compatibility (by DSC). Results from these tests indicated that most of the materials have excellent thermal stability, as determined by DSC analysis. However, the small scale safety properties and ingredient compatibilities of most of these

materials with standard propellant ingredients were found to be unsuitable for an acceptable propellant ingredient. The most promising furazan-based material investigated was DAAOF, based upon the above criteria.
DTIC
Thermal Stability; Solid Rocket Propellants; Stability Tests

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SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see 84 Law, Political Science and Space Policy.

20020081329 NASA Glenn Research Center, Cleveland, OH USA
The FCF Combustion Integrated Rack: Microgravity Combustion Science Onboard the International Space Station
OMalley, Terence F., NASA Glenn Research Center, USA; Weiland, Karen J., NASA Glenn Research Center, USA; September 2002; 18p; In English; International Space Station Utilization 2001, 15-18 Oct. 2001, Cape Canaveral, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 398-20-0C
Report No.(s): NASA/TM-2002-210981; NAS 1.15:210981; E-12893; AIAA Paper 2001-4927; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Combustion Integrated Rack (CIR) is one of three facility payload racks being developed for the International Space Station (ISS) Fluids and Combustion Facility (FCF). Most microgravity combustion experiments will be performed onboard the Space Station in the Combustion Integrated Rack. Experiment-specific equipment will be installed on orbit in the CIR to customize it to perform many different scientific experiments during the ten or more years that it will operate on orbit. This paper provides an overview of the CIR, including a description of its preliminary design and planned accommodations for microgravity combustion science experiments, and descriptions of the combustion science experiments currently planned for the CIR.
Author
Combustion Chambers; Microgravity; Gravitational Effects

20020082965 NASA Goddard Space Flight Center, Greenbelt, MD USA
Microgravity: Molecular Dynamics Simulations at the NCCS Probe the Behavior of Liquids in Low Gravity
1999 NCCS Highlights; July 2002, pp. 58-63; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The life of the very small, whether in something as complicated as a human cell or as simple as a drop of water, is of fundamental scientific interest: by knowing how a tiny amount of material reacts to changes in its environment, scientists maybe able to answer questions about how a bulk of material would react to comparable changes. NASA is in the forefront of computational research into a broad range of basic scientific questions about fluid dynamics and the nature of liquid boundary instability. For example, one important issue for the space program is how drops of water and other materials will behave in the low-gravity environment of space and how the low gravity will affect the transport and containment of these materials. Accurate prediction of this behavior is among the aims of a set of molecular dynamics experiments carried out on the NCCSs Cray supercomputers. In conventional computational studies of materials, matter is treated as continuous - a macroscopic whole without regard to its molecular parts - and the behavior patterns of the matter in various physical environments are studied using well-established differential equations and mathematical parameters based on physical properties such as compressibility density, heat capacity, and vapor pressure of the bulk material.
Derived from text
Compressibility; Differential Equations; Fluid Dynamics; Microgravity; Molecular Dynamics; Specific Heat

31
ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see categories 32 through 39.

20020080772
Project implementation plan: ASTD remote deployment
Crass, D. W.; Aug. 18, 1999; 37p; In English
Report No.(s): DE2002-797747; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This document is the project implementation plan for the ASTD Remote Deployment Project. The Plan identifies the roles and responsibilities for the project and defines the integration between the ASTD Project and the B-Cell Cleanout Project.
NTIS
Radioactive Wastes; Project Planning; Environmental Cleanup

20020080809 NASA Goddard Space Flight Center, Greenbelt, MD USA
Progress in the Development of a Continuous Adiabatic Demagnetization Refrigerator
Shirron, Peter, NASA Goddard Space Flight Center, USA; Canavan, Edgar, NASA Goddard Space Flight Center, USA; DiPirro, Michael, NASA Goddard Space Flight Center, USA; Jackson, Michael, NASA Goddard Space Flight Center, USA; King, Todd, NASA Goddard Space Flight Center, USA; Tuttle, James, NASA Goddard Space Flight Center, USA; Jun. 03, 2002; 8p; In English; 12th International Cryocooler Conference, 18-20 Jun. 2002, Cambridge, MA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
We report on recent progress in the development of a continuous adiabatic demagnetization refrigerator (CADR). Continuous operation avoids the constraints of long hold times and short recycle times that lead to the generally large mass of single-shot ADRs, allowing us to achieve an order of magnitude larger cooling power per unit mass. Our current design goal is 10 micro W of cooling at 50 mK using a 6-10 K heat sink. The estimated mass is less than 10 kg, including magnetic shielding of each stage. The relatively high heat rejection capability allows it to operate with a mechanical cryocooler as part of a cryogen-free, low temperature cooling system. This has the advantages of long mission life and reduced complexity and cost. We have assembled a three-stage CADR and have demonstrated continuous cooling using a superfluid helium bath as the heat sink. The temperature stability is 8 micro K rms or better over the entire cycle, and the cooling power is 2.5 micro W at 60 mK rising to 10 micro W at 100 mK.
Author
Fabrication; Adiabatic Conditions; Coolers; Cryogenic Cooling; Demagnetization; Magnetic Cooling; Refrigerators; Thermal Stability

20020080825 General Accounting Office, Washington, DC USA
Intellectual Property: Information on the U.S. Patent and Trademark Office's Past and Future Operations
Aug. 2002; 40p; In English
Report No.(s): PB2002-109158; GAO-02-907; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
At the request of Congress, this report examines the USA Patent and Trademark Office's (USPTO) past and future operations, particularly patent applications filed, patents granted, patent application inventory, patent pendency, patent examiner staffing, and fee collections and funding requirements (agency appropriations); (2) some of the differences between USPTOs Business and Strategic Plans; and (3) changes in the patent fee structure under proposed legislation. The results are summarized in this report.
NTIS
Intellectual Property; Patents; Law (Jurisprudence); Appropriations

20020080839 NASA Goddard Space Flight Center, Greenbelt, MD USA
Operation of A Sunpower M87 Cryocooler In A Magnetic Field
Breon, S. R., NASA Goddard Space Flight Center, USA; Shirey, K. A., NASA Goddard Space Flight Center, USA; Banks, I. S., NASA Goddard Space Flight Center, USA; Warner, B. A., NASA Goddard Space Flight Center, USA; Boyle, R. F., NASA Goddard Space Flight Center, USA; Mustafi, S., NASA Goddard Space Flight Center, USA; [2002]; 10p; In English; 12th International Cryocooler Conference, 17-20 Jun. 2002, Cambridge, MA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The Alpha Magnetic Spectrometer-02 (AMS-02) is an experiment that will be flown as an attached payload on the International Space Station to detect dark matter and antimatter. It uses large superconducting magnets cooled with superfluid

helium to bend the path of cosmic particles through a series of detectors, which then measure the mass, speed, charge, and direction of the particles. Four Sunpower M87N Stirling-cycle cryocoolers are used to extend the mission life by cooling the outer vapor-cooled shield of the dewar. The main magnet coils are separated by a distance of approximately 1 m and the coolers are located approximately 1.5 m from the center line of the magnet, where the field is as high as 925 gauss perpendicular to the cryocooler axis and 400 gauss along the cryocooler axis. Interactions between the applied magnetic field and the linear motor may result in additional forces and torques on the compressor piston. Motion of the compressor arid displacer pistons through the magnetic field spatial gradients will generate eddy currents. Additional eddy currents are created during magnet charge, discharge, and quench by the time-varying magnetic field. The results of tests to determine the magnitude of the forces, torques, and heating effects, as well as the need for additional magnetic shielding, are presented.
Author
Cryogenic Cooling; Magnetic Fields; Payloads; Dark Matter; Antimatter; Superconducting Magnets

20020080935 Performance Extremes Research and Development, Norman, OK USA
Motorcycle Parts
1993 Spinoff; 1993, pp. 94-95; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

An article in NASA Tech Briefs describing a vacuum bagging process for forming composite parts helped a small Oklahoma Company to improve its manufacturing process. President of Performance Extremes, Larry Ortega, and his partners make motorcycle parts from carbon/epoxy to reduce weight. Using vacuum bags, parts have a better surface and fewer voids inside. When heat used in the vacuum bag process caused deformation upon cooling, a solution found in another tech brief solved the problem. A metal plate inside the vacuum bag made for more even heat transfer. A third article described a simple procedure for repairing loose connector pins, which the company has also utilized.
Author
Manufacturing; Motor Vehicles; Engine Parts; Maintenance

20020080939 Tropic-Kool Engineering Corp., Largo, FL USA
Heat Pipe Systems
Spinoff 1993; 1993, pp. 76-77; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The heat pipe was developed to alternately cool and heat without using energy or any moving parts. It enables non-rotating spacecraft to maintain a constant temperature when the surface exposed to the Sun is excessively hot and the non Sun-facing side is very cold. Several organizations, such as Tropic-Kool Engineering Corporation, joined NASA in a subsequent program to refine and commercialize the technology. Heat pipes have been installed in fast food restaurants in areas where humid conditions cause materials to deteriorate quickly. Moisture removal was increased by 30 percent in a Clearwater, FL Burger King after heat pipes were installed. Relative humidity and power consumption were also reduced significantly. Similar results were recorded by Taco Bell, which now specifies heat pipe systems in new restaurants in the Southeast.
Author
Heat Pipes; Heating Equipment; Cooling Systems; Electronic Equipment

20020080949 United Technologies Corp., Huntsville, AL USA
Robots for Aircraft Maintenance
Spinoff 1993; 1993, pp. 84-87; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Marshall Space Flight Center charged USBI (now Pratt & Whitney) with the task of developing an advanced stripping system based on hydroblasting to strip paint and thermal protection material from Space Shuttle solid rocket boosters. A robot, mounted on a transportable platform, controls the waterjet angle, water pressure and flow rate. This technology, now known as ARMS, has found commercial applications in the removal of coatings from jet engine components. The system is significantly faster than manual procedures and uses only minimal labor. Because the amount of ”substrate” lost is minimal, the life of the component is extended. The need for toxic chemicals is reduced, as is waste disposal and human protection equipment. Users of the ARMS work cell include Delta Air Lines and the Air Force, which later contracted with USBI for development of a Large Aircraft Paint Stripping system (LARPS). LARPS’ advantages are similar to ARMS, and it has enormous potential in military and civil aircraft

maintenance. The technology may also be adapted to aircraft painting, aircraft inspection techniques and paint stripping of large objects like ships and railcars.
Author
Aircraft Maintenance; Civil Aviation; Robots; Automatic Control; Jet Engines

20020081035 NASA Goddard Space Flight Center, Greenbelt, MD USA
Final Qualification and Early On-Orbit Performance of the HESSI Cryocooler
Boyle, R. F., NASA Goddard Space Flight Center, USA; Banks, I. S., NASA Goddard Space Flight Center, USA; Shirey, K., NASA Goddard Space Flight Center, USA; June 2002; 6p; In English; Cryogenic Engineering Conference, 27 Jul. 2001, Madison, WI, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The High Energy Solar Spectroscopic Imager (HESSI) spacecraft was launched on February 5, 2002. It now observes the Sun with the finest angular and energy resolutions ever achieved from a few keV to hundreds of keV, using an array of nine germanium detectors operating at 75K. The spacecraft was originally scheduled for launch in July 2000, but a vibration facility mishap damaged the primary structure of the spacecraft, along with the cryocooler, This paper describes issues in the qualification of a replacement for the original flight cooler, and describes early on-orbit performance.
Author
Cryogenic Cooling; Vibration; Germanium; Angular Resolution; Coolers

20020081247 NASA Glenn Research Center, Cleveland, OH USA
Multidisciplinary Analysis of a Microsystem Device for Thermal Control
Moran, Matthew E., NASA Glenn Research Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 173-186; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A microelectromechanical (MEMS) device is under development that uses the Stirling cycle to provide cooling or heating directly to a thermally loaded surface. This MEMS cooler can be used strictly in the cooling mode, or switched between cooling and heating modes in milliseconds for precise temporal and spatial temperature control. Potential applications include cooling and thermal control of: microsystems, electronics, sensors, biomedical devices, and spacecraft components. A primary challenge for further development is the multidisciplinary analysis required to characterize and optimize its performance. This paper describes the first-order thermodynamic analysis performed on the MEMS cooler and the resulting ideal performance curves generated. The basis for additional coupled analyses such as fluid/gas dynamics, thermal, electrostatic, structural, dynamic, material, and processing is addressed. Scaling issues relevant to the device and the breakdown of continuum theory in the micro-domain is also examined.
Author
Microelectromechanical Systems; Stirling Cycle; Temperature Control; Multidisciplinary Design Optimization; Cooling Systems

20020081281 NASA Goddard Space Flight Center, Greenbelt, MD USA
Space Flight Qualification Program for the AMS-2 Commercial Cryocoolers
Shirey, K. A., NASA Goddard Space Flight Center, USA; Banks, I. S., NASA Goddard Space Flight Center, USA; Breon, S. R., NASA Goddard Space Flight Center, USA; Boyle, R. F., NASA Goddard Space Flight Center, USA; June 2002; 7p; In English; 12th International Cryocooler Conference (ICC-12), 18-20 Jun. 2002, Cambridge, MA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Alpha Magnetic Spectrometer-02 (AMS-02) experiment is a state-of-the-art particle physics detector containing a large superfluid helium-cooled superconducting magnet. Highly sensitive detector plates inside the magnet measure a particle's speed, momentum, charge, and path. The AMS-02 experiment will study the properties and origin of cosmic particles and nuclei including antimatter and dark matter. AMS-02 will be installed on the International Space Station on Utilization Flight-4. The experiment will be run for at least three years. to extend the life of the stored cryogen and minimize temperature gradients around the magnet, four Stirling-cycle Sunpower M87N cryocoolers will be integrated with AMS-02. The cryocooler cold tip will be connected via a flexible strap to the outer vapor cooled shield of the dewar. Initial thermal analysis shows the lifetime of the experiment is increased by a factor of 2.8 with the use of the cryocooler. The AMS-02 project selected the Sunpower M87 cryocoolers and has asked NASA Goddard to qualify the cryocoolers for space flight use. This paper describes the interfaces with the cryocoolers and presents data collected during testing of the two engineering model cryocoolers. Tests include thermal performance characterization and launch vibration testing. Magnetic field compatibility testing will be presented in a separate paper at the conference.
Author
Alpha Magnetic Spectrometer; Cryogenic Cooling; Space Flight; Particle Theory; Detectors

20020081291 NASA Glenn Research Center, Cleveland, OH USA

Baseline Testing of the EV Global E-Bike With Asymmetric Ultracapacitors

Eichenberg, Dennis J., NASA Glenn Research Center, USA; July 2002; 2p; In English

Contract(s)/Grant(s): RTOP 251-30-07

Report No.(s): NASA/TM-2002-211792; E-13487; NAS 1.15:211792; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The NASA John H. Glenn Research Center initiated baseline testing of the EV Global E-Bike with asymmetric ultracapacitors as a way to reduce pollution in urban areas, reduce fossil fuel consumption and reduce operating costs for transportation systems. The E-Bike provides an inexpensive approach to advance the state of the art in hybrid technology in a practical application. The project transfers space technology to terrestrial use via nontraditional partners and provides power system data valuable for future space applications. The work was done under the Hybrid Power Management (HPM) Program, which includes the Hybrid Electric Transit Bus (HETB). The E-Bike is a state of the art, ground up, hybrid electric bicycle. Unique features of the vehicle's power system include the use of an efficient, 400 watt, electric hub motor and a 7-speed derailleur system that permits operation as fully electric, fully pedal, or a combination of the two. Other innovative features, such as regenerative braking through ultracapacitor energy storage, are planned. Regenerative braking recovers much of the kinetic energy of the vehicle during deceleration. The E-bike has previously been tested with the standard battery energy storage system. a symmetric ultracapacitor energy storage system, and a combination battery and symmetric ultracapacitor energy storage system. The focus of this report is the test results of the E-bike with asymmetric ultracapacitor energy storage and comparison to the other energy storage systems. The report concludes that the E-Bike provides excellent performance and that the implementation of asymmetric ultracapacitors in the power system can provide significant performance improvements.

Author

Electric Hybrid Vehicles; Motor Vehicles; Electric Motors; Performance Tests; Capacitors; Energy Storage

20020082894 NASA Glenn Research Center, Cleveland, OH USA

Direct Optimal Control of Duffing Dynamics

Oz, Hayrani, Ohio State Univ., USA; Ramsey, John K., NASA Glenn Research Center, USA; September 2002; 20p; In English

Contract(s)/Grant(s): RTOP 297-10-00

Report No.(s): NASA/TM-2002-211582; E-13366; NAS 1.15:211582; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The "direct control method" is a novel concept that is an attractive alternative and competitor to the differential-equation-based methods. The direct method is equally well applicable to nonlinear, linear, time-varying, and time-invariant systems. For all such systems, the method yields explicit closed-form control laws based on minimization of a quadratic control performance measure. We present an application of the direct method to the dynamics and optimal control of the Duffing system where the control performance measure is not restricted to a quadratic form and hence may include a quartic energy term. The results we present in this report also constitute further generalizations of our earlier work in "direct optimal control methodology." The approach is demonstrated for the optimal control of the Duffing equation with a softening nonlinear stiffness.

Author

Nonlinearity; Time Functions; Duffing Differential Equation; Dynamic Control; Optimization; Softening

20020082990 Naval Postgraduate School, Monterey, CA USA

Performance Measurement of a Mini Thermoacoustic Refrigerator and Associated Drivers

Petrina, Denys; Jun. 2002; 59p; In English; Original contains color images

Report No.(s): AD-A405975; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A miniature Thermoacoustic refrigerator is being developed to cool integrated circuits, which must sometimes operate at high temperatures nearing the upper threshold of their tolerance, to temperature spans more within the circuits' tolerable limits, without the need of the chemicals of a traditional refrigerating system. The development of an electrically powered acoustic driver that powers the thermoacoustic refrigerator is described, as well as different schemes to improve its delivered acoustic power. The driver utilizes a flexural trilaminar piezoelectric disk to generate one to two Watts of acoustic power at 4 kHz in 15 bar of He-Kr gas mixture. Two different drivers are tested on a pressurized test resonator, and their quantitative performance is analyzed. The analysis of the drivers' performance indicates one power-improvement scheme may be faulty, while data taken before the second broke indicates its design may be beneficial to power-improvement. Tests are also conducted using a refrigerating resonator; these first attempts to meet design criteria of temperature span and cooling power are unsuccessful, but the results obtained, including

a thermodynamic coefficient of performance (COP) 13.1% below the modeled ideal value for the given data set, with less than ideal acoustic power delivered to the resonator signal suggest continued research is worthwhile.
DTIC
Integrated Circuits; Cooling; Refrigerating; Thermoacoustic Refrigerators

20020083221 Purdue Univ., Research Foundation, West Lafayette, IN USA
Development of a Carbon Dioxide-Based Field Deployable Environmental Control Unit to Replace HCFC-22 or HFC-134a Units ***Final Report, 2 Mar. 2000-31 Mar 2002***
Baek, Joo S.; Groll, Eckhard A.; Lawless, Patrick B.; Mar. 31, 2002; 242p; In English
Contract(s)/Grant(s): F08637-00-C-6001
Report No.(s): AD-A405917; HL-2002-10; AFRL-ML-TY-TR-2002-4549; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This document reports on the design, construction, and testing of a piston-cylinder type expansion device with output work (ED-WOW) to be used in a transcritical carbon dioxide air conditioning system that is intended to replace R-22-based or R-134a-based Field Deployable Environmental Control Units (FDECUs) . The ED-WOW is based on a highly modified small four-cycle, two-piston engine with a displacement of 2 x 13.26 cu cm that is commercially available. The ED-WOW replaced the expansion valve in an experimental transcritical CO2 cycle and increased the system performance by up to 10%. In addition, this document reports on the development of simulation models for the ED-WOW as well as for the transcritical CO2 cycle. The ED-WOW model was used to verify the proper operation of the device in the prototype application and to identify the major losses of the device. The model can be used to re-design the next generation ED-WOW. The cycle model was used to predict the performance of several modifications to the transcritical CO2 cycle and identify which modification is most suitable for implementation in a carbon dioxide-based FDECU.
DTIC
Thermodynamic Cycles; Air Conditioning Equipment

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 Space Communications, Spacecraft Communications, Command and Tracking; for search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

20020080731 Lockheed Martin Corp., Hampton, VA USA
Investigation of RF Emissions From Wireless Networks as a Threat to Avionic Systems
Salud, Maria Theresa P., Lockheed Martin Corp., USA; October 2002; 24p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-00135; RTOP 722-64-10-53
Report No.(s): NASA/CR-2002-211941; NAS 1.26:211941; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper focuses on understanding and obtaining preliminary measurements of radiated field (RF) emissions of laptop/wireless local area network (WLAN) systems. This work is part of a larger research project to measure radiated emissions of wireless devices to provide a better understanding for potential interference with crucial aircraft avionics systems. A reverberation chamber data collection process is included, as well as recommendations for additional tests. Analysis of measurements from devices under test (DUTs) proved inconclusive for addressing potential interference issues. Continued effort is expected to result in a complete easily reproducible test protocol. The data and protocol presented here are considered preliminary.
Author
Local Area Networks; Wireless Communication; Radio Frequencies; Field Emission

20020080779 NASA Goddard Space Flight Center, Greenbelt, MD USA
On-Orbit Performance Verification and End-to-End Characterization of the TDRS-H Ka-band Communications Payload
Toral, Marco, NASA Goddard Space Flight Center, USA; Wesdock, John, ITT Industries, Inc., USA; Kassa, Abby, ITT Industries, Inc., USA; Pogorelc, Patsy, ITT Industries, Inc., USA; [2002]; 1p; In English; Eighth Ka-Band Utilization Conference, 25-26 Sep. 2002, Baveno/Stresa-Lake Maggiore, Italy
Contract(s)/Grant(s): NASA Order S-87070-Y; No Copyright; Avail: Issuing Activity; Abstract Only

In June 2000, NASA launched the first of three next generation Tracking and Data Relay Satellites (TDRS-H) equipped with a Ka-band forward and return service capability. This Ka-band service supports forward data rates of up to 25 Mb/sec using the 22.55-23.55 GHz space-to-space allocation. Return services are supported via channel bandwidths of 225 and 650 MHz for data rates up to at least 800 Mb/sec using the 25.25 - 27.5 GHz space-to-space allocation. As part of NASA's acceptance of the TDRS-H spacecraft, an extensive on-orbit calibration, verification and characterization effort was performed to ensure that on-orbit spacecraft performance is within specified limits. This process verified the compliance of the Ka-band communications payload with all performance specifications, and demonstrated an end-to-end Ka-band service capability. This paper summarizes the results of the TDRS-H Ka-band communications payload on-orbit performance verification and end-to-end service characterization. Performance parameters addressed include antenna gain pattern, antenna Gain-to-System Noise Temperature (G/T), Effective Isotropically Radiated Power (EIRP), antenna pointing accuracy, frequency tunability, channel magnitude response, and Ka-band service Bit-Error-Rate (BER) performance.
Author
Bandwidth; Extremely High Frequencies; Radio Communication; TDR Satellites; Spacecraft Performance; Onboard Equipment; Payloads

20020080787 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Radar Seekers for Air Targets: Research Issues ***Radarmalsoekare mot Luftmal Forskningsfragor***
Kjellgren, J.; Sume, A.; Dec. 2001; 26p; In Swedish
Report No.(s): PB2002-107204; FOI-R-0293-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The report contains a proposal for a collected research effort concerning radar seekers for air targets, especially at medium to long distance, an area with no substantial Swedish activity for some time. The aim is to develop better methods for target state determination by joining competence at the FOI (Swedish Defense Research Agency) in theoretical analysis, measurement, simulation and verification, with foreseen collaboration with Swedish universities and industry. The report contains a short overview of relevant system aspects, with some references to unclassified seeker related ongoing research within and outside the FOI.
NTIS
Radar Tracking; Targets; Homing Devices

20020080793 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands
Reconstruction of Media Posed as an Optimization Problem
vandenBerg, P. M.; Nov. 1998; 56p; In English
Report No.(s): PB2002-106868; ET/EM-1998-26; Copyright; Avail: National Technical Information Service (NTIS)
A central problem in target identification, non-destructive testing, medical imaging and numerous other areas of application concerns the determination of the shape, location and constitutive parameters, such as complex index of refraction or local sound speed, of a local inhomogeneity from measurements of the scattered field when a monochromatic wave is incident upon the inhomogeneity. One class of methods of attacking this problem is based on minimizing the discrepancy between the measured data and predicted data as a function of the desired parameters. In the lectures we discuss, within a unified framework a number of such algorithms, including Born, extended Born, distorted Born, Newton-Kantorovich, gradient and modified gradient algorithms for index of refraction reconstruction from scattered field data from multiple sources at a single frequency. All of these approaches are based on domain integral representations of the scattered field. Further, it is shown that when a priori information, that the inhomogeneity is highly dissipative, is incorporated into the modified gradient algorithm, it successfully reconstructs the shape and location of impenetrable scatterers.
NTIS
Optimization; Scattering Cross Sections; Electromagnetic Radiation

20020080795 NASA Goddard Space Flight Center, Greenbelt, MD USA
On-Orbit Performance Verification and End-to-End Characterization of the TDRS-H Ka-Band Communications Payload
Toral, Marco, NASA Goddard Space Flight Center, USA; Wesdock, John, ITT Industries, Inc., USA; Kassa, Abby, ITT Industries, Inc., USA; Pogorelc, Patsy, ITT Industries, Inc., USA; [2002]; 8p; In English; Eighth Ka-Band Utilization Conference, 25-27 Sep. 2002, Baveno-Stresa-Lake Maggiore, Italy
Contract(s)/Grant(s): NASA Order S-87070-Y; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In June 2000, NASA launched the first of three next generation Tracking and Data Relay Satellites (TDRS-H) equipped with a Ka-band forward and return service capability. This Ka-band service supports forward data rates up to 25 Mb/sec using the 22.55

- 23.55 GHz space-to-space allocation. Return services are supported via channel bandwidths of 225 and 650 MHz for data rates up to 800 Mb/sec (QPSK) using the 25.25 - 27.5 GHz space-to-space allocation. As part of NASA's acceptance of the TDRS-H spacecraft, an extensive on-orbit calibration, verification and characterization effort was performed to ensure that on-orbit spacecraft performance is within specified limits. This process verified the compliance of the Ka-band communications payload with all performance specifications and demonstrated an end-to-end Ka-band service capability. This paper summarizes the results of the TDRS-H Ka-band communications payload on-orbit performance verification and end-to-end service characterization. Performance parameters addressed include Effective Isotropically Radiated Power (EIRP), antenna Gain-to-System Noise Temperature (G/T), antenna gain pattern, frequency tunability and accuracy, channel magnitude response, and Ka-band service Bit-Error-Rate (BER) performance.
Author
Payloads; Bit Error Rate; Bandwidth; Phase Shift Keying; TDR Satellites; Antenna Gain

20020080821 Swedish Defence Research Establishment, Sensor Technology, Linkoeping Sweden
HPM. Front-door Coupling and Protection. Progress report ***HPM. Framvaegskoppling och Skydd. Laegesrapport***
Baechstroem, M.; Lunden, O.; Andersson, P.; Ferrer, I.; Loren, J.; Nov. 2001; 46p; In Swedish
Report No.(s): PB2002-107202; FOI-R-0265-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This progress report describes the work done during 2001 aiming at strengthening the competence within the field HPM (High Power Microwave) Front-door coupling and protection. This field is a part of the project HPM Protection (E3031), and is coordinated with the project HPM Protection Techniques (3660). In the project plan it is stated that the research shall refer to HPM effects on array antennas and development/evaluation of protection methods. The protection can be accomplished as an integrated part of the MMIC (Microwaves Monolythic Integrated Circuits) structure or as an integrated part in the surface of a radom. At present the first alternative is studied. Another approach is to deliberately create an electrical discharge in the antenna aperture when the antenna is irradiated by HPM, thereby reducing the transmitted radiated power. During 2001 laboratory resources have been created for studies of slot discharges up to field levels of more than 10 kV/m at 3 GHz. Furthermore, an experimental set-up has been taken into operation for initial studies of the performance of commercial protection devices.
NTIS
Electromagnetic Shielding; Electronic Warfare; Protection

20020080848 General Accounting Office, Washington, DC USA
Telecommunications: Better Coordination and Enhanced Accountability Needed to Improve Spectrum Management
Sep. 2002; 80p
Report No.(s): PB2003-100280; GAO-02-906; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The radiofrequency spectrum is the medium that enables wireless communications of all kinds, such as mobile phone and paging services, radio and television broadcasting, radar, and satellite-based services. As new spectrum-dependent technologies are developed and deployed, the demand for this limited resource has escalated among both government and private sector users. Meeting these needs domestically is the responsibility of the Department of Commerce's National Telecommunications and Information Administration (NTIA) for federal government users and the Federal Communications Commission (FCC) for all other users. One of these agencies most important tasks is to decide how to allocate (apportion) the spectrum among the different types of wireless services and users a task that is increasingly difficult as the spectrum becomes more crowded and competition for radiofrequencies intensifies. As the Congress begins to debate whether fundamental reforms are needed in spectrum management, you asked us to provide an overview of the development of the legal and regulatory framework for spectrum management at the federal level and assess key issues associated with spectrum management at federal agencies. As agreed, we focused on the following issues: (1) the evolution of the current legal and regulatory framework for domestic spectrum management; (2) the current methods for allocating spectrum domestically and planning for its use; (3) the adequacy of the current U.S. preparatory process for the World Radiocommunication Conferences, at which decisions are made on how to allocate spectrum internationally; and (4) the activities used to increase accountability and encourage the efficient use of spectrum by federal agencies. In addition to these issues, you requested that we review how the current rules and regulations governing spectrum holders affect the rollout of new technologies and services and the level of competition in markets that use spectrum.
NTIS
Telecommunication; Radio Frequencies; Governments; Frequency Assignment

20020080981 Swedish Defence Research Establishment, Sensor Technology, Linkoeping Sweden

Development of New Antenna Concepts for Ground Penetrating Radar

Gunnarsson, R.; Erickson, R.; Dec. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-107235; FOI-R-0269-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes studies and development of conceivable antenna concepts for handheld and vehicle-mounted mineradar systems. The study has been concentrated on TEM-horns and dielectric rod antennas. Possibilities and limitations of TEM-horn antennas adapted for impulse radar are demonstrated. An antenna for impulse radar involves conflicting requirements of high instantaneous bandwidth, high antenna gain, small size, possible crossed transmitting and receiving antennas et cetera. Considerable compromises must be made. These compromises imply that it is not possible to simultaneously achieve high antenna gain and large bandwidth with a single small antenna. Measurements performed with a demonstrator antenna MPAX proved that the antenna can detect metallic mines, anti-tank mines and shrapnel, metal spheres and to some extent anti-personnel mines that are buried in sand and soil.

NTIS

Ground Penetrating Radar; Antennas; Mine Detectors

20020081018 NASA Goddard Space Flight Center, Greenbelt, MD USA

Low Resolution Picture Transmission (LRPT) Demonstration System

Fong, Wai, NASA Goddard Space Flight Center, USA; Yeh, Pen-Shu, NASA Goddard Space Flight Center, USA; Sank, Victor, QSS Group, Inc., USA; Nyugen, Xuan, QSS Group, Inc., USA; Xia, Wei, Global Science and Technology, Inc., USA; Duran, Steve, NASA Johnson Space Center, USA; June 2002; 38p; In English

Report No.(s): NASA/TM-2002-211608; NAS 1.15:211608; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Low-Resolution Picture Transmission (LRPT) is a proposed standard for direct broadcast transmission of satellite weather images. This standard is a joint effort by the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and the National Oceanic Atmospheric Administration (NOAA). As a digital transmission scheme, its purpose is to replace the current analog Automatic Picture Transmission (APT) system for use in the Meteorological Operational (METOP) satellites. Goddard Space Flight Center has been tasked to build an LRPT Demonstration System (LDS). It's main objective is to develop or demonstrate the feasibility of a low-cost receiver utilizing a Personal Computer (PC) as the primary processing component and determine the performance of the protocol in the simulated Radio Frequency (RF) environment. The approach would consist of two phases. In the phase 1, a Commercial-off-the-Shelf (COTS) Modulator-Demodulator (MODEM) board that would perform RF demodulation would be purchased allowing the Central Processing Unit (CPU) to perform the Consultative Committee for Space Data Systems (CCSDS) protocol processing. Also since the weather images are compressed the PC would perform the decompression. Phase 1 was successfully demonstrated on December 1997. Phase 2 consists of developing a high-fidelity receiver, transmitter and environment simulator. Its goal is to find out how the METOP Specification performs in a simulated noise environment in a cost-effective receiver. The approach would be to produce a receiver using as much software as possible to perform front-end processing to take advantage of the latest high-speed PCs. Thus the COTS MODEM used in Phase 1 is performing RF demodulation along with data acquisition providing data to the receiving software. Also, environment simulator is produced using the noise patterns generated by Institute for Telecommunications Sciences (ITS) from their noise environment study.

Author

Automatic Picture Transmission; Data Acquisition; Data Systems; Environment Simulators; Satellite Imagery; Transmitters

20020081250 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

The U.S. STEP-TAS Pilot

Siebes, Georg, Jet Propulsion Lab., California Inst. of Tech., USA; deKoning, Hans Peter, European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Lebegue, Eric, Simulog, France; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 215-223; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In January 2000, the STEP for Aerospace Workshop at JPL brought together representatives from the standards developer, tool vendor and user community. It served as the catalyst for further STEP implementation activities in NASA. The most mature of these activities is the US STEP-TAS pilot. Five US thermal tool vendors are participating. In alphabetical order they are Cullimore and Ring Inc. (Thermal Desktop), Harvard Thermal Inc. (TAS), Network Analysis Inc. (SINDA/ATM), SpaceDesign (TSS), and TAC Inc. (NEVADA). The scope of this pilot is limited to the development of a prototype bi-directional STEP-TAS interface of defined and limited capability. The word prototype is used in the sense of a feasibility demonstration. This specifically

means that the final product is not required to support all capabilities that are typically found in a radiation analysis tool. The prototype is limited to the bi-directional exchange of pre-defined surface geometry and thermal properties. The current status of this pilot and future plans are reported in this paper.
Author
Prototypes; Thermal Analysis; Surface Geometry; Protocol (Computers); Product Development; Human-Computer Interface; Applications Programs (Computers)

20020081259 NASA Goddard Space Flight Center, Greenbelt, MD USA
Lessons Learned from a Collaborative Sensor Web Prototype
Ames, Troy, NASA Goddard Space Flight Center, USA; Case, Lynne, Aquilent, Inc., USA; Krahe, Chris, Aquilent, Inc., USA; Hess, Melissa, Aquilent, Inc., USA; [2002]; 9p; In English; Earth Science Technology Conference 2002, 11-13 Jun. 2002, Pasadena, MD, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes the Sensor Web Application Prototype (SWAP) system that was developed for the Earth Science Technology Office (ESTO). The SWAP is aimed at providing an initial engineering proof-of-concept prototype highlighting sensor collaboration, dynamic cause-effect relationship between sensors, dynamic reconfiguration, and remote monitoring of sensor webs.
Author
Prototypes; Remote Sensors; Architecture (Computers); Computerized Simulation; Software Engineering; Mapping

20020081300 NASA Goddard Space Flight Center, Greenbelt, MD USA
Phenomena Associated with EIT Waves
Thompson, B. J., NASA Goddard Space Flight Center, USA; Biesecker, D. A., NASA Goddard Space Flight Center, USA; Gopalswamy, N., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; SOHO-11, 10-16 Mar. 2002, Davos, Switzerland; No Copyright; Avail: Issuing Activity; Abstract Only

We discuss phenomena associated with 'EIT Wave' transients. These phenomena include coronal mass ejections, flares, EUV/SXR dimmings, chromospheric waves, Moreton waves, solar energetic particle events, energetic electron events, and radio signatures. Although the occurrence of many phenomena correlate with the appearance of EIT waves, it is difficult to infer which associations are causal. The presentation will include a discussion of correlation surveys of these phenomena.
Author
Coronal Mass Ejection; Solar Flares; Extreme Ultraviolet Radiation; Chromosphere; Solar Wind; Solar Corpuscular Radiation; Solar Radio Emission

20020081350 NASA Goddard Space Flight Center, Greenbelt, MD USA
Low Resolution Picture Transmission (LRPT) Demonstration System, Phase II, 1.0
Fong, Wai, NASA Goddard Space Flight Center, USA; Yeh, Pen-Shu, NASA Goddard Space Flight Center, USA; Duran, Steve, NASA Johnson Space Center, USA; Sank, Victor, QSS Group, Inc., USA; Nyugen, Xuan, QSS Group, Inc., USA; Xia, Wei, Global Science and Technology, Inc., USA; July 2002; 48p; In English; Original contains color illustrations
Report No.(s): NASA/TM-2002-211608; NAS 1.15:211608; Rept-2002-02623-0; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Low-Resolution Picture Transmission (LRPT) is a proposed standard for direct broadcast transmission of satellite weather images. This standard is a joint effort by the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and NOAA. As a digital transmission scheme, its purpose is to replace the current analog Automatic Picture Transmission (APT) system for use in the Meteorological Operational (METOP) satellites. GSFC has been tasked to build an LRPT Demonstration System (LDS). Its main objective is to develop or demonstrate the feasibility of a low-cost receiver utilizing a PC as the primary processing component and determine the performance of the protocol in the simulated Radio Frequency (RF) environment. The approach would consist of two phases.
Author
Automatic Picture Transmission; Protocol (Computers); Radio Frequencies; Receivers; Satellite Imagery

20020082967 NASA Goddard Space Flight Center, Greenbelt, MD USA
Synthetic Aperture Radar: The NCCS Enables Search and Rescue
1999 NCCS Highlights; July 2002, pp. 70-77; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

For as long as planes have gone down, dedicated men and women have used ever-improving technologies to aid their search for survivors. Nearly 2,000 general aviation crashes occur each year in U.S.-and many, like the Montana incident, occur without witnesses. On average, every day in the U.S. one airplane is reported missing. The Air Force Rescue Coordination Center (AFRCC) organizes search missions for about 100 aircraft each year. Some of these are not found before the searches called off, and are discovered only by chance long after the crash. In some cases, the crash site is never found. NASA Search and Rescue Mission is using NCCS rescues to develop tools for processing radar data that can help these effort
Derived from text
Crashes; Rescue Operations; Radar Data

20020082978 Naval Undersea Warfare Center, Newport, RI USA
Extremely Low Frequency (ELF) Propagation Formulas for Dipole Sources Radiating in a Spherical Earth-Ionosphere Waveguide
Casey, Joseph P.; May 14, 2002; 182p; In English
Report No.(s): AD-A405897; NUWC-NPT-TR-11369; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
Extremely low frequency (ELF) propagation formulas are derived for dipole sources radiating in a spherical earth-ionosphere waveguide. In these formulas, the earth and ionosphere boundaries are modeled as scalar surface impedances. The spherical waveguide formulas are applied to predict the electromagnetic fields produced by vertical and horizontal electric dipoles (located on the surface of the earth) at antipodal ranges for several frequencies and propagation conditions. These results are used to establish the maximum ranges of validity of ELF propagation formulas that are based on the earth-flattening approximation. Numerous derivations are given in the appendices.
DTIC
Dipole Antennas; Wave Propagation; Electromagnetic Wave Transmission

20020082980 Range Commanders Council, Telemetry Group, White Sands Missile Range, NM USA
Test Methods for Telemetry Systems and Subsystems. Volume 2. Test Methods for Telemetry RF Subsystems
Jun. 2002; 330p; In English
Report No.(s): AD-A405901; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche
The Telemetry Group of the Range Commanders Council (RCC) has prepared this document to provide common methods for testing radio frequency (RF) equipment. Figure 1-1, RF/System Measurements and Data Flow Diagram, is included to serve as a guide for recommended tests to verify equipment status. The use of common methods should minimize problems when organizations exchange test results. Other volumes of this document address test methods for recorder/reproducer systems and magnetic tape, data multiplex equipment, and vehicular telemetry systems. The Telemetry Standards (IRIG Standard 106-XX) and the Telemetry Applications Handbook (RCC document 119-XX) are companion documents. The test methods in this document provide standard outlines on how to measure various parameters. The comments listed below apply where appropriate. (1) Equipment may need to be tested at a variety of environmental conditions such as temperature, humidity, vibration, and shock. The user needs to determine the appropriate test conditions. (2) Electromagnetic interference characteristics should be measured in accordance with the latest version of Military Standard (MIL-STD)-462, Measurement of Electromagnetic Interference Characteristics. (3) Proper interconnection of equipment is critical for accurate test results. Verify that connectors are not corroded or otherwise damaged. Tighten connectors properly. The cables should not be kinked, cut, stretched, or otherwise damaged. The line losses for RF cables should be known prior to their use for correct interpretation of the data results. (4) The test equipment may output spurious signals that produce erroneous test results. Verify that the test equipment is not causing problems with the measurements. (5) The test equipment should have an accuracy of 10 percent of the specified tolerance (or 10 percent of the absolute value to be measured if no tolerance is given).
DTIC
Telemetry; Military Operations

20020082991 Air Force Research Lab., Human Effectiveness Directorate, Brooks AFB, TX USA
Dielectric Response Data on Materials of Military Consequence ***Final Report, 1999-2002***
Medina, Richard; Penn, John; Albanese, Richard; Aug. 2002; 33p; In English
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A405996; AFRL-HE-BR-TR-2002-0155; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We are interested in the remote determination of materials. That is, we desire to irradiate a material from a distance using efficient antenna systems and infer from the scattered signal the nature of the irradiated material. To accomplish this task we require a library of material properties as related to electromagnetic scattering and we require signal features that permit materials

to be discriminated from a distance using scattered signals. This technical report provides a significant first step in the direction of providing the needed capability. A small materials library is presented along with signal properties of interest.
DTIC
Dielectrics; Remote Sensors; Characterization; Identifying

20020083011 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Two-Dimensional ESPRIT with Tracking for Radar Imaging and Feature Extraction
Burrows, M. L.; Aug. 02, 2002; 29p; In English; Original contains color images
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A405754; TR-1084; ESC-TR-2001-075; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
ESPRIT processing appears to be the best of the known spectral-analysis techniques. It provides the highest resolution and has no spectral splatter. By applying matrix eigenstructure analysis, it gives a direct answer to the direct question 'What frequencies, real or complex, are present in the data and what are their amplitudes'? Conventional Fourier techniques, as well as some of the other higher-resolution methods, answer the less direct question 'What amplitudes, applied to a set of regularly-spaced real frequencies, best represent the data'? Then comes the problem of interpreting the amplitudes. These attributes of ESPRIT, in the two-dimensional version described here, make it a natural for radar signal processing, where it answers the need for high-resolution imaging, free of sidelobes in range and Doppler, and for high-fidelity target feature extraction. For example, the uncertainty in the scatterering-center locations in an ESPRIT image extracted from high-quality static-range radar data collected over a bandwidth of 1 GHz is just a few millimeters; for conventional Fourier processing of the same data the uncertainty is many centimeters. The signature of the base edge of a perfectly conducting cone extracted from static-range data by ESPRIT agrees accurately with the signature predicted by edge-diffraction theory. This report starts with a mathematical model for the radar data, describes a technique for 'resampling' the data to achieve a more perfect fit with the ESPRIT data model, summarizes the two-dimensional ESPRIT algorithm itself, and presents examples of its performance. The appendix covers the details of this least-mean-square version of ESPRIT, including an enhancement that allows the scatterers to be tracked individually.
DTIC
Radar Tracking; Tracking Radar; Spectrum Analysis; Pattern Recognition

20020083026 Corps of Engineers, Washington, DC USA
Operating Plans and Procedures for The U.S. Army Corps of Engineers National HF-SSB Emergency Communications Network
Dec. 01, 1989; 60p; In English
Report No.(s): AD-A405797; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Historically the Corps of Engineers has not had Corps wide Continental USA (CONUS) radio communications capability due to the lack of compatible High Frequency Single Sideband (HF/SSB) equipment. With the acquisition of 1Kw (HF/SSB) radios for HQUSACE and each division and district in CONUS we noW have excellent, compatible radio equipment to support emergency operations. to become and remain proficient over an extended period of time, it will be necessary for the operators to participate in frequent on-the-air training nets established by this manual. The manual additionally describes military radio procedures sufficient to communicate with military installations when necessary. Provisions have been made to allow informal training sessions on the air for sharing information and asking specific questions regarding operating procedures etc. As changes to the manual become necessary amendments will be published and distributed by the proponent activity, Lower Mississippi Valley Division.
DTIC
Emergencies; Engineers; Armed Forces; Communication Networks

20020083099 Arcon Corp., Waltham, MA USA
Performance Analysis of the Nonhomogeneity Detector for STAP Applications
RAngaswamy, Muralidhar; Himed, Braham; Michels, James H.; May 2001; 5p; In English; AFRL Contract Manager: Dr. James H. Michels/AFRL/SNRT/315-330-4432. Conference paper published in Proceedings of the 2001 IEEE Radar Conference, Atlanta, GA, pp.193-197, May 2001
Contract(s)/Grant(s): F30602-00-C-0231; Proj-2304
Report No.(s): AD-A406183; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
We consider the statistical analysis of a recently proposed non-homogeneity detector (NHD) for Gaussian interference statistics. We show that a formal goodness-of-fit test can be constructed by accounting for the statistics of the generalized inner product (GIP). Specifically the Normalized-GIP follows a central-F distribution. This fact is used to derive the goodness-of-fit

test in this paper. We also address the issue of space-time adaptive processing (STAP) algorithm performance using the NHD as a pre-processing step for training data selection. Performance results are reported using simulated as well as measured data.
DTIC
Algorithms; Reliability Analysis; Homogeneity; Scalars

20020083101 Army Aviation and Missile Command, Redstone Arsenal, AL USA
Facility Design and Measurements of Bistatic and Monostatic Reflectivity of X, KU, KA, and W-Band Frequencies Over Sand Terrain ***Final Report***
Matkin, Brenda L.; Mullins, James H.; Ferster, Tommy; Vanderford, Perry; Feb. 2002; 30p; In English; Prepared in collaboration with Simulation Technologies, Huntsville, AL
Report No.(s): AD-A406187; AMCOM-TR-RD-MG-01-38; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report provides an overview of an X, Ku, Ka, and W-Band monostatic and bistatic measurement facility in the Aviation and Missile research, Development, and Engineering Center (AMRDEC) at Redstone Arsenal, Alabama. The data collection includes both on-axis (zero degrees) and off-axis (10 and 30 degrees) measurements of the bistatic reflectivity response. The instrumentation design for the data collection will be briefly described. The calibration processes and the data collection methodologies for monostatic and bistatic measurements will be discussed. A summary of the reflectivity results from smooth sand terrain will be presented. This work has application to tactical missile systems that must complete their engagements at low altitudes in a clutter environment.
DTIC
Bistatic Reflectivity; Extremely High Frequencies; Superhigh Frequencies; Data Acquisition

20020083102 Lebedev Physical Inst., Moscow, Russia
Studies of Plasma Instability Processes Excited by Ground Based High Power HF (”Heating”) Facilities ***Final Report, 26 Apr. 2000-23 Apr 2001***
Gurevich, Alexander V.; Apr. 2001; 48p; In English
Contract(s)/Grant(s): F61775-00-W-E010
Report No.(s): AD-A406188; EOARD-SPC-00-4010; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report results from a contract tasking P. N. Lebedev Physical Institute as follows: The contractor will investigate how high power HF radio waves interact with collisional plasmas, such as the earth’s ionosphere. Specifically, the contractor will predict and measure the formation of field aligned small scale striations; and energization of electrons along with their relationship to excited optical emissions. AFRL/AFOSR & AFRL/VS workers (Dr Carlson and coworkers) will provide existing airglow and incoherent scatter radar (ISR) data, and background conditions for boundary inputs to a theoretical calculation. The contractor will perform quantitative comparisons between the parameter values calculated, and those observed.
DTIC
Radio Waves; Collisional Plasmas; Earth Ionosphere; Incoherent Scatter Radar

20020083182 Air Force Research Lab., Edwards AFB, CA USA
Electromagnetic Effects of the ESEX 26 kW Ammonia Arcjet on Normal Spacecraft Communications and Operations
Dulligan, M. J.; Johnson, L. K.; Zimmerman, J. A.; Salasovich, R. M.; Bromaghim, D. R.; Jun. 1999; 17p; In English
Report No.(s): AD-A406145; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Arcjet thrusters employ an arc discharge to heat propellant which expands through a nozzle to produce thrust. Spacecraft designers who desire to exploit arcjet technology have expressed concern about interference from the electromagnetic environment produced by the thrusters. One of the four major interest areas of the ESEX program was to determine the electromagnetic effect of operating a 30 kW class arcjet upon normal spacecraft communications and operations. to accomplish this task, noise levels were recorded in four frequency bands (2, 4, 8, and 12 GHz) by two onboard antennas. The electromagnetic noise levels observed during all arcjet firings were indistinguishable from those observed during the baseline non-firing periods. Communication bit error rates were also measured during arcjet firings and comparison with non-firing BER data revealed that spacecraft command and control communications were not significantly affected by arcjet firings.
DTIC
Electromagnetic Interference; Arc Jet Engines; Electric Rocket Engines; Spacecraft Control; Spacecraft Communication

20020083200 Villanova Univ., PA USA

Classification and Discrimination of Sources with Time-Varying Frequency and Spatial Spectra ***Interim Report, 1 Oct. 2001-30 Sep. 2002***

Amin, Moeness; Oct. 2002; 103p; In English

Contract(s)/Grant(s): N00014-98-1-0176

Report No.(s): AD-A406349; 527616; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

We introduce the quadratic sensor angle distribution (SAD) for near-field source characterization. The SAD is a joint-variable distribution and a dual in sensor number and angle to Cohen's class of time-frequency distributions. It provides the power at every angle for each sensor in the array. In this distribution, near-field sources have different angle for each sensor. We use a known test source to illuminate the local scatterer distribution we wish to characterize. The high-power test source can be removed via orthogonal projection so as to reveal the less powerful local scatter. It is shown that the eigen-decomposition of the quadratic representation of SAD lends itself to source representation via multiple subarray beam forming. The SAD can be used to clearly identify scatterers on the array axis both within and beyond the array extent. Distinction between far-field spatial spread source and near-filed point source can also be easily achieved.

DTIC

Electromagnetic Scattering; Target Recognition

20020083245 AMPTEk, Inc., Bedford, MA USA

Space Systems Environmental Interaction Studies

Morgan, M. A.; Huber, Alan C.; Sperry, David J.; Donkin, Alan N., Jr.; Moran, Scott J.; Aug. 30, 2000; 20p; In English; Original contains color images

Contract(s)/Grant(s): F19628-96-C-0144; AF Proj. 2822

Report No.(s): AD-A406023; AFRL-VS-TR-2001-1660; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Pre and post launch support work constitute the most significant activity during the report period. DIDM-2 was launched 13 July 2000 on the CHAMP spacecraft. The initial turn-on and early orbit phase of operations was virtually anomalous-event free, and the instrument continues to return good data. A synopsis of the on-orbit performance to date, is presented in this report. A review of another undertaking, the analysis and design work carried out on behalf of the succeeding instrument (DIDM-3), which is to he flown on the Air Force Research Laboratory's Communication Navigation Outage Forecast (C/ NOFS) spacecraft, is also given.

DTIC

Ionospheric Disturbances; Spread F; Plasma Drift

20020083255 Naval Postgraduate School, Monterey, CA USA

Analysis of a Proposed Third Generation (3G) Mobile Communication Standard, Time Division - Synchronous Code Division Multiple Access (TD-SCDMA)

Paulson, Donald H., Jr.; Jun. 2002; 96p; In English; Original contains color images

Report No.(s): AD-A405966; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

With a growing number of consumers utilizing the Internet, companies have foreseen a consumer demand for high-speed wireless access. Since current mobile cellular systems can transfer at most 115.2 kbps per user, a third generation of mobile cellular service has been under development by various organizations since 1997. This new generation of technology will support data rates up to 2 Mbps for stationary mobiles and up to 144 kbps for vehicular traffic. This thesis focuses mainly on TD-SCDMA, one of many candidates submitted to the International Telecommunications Union for third generation review. The standard, developed in China by the Chinese Academy of Telecommunications Technology, employs both code-division multiple access (CDMA) and time-division duplexing (TDD) to support both forward and reverse transmissions on one physical layer. This aspect, along with other common features of TD-SCDMA, will be studied and evaluated to determine if this new technology is a viable option for future commercial or military deployment.

DTIC

Wireless Communication; Code Division Multiple Access; Time Division Multiple Access

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also 60 Computer Operations and Hardware; and 76 Solid-State Physics. For communications equipment and devices see 32 Communications and Radar.

20020080766 Department of Energy, Washington, DC USA
Acceptance test procedure for removal of CS1K circuit switcher block and trip schemes
Hache, J. M.; Aug. 25, 1999; 12p; In English
Report No.(s): DE2002-797710; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This supporting document provides a detailed process to test the functions of the circuit switcher, protective relays, alarms, SCADA and 125VDC control logic of 115kV and 13.8kV systems at B3S4 substation following the removal of trip and blocking schemes to Transformer No. 1 Circuit Switcher B594.
NTIS
Switches; Circuits; Control Systems Design; Sequential Control; Warning Systems

20020080823 Helsinki Univ. of Technology, Dept. of Electrical and Communications Engineering, Espoo, Finland
Rotor Constructions for a High-Speed Induction Motor
Laehteenmaeki, J.; 2001; 94p; In English
Report No.(s): PB2002-107027; REPT-65; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The motivation of this work was to identify the changes in the optimal design of a high-speed induction motor in comparison to a conventional motor design. The aim was to acquire knowledge on how to build good high-speed induction motors. Special attention was paid on rotors suitable for a high-speed motor. Literature study showed that a construction of a high-speed induction motor is subjected to changes in the design. The lamination and winding materials must be suited for a high frequency voltage, current and flux. The waveform of the magnetic air gap flux should be made as sinusoidal as possible in order to avoid excessive power loss. This is important especially with solid steel rotors. Different ways to obtain the flux with a low harmonic content are suggested in the literature review.
NTIS
Induction Motors; Rotors; High Speed; Design Optimization

20020080878 NASA Goddard Space Flight Center, Greenbelt, MD USA
Super NiCd Open-Circuit Storage and Low Earth Orbit (LEO) Life Test Evaluation
Baer, Jean Marie, Aerospace Corp., USA; Hwang, Warren C., Aerospace Corp., USA; Ang, Valerie J., Aerospace Corp., USA; Hayden, Jeff, Eagle-Picher Technologies, LLC, USA; Rao, Gopalakrishna, NASA Goddard Space Flight Center, USA; [2002]; 25p; In English; 2002 Space Power Workshop, 22-25 Apr. 2002, Redondo Beach, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This presentation discusses Air Force tests performed on super NiCd cells to measure their performance under conditions simulating Low Earth Orbit (LEO) conditions. Super NiCd cells offer potential advantages over existing NiCd cell designs including advanced cell design with improved separator material and electrode making processes, but handling and storage requires active charging. These tests conclude that the super NiCd cells support generic Air Force qualifications for conventional LEO missions (up to five years duration) and that handling and storage may not actually require active charging as previously assumed. Topics covered include: Test Plan, Initial Characterization Tests, Open-Circuit Storage Tests, and post storage capacities.
CASI
Nickel Cadmium Batteries; Life (Durability); Performance Tests; Environment Simulation; Charge Efficiency

20020080921 Harris Semiconductor, Melbourne, FL USA
Power Switching Device
Spinoff 1993; 1993, pp. 119; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.
The MOS-Controlled Thyristor is a new type of power switching device for faster and more efficient control and management of power electronics. It enables power electronic switching at frequencies of 50 to 100 thousand times a second with much lower power losses than other semiconductor devices. Advantages include electric power savings and smaller space. The device is used in motor and power controllers, AC & DC motor drives and induction heating. Early development was supported by Lewis

Research Center (LEW) and other agencies. General Electric''s power semiconductor operation, the initial NASA contractor, was later purchased by Harris Semiconductor.
Author
Switching Circuits; Thyristors; Controllers; Semiconductor Devices

20020080946 Firing Circuits, Inc., Norwalk, CT USA
Smart Starter
Spinoff 1993; 1993, pp. 118-119; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

A NASA-developed technology provides an effective and economical method of starting standard three phase motors. Firing Circuits, Inc. uses the power factor controller in its Wattstop Reduced Voltage AC Motor Starters. The power factor controller matches voltage with a motor's actual need by continuously sensing shifts between voltage and circuit. Energy savings range from 8 to 65 percent. Wattstops are used on cranes, hoists, conveyors, fans, as well as in papermaking, woodworking, metalworking, and many other applications.
Author
Power Factor Controllers; Fire Control Circuits; Engine Starters; Electric Motors

20020081324 NASA Glenn Research Center, Cleveland, OH USA
Stator and Rotor Flux Based Deadbeat Direct Torque Control of Induction Machines
Kenny, Barbara H., NASA Glenn Research Center, USA; Lorenz, Robert D., Wisconsin Univ., USA; September 2002; 18p; In English; 2001 Industry Applications Society Annual Meeting, 30 Sep. - 5 Oct. 2001, Chicago, IL, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): RTOP 755-1A-11
Report No.(s): NASA/TM-2001-211100/REV1; NAS 1.15:211100/REV1; E-12945-1/REV1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new, deadbeat type of direct torque control is proposed, analyzed, and experimentally verified in this paper. The control is based on stator and rotor flux as state variables. This choice of state variables allows a graphical representation which is transparent and insightful. The graphical solution shows the effects of realistic considerations such as voltage and current limits. A position and speed sensorless implementation of the control, based on the self-sensing signal injection technique, is also demonstrated experimentally for low speed operation. The paper first develops the new, deadbeat DTC methodology and graphical representation of the new algorithm. It then evaluates feasibility via simulation and experimentally demonstrates performance of the new method with a laboratory prototype including the sensorless methods.
Author
Torque; Simulation; Graphs (Charts); Feasibility; Experimentation; Torquemeters

20020081327 NASA Goddard Space Flight Center, Greenbelt, MD USA
Cryogenetically Cooled Field Effect Transistors for Low-Noise Systems
Wollack, Edward J., NASA Goddard Space Flight Center, USA; Jul. 11, 2002; 1p; In English; Applied Superconductivity and Cryogenics Microwave Subsystems Conference, 3-4 Aug. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Recent tends in the design, fabrication and use of High-Electron-Mobility-Transistors (HEMT) in low noise amplifiers are reviewed. Systems employing these devices have achieved the lowest system noise for wavelengths greater than three millimeters with relatively modest cryogenic cooling requirements in a variety of ground and space based applications. System requirements which arise in employing such devices in imaging applications are contrasted with other leading coherent detector candidates at microwave wavelengths. Fundamental and practical limitations which arise in the context of microwave application of field effect devices at cryogenic temperatures will be discussed from a component and systems point of view.
Author
High Electron Mobility Transistors; Cryogenic Cooling; Low Noise; Microwave Frequencies

20020082893 NASA Glenn Research Center, Cleveland, OH USA
Electronics for Deep Space Cryogenic Applications
Patterson, R. L., NASA Glenn Research Center, USA; Hammond, A., QSS Group, Inc., USA; Dickman, J. E., NASA Glenn Research Center, USA; Gerber, S. S., ZIN Technologies, Inc., USA; Elbuluk, M. E., Akron Univ., USA; Overton, E., NASA Glenn Research Center, USA; October 2002; 10p; In English; Fifth European Workshop on Low Temperature Electronics, 19-21 Jun.

2002, Grenoble, France; Sponsored by Institut National Polytechnique, France
Contract(s)/Grant(s): RTOP 297-60-10
Report No.(s): NASA/TM-2002-211695; E-13427; NAS 1.15:211695; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Deep space probes and planetary exploration missions require electrical power management and control systems that are capable of efficient and reliable operation in very cold temperature environments. Typically, in deep space probes, heating elements are used to keep the spacecraft electronics near room temperature. The utilization of power electronics designed for and operated at low temperature will contribute to increasing efficiency and improving reliability of space power systems. At NASA Glenn Research Center, commercial-off-the-shelf devices as well as developed components are being investigated for potential use at low temperatures. These devices include semiconductor switching devices, magnetics, and capacitors. Integrated circuits such as digital-to-analog and analog-to-digital converters, DC/DC converters, operational amplifiers, and oscillators are also being evaluated. In this paper, results will be presented for selected analog-to-digital converters, oscillators, DC/DC converters, and pulse width modulation (PWM) controllers.

Author

Cryogenics; Electric Power; Controllers; Electronic Equipment; Room Temperature; Spacecraft Temperature; Spacecraft Power Supplies

20020083198 California Univ., Dept. of Computer Engineering, Santa Barbara, CA USA

Metamorphic HBT's: InP/InGaAs/InP Devices Grown on GaAs Substrates ***Annual Report, 1 Oct. 2000-30 Sep. 2001***

Rodwell, Mark; Aug. 01, 2002; 11p; In English
Contract(s)/Grant(s): N00014-01-1-0065
Report No.(s): AD-A406365; 442530-23091; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This program supported the development of metamorphic heterojunction bipolar transistors (MHBTs). We accomplished this by growing an InP based HBT layer structure on GaAs substrates. InP metamorphic buffer layer was chosen in thermal point of view. Peak values of current-gain cutoff frequency (f(sub t) = 207 GHz) and power-gain cutoff frequency (f(sub max) = 140) were obtained from If devices at bias conditions of V(sub CE) = 1.5 Volts and J(sub c) = 4 x 10(exp 5) A/sq cm. These are the highest values reported for metamorphic HBTs.

DTIC

Thermodynamic Properties; Bipolar Transistors

20020083201 Space and Naval Warfare Systems Command, San Diego, CA USA

Monitoring of High-Power Microwave Tube Systems Using the Integrated Condition Assessment System (ICAS)

Joshi, N. R.; Ramirez, A. D.; Brock, D. W.; Russell, S. D.; Jul. 2002; 124p; In English; Original contains color images; Prepared in collaboration with North Harris College and Prairie View A and M Univ., TX
Report No.(s): AD-A406339; SPAWAR-TR-1885; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In the earlier phases of the Microwave Tube Built-In Test (MTBIT) program (1999-2001), a new advanced nondestructive testing technique was demonstrated using acoustic emission (AE) for in-situ monitoring of normal and abnormal performance of high- power radar tubes such as magnetrons, traveling wave tubes (TWTs), and klystrons. This report details the next step in transitioning the laboratory MTBIT system into a system that is compatible with condition-based maintenance systems employing the Integrated Condition Assessment System (ICAS) used by the Fleet. This report identifies the interface requirements for the sensors and ICAS, as well as accommodating limitations of the ICAS software, which currently is not configured to accommodate the sensor data rates and data sets required. Ten new electronic circuits were designed, built, and tested to interface the outputs of the current sensor and acoustic emission sensor attached to a magnetron through an OPTO22 digital and analog input/output (I/O) hardware along with its Optomux protocol, and the ICAS software (Version 4.11). The complete computerized system to monitor the in-situ performance of the high-power microwave tube was developed, tested, and reported here. The system could be extended to achieve the same goal with other microwave tubes such as TWTs and klystrons with minor modifications.

DTIC

Radar Equipment; Microwave Tubes

20020083208 Naval Postgraduate School, Monterey, CA USA

Analysis and Cost Optimization of a USCG Remote Hybrid Power System

Weiss, Zachary A.; Jun. 2002; 125p; In English; Original contains color images
Report No.(s): AD-A406290; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Analysis and simulations were performed to provide recommendations on how to improve the cost- effectiveness of the operation of remote hybrid power systems supporting various Alaskan National Distress System (NDS) communications sites. The study characterizes the loads and power sources at two NDS sites. Basic lead-acid battery theory is applied to produce a mathematical model to simulate the normal operation of the hybrid power system. Data from 2001 is analyzed to account for the effect of solar energy on the model. Results from the simulations indicate that a cost savings is realizable through improved hybrid controller settings.
DTIC
Telecommunication; Rural Areas

20020083282 Motorola, Inc., Advanced Technology Center, Schaumburg, IL USA
A Static Technique for the Electro-Mechanical Characterization of Organic MEMS Devices for RF and Microwave Applications
Kaul, Anupama B.; Klosowiak, Tomasz; Liu, Joshua; Mar. 2002; 10p; In English; Original contains color images
Contract(s)/Grant(s): F33615-00-2-1718; AF Proj. ARPS
Report No.(s): AD-A405902; AFRL-SN-WP-TP-2002-108; AFRL-SN-WP-TP-2002-108; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
An approach for measuring force-dependent properties of microscopic structures commonly found in MEMS has been developed. The system has the capability of measuring forces and deflections on the order of micro-newtons and micro-meters, respectively. by implementing a visual inspection system, force can be selectively applied to localized areas on a beam, and the resulting force-deflection characteristic obtained from which beam stiffness and effective elastic modulus can be calculated. These results were compared to simulation, which was performed using ANSYS FEM code. In addition, by applying a known mechanical force, direct correlation to voltage and thus electrostatic force can be obtained, which also elucidates the magnitude of the electrostatic feedback effect. Characterization of other force-dependent parameters such as contact resistance at DC, in addition to isolation/insertion loss at RF and microwave frequencies was obtained experimentally from which parameters such as lumped capacitance and inductance can be extracted.
DTIC
Microelectromechanical Systems; Numerical Analysis

20020083318 Army Communications-Electronics Command, Fort Monmouth, NJ USA
Proceedings of the International Wire and Cable Symposium (50th) Held at Lake Buena Vista, Florida on 12-15 November 2001
Nov. 15, 2001; 842p; In English
Report No.(s): AD-A404389; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche
Proceedings of the International Wire and Cable Symposium is presented from November 12-15 2001.
CASI
Conferences; Fiber Optics; Wire; Communication Cables

20020083331 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA
Advanced Optoelectronic Components for All-Optical Networks ***Final Report, 1 Apr. 1996-15 Jan. 2002***
Shapiro, Jeffrey H.; Haus, Hermann A.; Ippen, Erich P.; Kolodziejski, Leslie A.; Smith, Henry I.; Jul. 19, 2002; 19p; In English
Contract(s)/Grant(s): F49620-96-1-0126
Report No.(s): AD-A405730; AFRL-SR-AR-TR-02-0274; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Under APOSR 'Advanced Optoelectronic Components for All-Optical Networks', we have worked to develop key technologies and components to substantially improve the performance, and potentially lower the cost, of future optical networks. Our multidisciplinary team comprised MIT faculty and research staff whose collective expertise spans optical materials, optical component fabrication, ultrafast optics, optical communications, and network architecture. The specific objectives of our program were to: (1) develop key technology components for all-optical networks that employ time-division multiplexing (TDM); (2) develop key technology components for all-optical networks that employ wavelength division multiplexing (WDM); (3) perform ancillary studies of noise behavior, dispersion management, and other issues relevant to all-optical networks. In this final report we briefly summarize our accomplishments over the entire grant period, 1 April 1996 through 15 January 2002. Many additional details can be found in our annual progress reports, and all our work has been extensively documented in archival journals.
DTIC
Communication Networks; Fabrication; Optical Communication; Optical Materials; Electro-Optics

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics.

20020080740 NASA Goddard Space Flight Center, Greenbelt, MD USA
NASA Thermal Control Technologies for Robotic Spacecraft
Swanson, Theodore D., NASA Goddard Space Flight Center, USA; Biur, Gajanana C., Jet Propulsion Lab., California Inst. of Tech., USA; [2002]; 5p; In English; 12th International Heat Pipe Conference, 19-24 May 2002, Moscow, Russia; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Technology development is inevitably a dynamic process in search of an elusive goal. It is never truly clear whether the need for a particular technology drives its development, or the existence of a new capability initiates new applications. Technology development for the thermal control of spacecraft presents an excellent example of this situation. Nevertheless, it is imperative to have a basic plan to help guide and focus such an effort. Although this plan will be a living document that changes with time to reflect technological developments, perceived needs, perceived opportunities, and the ever-changing funding environment, it is still a very useful tool. This presentation summarizes the current efforts at NASA/Goddard and NASA/JPL to develop new thermal control technology for future NASA missions.
Author
NASA Programs; Robotics; Spacecraft Control; Temperature Control

20020080778 Rutherford Appleton Lab., Chilton UK
CFD Simulations of Convective Heat Transfer in the Atlas SCT End-Cap
Fowler, R. F.; Greenough, C.; Nov. 2001; 36p
Report No.(s): PB2002-106057; RAL-TR-2001-042; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The convective heat transfer process within the End-cap detector of the Atlas SCT (Semiconductor Tracker) has been modeled using the CFD (computational fluid dynamics) package CFX. Predictions of the levels of heat flux across sensitive parts of the detector are given for 2 and 3D (three dimensional) approximations of the actual system.
NTIS
Convective Heat Transfer; Computational Fluid Dynamics; Research Facilities

20020080782 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
An Irreversible Constitutive Law for Modeling the Delamination Process Using Interface Elements
Goyal, Vinay K., Virginia Polytechnic Inst. and State Univ., USA; Johnson, Eric R., Virginia Polytechnic Inst. and State Univ., USA; Davila, Carlos G., NASA Langley Research Center, USA; Jaunky, Navin, Institute for Computer Applications in Science and Engineering, USA; August 2002; 25p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211758; NAS 1.26:211758; ICASE-2002-25; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An irreversible constitutive law is postulated for the formulation of interface elements to predict initiation and progression of delamination in composite structures. An exponential function is used for the constitutive law such that it satisfies a multi-axial stress criterion for the onset of delamination, and satisfies a mixed mode fracture criterion for the progression of delamination. A damage parameter is included to prevent the restoration of the previous cohesive state between the interfacial surfaces. to demonstrate the irreversibility capability of the constitutive law, steady-state crack growth is simulated for quasi-static loading-unloading cycle of various fracture test specimens.
Author
Delaminating; Mathematical Models; Constitutive Equations; Fracture Mechanics; Mechanical Properties

20020080783 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Progressive Failure Studies of Stiffened Panels Subjected to Shear Loading *Final Report*
Ambur, Damodar R., NASA Langley Research Center, USA; Jaunky, Navin, Institute for Computer Applications in Science and Engineering, USA; Hilburger, Mark W., NASA Langley Research Center, USA; August 2002; 25p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01

Report No.(s): NASA/CR-2002-211757; NAS 1.26:211757; ICASE-2002-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experimental and analytical results are presented for progressive failure of stiffened composite panels with and without a notch and subjected to in plane shear loading well into their postbuckling regime. Initial geometric imperfections are included in the finite element models. Ply damage modes such as matrix cracking, fiber-matrix shear, and fiber failure are modeled by degrading the material properties. Experimental results from the test include strain field data from video image correlation in three dimensions in addition to other strain and displacement measurements. Results from nonlinear finite element analyses are compared with experimental data. Good agreement between experimental data and numerical results are observed for the stitched stiffened composite panels studied.

Author

Panels; Loads (Forces); Failure Analysis; Stiffening; Shear Strength; Mechanical Properties

20020080901 NASA Glenn Research Center, Cleveland, OH USA

Measurement and Computation of Supersonic Flow in a Lobed Diffuser-Mixer for Trapped Vortex Combustors

Brankovic, Andreja, Flow Parametrics, LLC, USA; Ryder, Robert C., Jr., Flow Parametrics, LLC, USA; Hendricks, Robert C., NASA Glenn Research Center, USA; Liu, Nan-Suey, NASA Glenn Research Center, USA; Gallagher, John R., NASA Glenn Research Center, USA; Shouse, Dale T., Department of the Air Force, USA; Roquemore, W. Melvyn, Department of the Air Force, USA; Cooper, Clayton S., General Electric Aircraft Engines, USA; Burrus, David L., General Electric Aircraft Engines, USA; Hendricks, John A., Diligent Design, USA; July 2002; 45p; In English; 2001 19th International Congress on Instrumentation in Aerospace Simulation Facilities, 27-30 Aug. 2001, Cleveland, OH, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 910-30-11

Report No.(s): NASA/TM-2002-211127; E-12861; NAS 1.15:211127; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The trapped vortex combustor (TVC) pioneered by Air Force Research Laboratories (AFRL) is under consideration as an alternative to conventional gas turbine combustors. The TVC has demonstrated excellent operational characteristics such as high combustion efficiency, low NO(x) emissions, effective flame stabilization, excellent high-altitude relight capability, and operation in the lean-burn or rich burn-quick quench-lean burn (RQL) modes of combustion. It also has excellent potential for lowering the engine combustor weight. This performance at low to moderate combustor mach numbers has stimulated interest in its ability to operate at higher combustion mach number, and for aerospace, this implies potentially higher flight mach numbers. to this end, a lobed diffuser-mixer that enhances the fuel-air mixing in the TVC combustor core was designed and evaluated, with special attention paid to the potential shock system entering the combustor core. For the present investigation, the lobed diffuser-mixer combustor rig is in a full annular configuration featuring sixfold symmetry among the lobes, symmetry within each lobe, and plain parallel, symmetric incident flow. During hardware cold-flow testing, significant discrepancies were found between computed and measured values for the pitot-probe-averaged static pressure profiles at the lobe exit plane. Computational fluid dynamics (CFD) simulations were initiated to determine whether the static pressure probe was causing high local flow-field disturbances in the supersonic flow exiting the diffuser-mixer and whether shock wave impingement on the pitot probe tip, pressure ports, or surface was the cause of the discrepancies. Simulations were performed with and without the pitot probe present in the modeling. A comparison of static pressure profiles without the probe showed that static pressure was off by nearly a factor of 2 over much of the radial profile, even when taking into account potential axial displacement of the probe by up to 0.25 in. (0.64 cm). Including the pitot probe in the CFD modeling and data interpretation lead to good agreement between measurement and prediction. Graphical inspection of the results showed that the shock waves impinging on the probe surface were highly nonuniform, with static pressure varying circumferentially among the pressure ports by over 10 percent in some cases. As part of the measurement methodology, such measurements should be routinely supplemented with CFD analyses that include the pitot probe as part of the flow-path geometry.

Author

Supersonic Flow; Computation; Flow Measurement; Trapped Vortices; Computational Fluid Dynamics; Combustion Efficiency

20020080918 Tennessee Univ., Space Inst., Tullahoma, TN USA

Heat Flow Measurement

Spinoff 1993; 1993, pp. 123; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Heat gauges are used to measure heat flow in industrial activities. They must periodically be certified by instruments designed to provide a heat flux measurement standard. CSTAR, a NASA CCDS, and REMTECH have developed a portable heat flux

checker/calibrator. The Q-CHEC can be carried to the heat gauge for certification, reducing out of service time for the gauge and eliminating the need for a replacement gauge during certification. It can provide an ”end-to-end” check of the instrumentation measurement system or be used as a standalone calibrator. Because Q-CHEC offers on-site capability to detect and eliminate measurement errors, measurements do not have to be repeated, and money is saved.
Author
Flow Measurement; Heat Flux; Measuring Instruments; Heat Transmission

20020080932 NASA Ames Research Center, Moffett Field, CA USA
Aerospace Engineering Systems
VanDalsem, William R., NASA Ames Research Center, USA; Livingston, Mary E., NASA Ames Research Center, USA; Melton, John E., NASA Ames Research Center, USA; Torres, Francisco J., NASA Ames Research Center, USA; Stremel, Paul M., NASA Ames Research Center, USA; [1999]; 1p; In English; 8th International Symposium on Computational Fluid Dynamics, 5-10 Sep. 1999, Bremen, Stockholm, Aachen, Germany, Sweden, Germany
Contract(s)/Grant(s): RTOP 509-10-11; No Copyright; Avail: Issuing Activity; Abstract Only

Continuous improvement of aerospace product development processes is a driving requirement across much of the aerospace community. As up to 90% of the cost of an aerospace product is committed during the first 10% of the development cycle, there is a strong emphasis on capturing, creating, and communicating better information (both requirements and performance) early in the product development process. The community has responded by pursuing the development of computer-based systems designed to enhance the decision-making capabilities of product development individuals and teams. Recently, the historical foci on sharing the geometrical representation and on configuration management are being augmented: Physics-based analysis tools for filling the design space database; Distributed computational resources to reduce response time and cost; Web-based technologies to relieve machine-dependence; and Artificial intelligence technologies to accelerate processes and reduce process variability. Activities such as the Advanced Design Technologies Testbed (ADTT) project at NASA Ames Research Center study the strengths and weaknesses of the technologies supporting each of these trends, as well as the overall impact of the combination of these trends on a product development event. Lessons learned and recommendations for future activities will be reported.
Author
Aerospace Industry; Product Development; Optimization; Decision Support Systems; Configuration Management; Decision Making

20020080985 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden
Structural Protection for Stationary/Mobile Tactical Behaviour 2001
Hansson, H.; Skoglund, P.; Unosson, M.; Dec. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-107225; FOI-R-0281-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The overall goal for this project is to develop methods and techniques for modeling of weapons effects in order to provide a basis for the development of structural protection for stationary and mobile tactical behavior.
NTIS
Protection; Structural Analysis; Weapons

20020081000 Fluent, Inc., Lebanon, NH USA
Design Tool
1993 Spinoff; 1993, pp. 90-91; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Developed under a Small Business Innovation Research (SBIR) contract, RAMPANT is a CFD software package for computing flow around complex shapes. The package is flexible, fast and easy to use. It has found a great number of applications, including computation of air flow around a Nordic ski jumper, prediction of flow over an airfoil and computation of the external aerodynamics of motor vehicles.
Author
Applications Programs (Computers); Computational Fluid Dynamics; Software Engineering; Aircraft Design; Aerodynamics

20020081233 NASA Glenn Research Center, Cleveland, OH USA
Proceedings of the 11th Thermal and Fluids Analysis Workshop
Sakowski, Barbara, Compiler, NASA Glenn Research Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002; 288p; In English; 11th Thermal and Fluids Analysis Workshop, 21-25 Aug. 2000, Cleveland, OH, USA;

Sponsored by Ohio Aerospace Inst., USA; Also announced as 20020081234 through 20020081255
Contract(s)/Grant(s): RTOP 940-30-09-21
Report No.(s): NASA/CP-2002-211486; E-13254; NAS 1.55:211486; No Copyright; Avail: CASI; C01, CD-ROM; A13, Hardcopy; A03, Microfiche

The Eleventh Thermal & Fluids Analysis WorkShop (TFAWS 2000) was held the week of August 21-25 at The Forum in downtown Cleveland. This year's annual event focused on building stronger links between research community and the engineering design/application world and celebrated the theme "Bridging the Gap Between Research and Design". Dr. Simon Ostrach delivered the keynote address "Research for Design (R4D)" and encouraged a more deliberate approach to performing research with near-term engineering design applications in mind. Over 100 persons attended TFAWS 2000, including participants from five different countries. This year's conference devoted a full-day seminar to the discussion of analysis and design tools associated with aeropropulsion research at the Glenn Research Center. As in previous years, the workshop also included hands-on instruction in state-of-the-art analysis tools, paper sessions on selected topics, short courses and application software demonstrations. TFAWS 2000 was co-hosted by the Thermal/Fluids Systems Design and Analysis Branch of NASA GRC and by the Ohio Aerospace Institute and was co-chaired by Barbara A. Sakowski and James R. Yuko. The annual NASA Delegates meeting is a standard component of TFAWS where the civil servants of the various centers represented discuss current and future events which affect the Community of Applied Thermal and Fluid ANalystS (CATFANS). At this year's delegates meeting the following goals (among others) were set by the collective body of delegates participation of all Centers in the NASA material properties database (TPSX) update: (1) developing and collaboratively supporting multi-center proposals; (2) expanding the scope of TFAWS to include other federal laboratories; (3) initiation of a white papers on thermal tools and standards; and (4) formation of an Agency-wide TFAWS steering committee.
Author
Conferences; Design Analysis; Systems Engineering; Thermal Analysis

20020081234 ZIN Technologies, Inc., Brook Park, OH USA
On the Adaptation of the ADI-Brian Method to Solve the Advection-Diffusion Transport Equation
Schrage, Dean S., ZIN Technologies, Inc., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 1-15; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The focus of the present study is a semi-direct solution to the linearized Burger's advection-diffusion (AD) equation using alternating direction implicit (ADI) methods. In particular, the paper features the adaptation of the Brian ADI method, originally designed for stable three dimensional (3D) solutions of the parabolic heat equation, to include the advection component of the Burgers equation. The present study presents a method to split up the advection component in a manner which is consistent with the splitting of the diffusive terms in the Brian method. Upon implementing upwind differencing, this new method offers very robust stability margins and is capable of issuing stable solutions at Courant numbers exceeding 10. The upwind scheme applies only the left or right diagonals of the ADI coefficient matrix to register the advection term depending on the direction of the velocity vector. For this reason, upwind differencing is an ideal starting point for the ADI solution method because ADI methods depend on a direct inversion of a tri-diagonal coefficient matrix. However, for large Peclet numbers, the advection term dominates the diffusion term in the Burgers equation and the solution is hampered by the classical numerical diffusion induced by upwind differencing. This motivates the search for enhanced differencing schemes which can be implemented with the ADI method. A central differencing scheme produces second-order spatial accuracy and can be differenced within the tri-diagonal band and eliminates numerical diffusion, but generates dispersion errors. To mitigate both diffusion and dispersion errors, third-order upwind differencing is implemented. Third-order upwinding requires four points (i - 2, i - 1, i, i + 1). In the tri-diagonally bound ADI method, the fourth point (i - 2) is registered as a source term using the belated ADI state. Effectively, the third-order upwinding is implemented as either central differencing with a smoother or upwind differencing with a sharpener. Both give the same numerical results. All three advection differencing methods are compared to a showcase of steady and transient exact solutions to the Burgers equation which demonstrates the combined utility of the new advection method with an ADI solution engine.
Author
Alternating Direction Implicit Methods; Burger Equation; Finite Difference Theory; Upwind Schemes (Mathematics); Transport Theory; Advection; Diffusion

20020081235 Rensselaer Polytechnic Inst., Isermann Dept. of Chemical Engineering, Troy, NY USA
Initial Thermal Modeling of the Constrained Vapor Bubble Heat Exchanger Using TSS/SINDA
Basu, S., Rensselaer Polytechnic Inst., USA; Wayner, P. C., Jr., Rensselaer Polytechnic Inst., USA; Plawsky, J. L., Rensselaer Polytechnic Inst., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 17-25; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Heat transfer systems operating under interfacial free-energy gradients to control the fluid flow are simple and light due to the absence of mechanical pumps. These have been proposed as reliable cooling systems in microgravity environments (Wayner, 1999). The Constrained Vapor Bubble (CVB) heat exchanger is being designed as a microgravity (mu-g) fluid physics experiment for the Fluids Integrated Rack (FIR) aboard the International Space Station (ISS). The aim of this study is to characterize the heat flow mechanisms of such a device operating as a wickless heat pipe, using the Thermal Synthesizer System/Systems Improved Numerical Differencing Analyzer (TSS/SINDA) software. The geometry and nodal meshwork was created using TSS, the graphics interface to SINDA. A SINDA (thermal) model was created to study steady state and transient solutions to heat transfer under the influence of conduction, convection and radiation. Experiments were performed with the CVB in vacuum and air, for various power inputs. An initial thermal model using TSS-SINDA is presented for the dry, evacuated CVB cell. The temperature profile data collected from the experiments were compared to the results of the model to provide significant insights to the losses due to radiation and convection. In view of expected flight-data trends (where convection is essentially negligible), the importance of radiation is discussed. The presence of a good heater-insulation is essential for high heat input to the cell.
Author
Heat Transfer; Heat Exchangers; Thermal Analysis; Mathematical Models; Heat Transmission; Heat Pipes

20020081236 NASA Glenn Research Center, Cleveland, OH USA
An Analysis and Procedure for Determining Space Environmental Sink Temperatures with Selected Computational Results
Juhasz, Albert J., NASA Glenn Research Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 27-35; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The purpose of this paper is to analyze the heat transfer problem posed by the determination of spacecraft temperatures and to incorporate the theoretically derived relationships into a computational code. Subject code is based on a theoretical analysis of thermal radiative equilibrium in space, particularly in the Solar System. Starting with the solar luminosity, the code takes into account a number of key variables, namely: the spacecraft-to-Sun distance expressed in AU (Astronomical Units), with 1 AU representing the average Sun-to-Earth distance of 149.6 million km; the angle (degrees of arc) at which solar radiation is incident on a spacecraft surface, the temperature of which is to be determined (i.e., a radiator or PV (photovoltaic) array); the absorptivity-to-emissivity ratio of the surface, alpha/epsilon, with respect to solar radiation; and the view factor of the surface to space.
Author
Heat Transfer; Spacecraft Temperature; Thermodynamic Equilibrium; Ambient Temperature; Aerospace Environments

20020081239 NASA Marshall Space Flight Center, Huntsville, AL USA
Modeling Specular Exchange Between Concentric Cylinders in a Radiative Shielded Furnace
Schunk, R. Gregory, NASA Marshall Space Flight Center, USA; Wessling, Francis C., Alabama Univ., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 57-80; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The objective of this research is to develop and validate mathematical models to characterize the thermal performance of a radiative shielded furnace, the University of Alabama in Huntsville (UAH) Isothermal Diffusion Oven. The mathematical models are validated against experimental data obtained from testing the breadboard oven in a terrestrial laboratory environment. Development of math models to characterize the thermal behavior of the furnace is a challenging task due to the complexity of the interacting heat transfer modes. Important considerations in the analysis of the furnace include heat losses through power and instrumentation cables, buoyancy driven flows through and around exposed surfaces of the furnace, and specular radiation effects within the furnace. Due in part to the large aspect ratios of the cylindrical cavities formed by the radial shields within the furnace, a diffuse radiation exchange model was initially assumed with qualitative error bounds established through a simplified model of the furnace core and innermost shield. An improved correlation to the experimental data is obtained by directly modeling the specular radiative exchange between the radial shields of the furnace.
Author
Concentric Cylinders; Diffuse Radiation; Furnaces; Mathematical Models; Radiation Shielding; Radiative Heat Transfer; Ovens

20020081241 NASA Glenn Research Center, Cleveland, OH USA
Remote Thermal Analysis Through the Internet
Malroy, Eric T., NASA Glenn Research Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 95-105; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Heater of the Hypersonic Tunnel Facility (HTF) was modeled using SINDA/FLUINT thermal software. A description of the model is given. The project presented the opportunity of interfacing the thermal model with the Internet and was a demonstration that complex analysis is possible through the Internet. Some of the issues that need to be addressed related to interfacing software with the Internet are the following: justification for using the Internet, selection of the web server, choice of the CGI language, security of the system, communication among the parties, maintenance of state between web pages, and simultaneous users on the Internet system. The opportunities available for using the Internet for analysis are many and can present a significant jump in technology. This paper presents a vision how interfacing with the Internet could develop in the future. Using a separate Optical Internet (OI) for analysis, coupled with virtual reality analysis rooms (VRAR), could provide a synergistic environment to couple together engineering analysis within industry, academia, and government. The process of analysis could be broken down into sub-components so that specialization could occur resulting in superior quality, minimized cost and reduced time for engineering analysis and manufacturing. Some possible subcomponents of the system are solver routines, databases, Graphical User Interfaces, engineering design software, VRARs, computer processing, CAD systems, manufacturing, and a plethora of other options only limited by ones imagination. On a larger scope, the specialization of companies on the optical network would allow companies to rapidly construct and reconstruct their infrastructure based on changing economic conditions. This could transform business.
Author
Finite Difference Theory; Graphical User Interface; Internets; Thermal Analysis; Computer Aided Design; Internet Resources; Design Analysis; Human-Computer Interface

20020081242 Concepts ETI, Inc., White River Jct, VT USA
Correlation of Annular Diffuser Performance with Geometry, Swirl, and Blockage
Japikse, David, Concepts ETI, Inc., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 107-118; In English; Also announced as 20020081233; Copyright; Avail: Issuing Activity

A correlation equation set for annular diffuser performance has been developed. The relationships are based on all of the experimental data available from the known open literature that covers basic diffuser geometry, inlet aerodynamic swirl, and inlet aerodynamic blockage. A sensible baseline correlation has been established which is suitable for preliminary design of some turbine systems. It has also been established, however, that the existing world's technical literature is deficient in a number of important variables and a resultant level of data variance has been established which ought to be reduced in future investigations. This paper establishes a baseline for current work and goals for future development.
Author
Data Correlation; Diffusers; Annular Nozzles; Parameter Identification; Flow Geometry; Annular Flow

20020081243 Prairie View Agricultural and Mechanical Coll., Dept. of Mechanical Engineering, TX USA
The Effect of Orientation on Flow Boiling in Single-Side Heated Channels
Boyd, Ronald D., Sr., Prairie View Agricultural and Mechanical Coll., USA; Peatiwala, Quaid; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 119-127; In English; Also announced as 20020081233
Contract(s)/Grant(s): NAG9-631; DEFG03-97ER54452; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

As part of a study on factors affecting the flow boiling in vertical tubes, the two-dimensional wall temperature profiles and the boiling heat transfer coefficient were measured for downward flowing Freon-11 in vertical channels for a single-side heating configuration. The results obtained were compared with identical test runs for Freon-11 flowing in horizontal channels with a top-side heating configuration. The single-side heated experiments show a significant effect of flow direction on local outside wall temperatures, the local (axial) heat transfer coefficient, and the averaged heat transfer coefficient.
Author
Boiling; Heat Transfer Coefficients; Temperature Profiles; Wall Temperature; Heat Transfer; Tubes; Vertical Orientation

20020081244 Aero-Electronic Leasing Corp., Glen Head, NY USA
Mathematical Physics of the Propagation of a Laminar Aerodynamic Boundary Layer, Using the Kinetic Theory of Gases
deGraffenried, Albert L., Aero-Electronic Leasing Corp., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 129-142; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The paper presents a derivation showing the propagation mechanisms fundamental to the growth of the laminar aerodynamic boundary layer. The molecular mechanisms basic to such growth are those presented by James Clerk Maxwell in his classic derivation of mu, the viscosity of a gas, based on the Kinetic Theory of Gases. Maxwell's derivation is modified by moving the scene of the analysis from a free-stream location (where he assumes a linear velocity gradient) to a location immediately adjacent

an infinite flat plate, using an unknown velocity profile. Gas, initially quiescent above the flat plate, suddenly jumps to velocity U(sub 0) at time t=0+. The resultant growth of a boundary-layer velocity profile, v(sub x)(y,t), is solved for in the following manner: a. Phi-up, the stream momentum crossing an element of area, da=dxdz per second per square centimeter, in an upward (+y) direction, is found by integrating through all volume below da, using an unknown velocity profile, v(sub x)(y,t). Similarly, Phi-down, the stream momentum crossing da in a downward (-y) direction is found by integrating through all volume above da. The net stream momentum, Phy(y) equals Phi-up minus Phi-down. The acceleration, dv(sub x)/dt of an element of mass dm, equal to rho times dxdydz is set equal to minus the partial of Phi with respect to y, the net momentum-flux gradient, based on Newton's Law. In cylindrical coordinates, azimuth angle gamma is promptly integrated out. Elevation angle theta is integrated-out numerically, using a short BASIC program on a PC. Separation of Variables is assumed, specifically, v(sub x)(y,t) may be set equal to f1(y)f2(t), thus producing two separate integro-differential equations which are each set equal to a common constant, -Beta(exp 2). LaPlace transforming these two equations into the s(sub y) and s(sub t) domains, applying the Method of Partial Fractions to the s(sub y) equation, the FORM of the solution is found, viz., exponential and hyperbolic functions. Boundary conditions are satisfied in order to provide a closed solution. The first experimental fall-out from this long-term boundary-layer-growth research project is: "BoundaryLayer-Growth Suppression" (BLG-S), a new boundary-layer control technique yielding more than 30% reduction in Profile Drag Coefficient of an infinite-aspect-ratio wing at low subsonic speeds, in the Hofstra University laminar-flow wind tunnel. It is hoped that this new molecular analytical approach to boundary-layer growth will be able to mature and merge with current Computer Fluid Dynamics software, in order to provide a more realistic family of solutions, as well as a clearer picture of the molecular mechanisms present in the flow pattern.
Author
Aerodynamic Drag; Boundary Layer Control; Drag Reduction; Gas Viscosity; Kinetic Theory; Laminar Boundary Layer; Theoretical Physics

20020081246 Alabama Agricultural and Mechanical Univ., Dept. of Civil Engineering, Normal, AL USA
A Modified NPARC Code: The Burnett Equations Solver
Guo, K. L., Alabama Agricultural and Mechanical Univ., USA; Liaw, G. S., Alabama Agricultural and Mechanical Univ., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 161-172; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The conventional continuum Navier-Stokes equations gradually deteriorate when Kn is greater than 0.01 because the transitional nonequilibrium effect begins to prevail. Therefore, the Navier-Stokes equations fail to predict the transitional flows accurately. In the past, many researchers have indicated that the Burnett equations can provide better solutions than the Navier-Stokes equations. In this study, the NPARC code was modified to solve the Burnett solutions for near-continuum flows. Tests were conducted for flows over an ellipsoid and a blunt body at high speeds. The limitation and characteristics of the Burnett equations, Knudsen layer wall boundary conditions (slip velocity and temperature jump), numerical procedure and stability analysis are discussed. Comparisons of Burnett solutions and Navier-Stokes solutions and the DSMC results show that the Burnett equations can provide more accurate results than the Navier-Stokes equations in the near-continuum flow.
Author
Burnett Equations; Computerized Simulation; Continuum Flow; Systems Stability; Knudsen Flow; Transition Flow

20020081325 General Electric Aircraft Engines, Cincinnati, OH USA
Acoustic and Laser Doppler Anemometer Results for Confluent, 22-Lobed, and Unique-Lobed Mixer Exhaust Systems for Subsonic Jet Noise Reduction *Final Report*
Salikuddin, M., General Electric Aircraft Engines, USA; Martens, S., General Electric Aircraft Engines, USA; Shin, H., General Electric Aircraft Engines, USA; Majjigi, R. K., General Electric Aircraft Engines, USA; September 2002; 200p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-26617; RTOP 781-30-12
Report No.(s): NASA/CR-2002-211598; NAS 1.26:211598; E-13385; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The objective of this task was to develop a design methodology and noise reduction concepts for high bypass exhaust systems which could be applied to both existing production and new advanced engine designs. Special emphasis was given to engine cycles with bypass ratios in the range of 4:1 to 7:1, where jet mixing noise was a primary noise source at full power takeoff conditions. The goal of this effort was to develop the design methodology for mixed-flow exhaust systems and other novel noise reduction concepts that would yield 3 EPNdB noise reduction relative to 1992 baseline technology. Two multi-lobed mixers, a 22-lobed axisymmetric and a 21-lobed with a unique lobe, were designed. These mixers along with a confluent mixer were tested with several fan nozzles of different lengths with and without acoustic treatment in GEAE's Cell 41 under the current subtask (Subtask

C). In addition to the acoustic and LDA tests for the model mixer exhaust systems, a semi-empirical noise prediction method for mixer exhaust system is developed. Effort was also made to implement flowfield data for noise prediction by utilizing MGB code. In general, this study established an aero and acoustic diagnostic database to calibrate and refine current aero and acoustic prediction tools.
Author
Acoustics; Laser Doppler Velocimeters; Exhaust Systems; Jet Aircraft Noise; Engine Design; Noise Reduction; Laser Anemometers; Aerodynamic Noise

20020081336 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. fuer Antriebstechnik, Cologne, Germany
Experimental Investigation of a Non-Equilibrium Expansion Flow After Hydrogen/Air Combustion in Hypersonic Ramjet Engines *Experimentelle Untersuchungen zur Nichgleichgewichsexpansionsstroemung Nach Wasserstoff/Luft-Verbrennung in Hyperschall Staustrahitriebwerken*
Weisgerber, Hedwig, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; 2002; ISSN 1434-8454; 148p; In German
Report No.(s): DLR-FB-2002-03; Copyright; Avail: Issuing Activity

The exhaust gas flow in the model thrust nozzle under investigation is characterized by chemical and thermal (vibrational) non-equilibrium which is experimentally detected by differing rotational and vibrational temperatures in the supersonic region of the nozzle. An analytical method to determine the vibrational relaxation time from expansion experiments is presented and validated using literature data. The nitrogen vibrational temperature at the nozzle exit strongly depends on the relaxation time of collisions with water molecules; for this process a correlation from the literature is selected. The measurements are completed by an experimental and numerical analysis of velocimetry tracer particle motion in flows with strong velocity gradients and an experimental investigation of the causes and effects of laser beam distortions occurring in high enthalpy flows. So a reliable database is presented for a reacting flow in a model nozzle of rectangular cross-section which was already successfully used to validate a CFD code including the model of thermal non-equilibrium effects.
Author
Computational Fluid Dynamics; Numerical Analysis; Ramjet Engines; Hypersonic Nozzles; Nonequilibrium Flow; Combustion; Hydrogen Fuels; Nozzle Design

20020082905 General Electric Aircraft Engines, Cincinnati, OH USA
Acoustic and Laser Doppler Anemometer Results for Confluent and 12-Lobed E(exp 3) Mixer Exhaust Systems for Subsonic Jet Noise Reduction *Final Report*
Salikuddin, M., General Electric Aircraft Engines, USA; Babbit, R. R., General Electric Aircraft Engines, USA; Shin, H., General Electric Aircraft Engines, USA; Wisler, S., General Electric Aircraft Engines, USA; Janardan, B. A., General Electric Aircraft Engines, USA; Majjigi, R. K., General Electric Aircraft Engines, USA; September 2002; 171p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-26617; RTOP 781-30-12
Report No.(s): NASA/CR-2002-211597; E-13387; NAS 1.26:211597; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The research described in this report has been funded by NASA Glenn Research Center as part of the Advanced Subsonic Technologies (AST) initiative. The program operates under the Large Engine Technologies (LET) as Task Order #3 1. Task Order 31 is a three year research program divided into three subtasks. Subtask A develops the experimental acoustic and aerodynamic subsonic mixed flow exhaust system databases. Subtask B seeks to develop and assess CFD-based aero-acoustic methods for subsonic mixed flow exhaust systems. Subtask B relies on the data obtained from Subtask A to direct and calibrate the aero-acoustic methods development. Subtask C then seeks to utilize both the aero-acoustic data bases developed in Subtask A and the analytical methods developed in Subtask B to define improved subsonic mixed-flow exhaust systems. The mixed flow systems defined in Subtask C will be experimentally demonstrated for improved noise reduction in a scale model aero-acoustic test conducted similarly to the test performed in Subtask A. The overall object of this Task Order is to develop and demonstrate the technology to define a -3EPNdB exhaust system relative to 1992 exhaust system technology.
Author
Acoustic Measurement; Laser Doppler Velocimeters; Noise Reduction; Scale Models; Exhaust Systems; Subsonic Flow; Jet Aircraft Noise

20020082919 NASA Glenn Research Center, Cleveland, OH USA
Damping of Quasi-Stationary Waves Between Two Miscible Liquids
Duval, Walter M. B., NASA Glenn Research Center, USA; July 2002; 13p; In English; 40th Aerospace Sciences Meeting and

Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAG3-2443; RTOP 101-53-00
Report No.(s): NASA/TM-2002-211694; NAS 1.15:211694; E-13425; AIAA Paper 2002-0890; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two viscous miscible liquids with an initially sharp interface oriented vertically inside a cavity become unstable against oscillatory external forcing due to Kelvin-Helmholtz instability. The instability causes growth of quasi-stationary (q-s) waves at the interface between the two liquids. We examine computationally the dynamics of a four-mode q-s wave, for a fixed energy input, when one of the components of the external forcing is suddenly ceased. The external forcing consists of a steady and oscillatory component as realizable in a microgravity environment. Results show that when there is a jump discontinuity in the oscillatory excitation that produced the four-mode q-s wave, the interface does not return to its equilibrium position, the structure of the q-s wave remains imbedded between the two fluids over a long time scale. The damping characteristics of the q-s wave from the time history of the velocity field show overdamped and critically damped response; there is no underdamped oscillation as the flow field approaches steady state. Viscous effects serve as a dissipative mechanism to effectively damp the system. The stability of the four-mode q-s wave is dependent on both a geometric length scale as well as the level of background steady acceleration.
Author
Viscous Flow; Liquids; Kelvin-Helmholtz Instability; Flow Distribution; S Waves; Velocity Distribution

20020082924 NASA Glenn Research Center, Cleveland, OH USA
Response Surface Modeling of Combined-Cycle Propulsion Components using Computational Fluid Dynamics
Steffen, C. J., Jr., NASA Glenn Research Center, USA; March 2002; 20p; In English; 40th Aerospace Sciences Meeting and Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 708-90-63
Report No.(s): NASA/TM-2002-211379; NAS 1.15:211379; E-13204; AIAA Paper 2002-0542; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Three examples of response surface modeling with CFD are presented for combined cycle propulsion components. The examples include a mixed-compression-inlet during hypersonic flight, a hydrogen-fueled scramjet combustor during hypersonic flight, and a ducted-rocket nozzle during all-rocket flight. Three different experimental strategies were examined, including full factorial, fractionated central-composite, and D-optimal with embedded Plackett-Burman designs. The response variables have been confined to integral data extracted from multidimensional CFD results. Careful attention to uncertainty assessment and modeling bias has been addressed. The importance of automating experimental setup and effectively communicating statistical results are emphasized.
Author
Computational Fluid Dynamics; Rocket Nozzles; Hypersonic Flight; Factorials; Ducted Rocket Engines; Combustion Chambers

20020082935 NASA Glenn Research Center, Cleveland, OH USA
Sixth Microgravity Fluid Physics and Transport Phenomena Conference Abstracts
Singh, Bhim, Compiler, NASA Glenn Research Center, USA; August 2002; 303p; In English, 14-16 Aug. 2002, Cleveland, OH, USA; Sponsored by NASA Glenn Research Center, USA
Contract(s)/Grant(s): RTOP 101-58-0A
Report No.(s): NASA/TM-2002-211211; NAS 1.15:211211; E-13063; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The Sixth Microgravity Fluid Physics and Transport Phenomena Conference provides the scientific community the opportunity to view the current scope of the Microgravity Fluid Physics and Transport Phenomena Program, current research opportunities, and plans for the near future. The conference focuses not only on fundamental research but also on applications of this knowledge towards enabling future space exploration missions. A whole session dedicated to biological fluid physics shows increased emphasis that the program has placed on interdisciplinary research. The conference includes invited plenary talks, technical paper presentations, poster presentations, and exhibits. This TM is a compilation of abstracts of the papers and the posters presented at the conference. Web-based proceedings, including the charts used by the presenters, will be posted on the web shortly after the conference.
Author
Microgravity; Fluid Dynamics; Transport Properties

20020083017 California Univ., Berkeley, CA USA

Microelectromechanical Systems (MEMS)-Based Microcapillary Pumped Loop for Chip-Level Temperature Control ***Final Report, 1 Sep. 1997-1 Jan. 2001***

Kirshberg, Jeffrey A.; Jan. 2002; 108p; In English

Contract(s)/Grant(s): F33615-97-1-2788; Proj-1651

Report No.(s): AD-A405777; AFRL-PR-WP-TR-2002-2062; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Utilizing current microelectromechanical systems (MEMS) technologies, a three-port microcapillary pumped loop (micro-CPL) was designed, fabricated, and tested to provide integral cooling to electronics of MEMS-type devices. The two-wafer design consists of one silicon and one borofloat glass wafer. An analytical study, adopted from traditional CLP theory, was used in determining the geometry of the device, including the evaporator dimensions (1000 by 2000 micrometers) and the length of the liquid and vapor lines (35 mm). Using laser spot heating, the finished device was run near steady state. The micro-CPL resulted in a backside cooling effect of a least 7 K when a laser delivering 7.5 W (+/- 0.2 W) with a spot-Size diameter of 1.0 mm was focused on the front side of the evaporator region.

DTIC

Heat Pumps; Microelectromechanical Systems; Temperature Control

20020083021 NASA Glenn Research Center, Cleveland, OH USA

Turbulence Measurements of Separate Flow Nozzles with Mixing Enhancement Features

Bridges, James, NASA Glenn Research Center, USA; Wernet, Mark P., NASA Glenn Research Center, USA; June 2002; 16p; In English; Eighth Aeroacoustics Conference, 17-19 Jun. 2002, Breckenbridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 781-30-12

Report No.(s): NASA/TM-2002-211592; E-13376; NAS 1.15:211592; AIAA Paper 2002-2484; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Comparison of turbulence data taken in three separate flow nozzles, two with mixing enhancement features on their core nozzle, shows how the mixing enhancement features modify turbulence to reduce jet noise. The three nozzles measured were the baseline axisymmetric nozzle 3BB, the alternating chevron nozzle, 3A12B, with 6-fold symmetry, and the flipper tab nozzle 3T24B also with 6-fold symmetry. The data presented show the differences in turbulence characteristics produced by the geometric differences in the nozzles, with emphasis on those characteristics of interest in jet noise. Among the significant findings: the enhanced mixing devices reduce turbulence in the jet mixing region while increasing it in the fan/core shear layer, the ratios of turbulence components are significantly altered by the mixing devices, and the integral lengthscales do not conform to any turbulence model yet proposed. These findings should provide guidance for modeling the statistical properties of turbulence to improve jet noise prediction.

Author

Turbulent Flow; Jet Mixing Flow; Flow Measurement; Noise Reduction; Jet Aircraft Noise; Fluid Jets

20020083073 Naval Postgraduate School, Monterey, CA USA

Analysis of Turbulence Models in a Cross Flow Pin Fin Micro-Heat Exchanger

Lind, Eric K.; Jun. 2002; 59p; In English; Original contains color images

Report No.(s): AD-A405837; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this study, several turbulence models are analyzed in a 3-D finite element model of a micro-heat exchanger. The micro-heat exchanger consists of a narrow planar flow passage between parallel walls with small cylindrical pin fins spanning these walls with axes perpendicular to the direction of flow. Turbulence model performance is compared with baseline experimental data available in the literature that cover a range of low turbulent Reynolds numbers and spacing configurations. The metric for these comparisons is an array averaged Nusselt Number. Adjustments made to the coefficients in the turbulence models are explained in terms of their physical significance to the complex flow environment of a pin fin, cross flow, micro-heat exchanger. Applications of this research include cooling of turbine blades and of closely spaced electronics.

DTIC

Turbulence; Heat Exchangers; Cross Flow; Three Dimensional Models; Turbulence Models; Turbine Blades

20020083339 Massachusetts Inst. of Tech., Cambridge, MA USA

Unsteady Separation Point Injection for Pressure Recovery Improvement in High Subsonic Diffusers

McElwain, Brian D.; Jun. 2002; 157p; In English; Original contains color images

Contract(s)/Grant(s): F49620-00-C-0035

Report No.(s): AD-A405746; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Serpentine inlet ducts on modem tactical aircraft distort the inlet flow and decrease pressure recovery at the aerodynamic interface plane (AIP). Current inlet designs are more aggressive, increasing distortion and decreasing pressure recovery at the AIP. Often the flow separates from the wall of the diffuser, creating most of the distortion and pressure loss in the inlet. Diffuser separation experiments were conducted at high subsonic cruise conditions in a 2D test section. Periodic injection tangential to the flow at the separation point improved downstream pressure recovery. The injection also increased static pressure measured at the test section walls in the separated region. Flow visualization tests indicated that the separation shrinks as the injection mass flow increases. Pressure recovery also increased as injection mass flow increased. The unsteady component of the injection flow remained constant with injection mass flow, indicating that the steady component of the injection enhanced control of the separation. The preliminary conclusion is that the average velocity of the injection flow should be at least equivalent to the velocity of the core flow to maximize pressure recovery. Experiments were also conducted in a one-sixth scale tactical aircraft diffuser at cruise conditions (3.1 lb/sec, maximum M = 0.65). Periodic injection at the separation point improved the pressure recovery at the AIP. The improvement in pressure recovery at the AIP was limited to the area of pressure loss due to the separation in the diffuser. The diffuser has strong secondary flows that also cause losses at the AIP. These secondary flows prevented the injection from restoring pressure recovery as well as it had in the 2D test section. Higher injection mass flows than in the 2D case were required to achieve the same degree of improvement in pressure recovery at the AIP.

DTIC

Injection; Subsonic Flow; Diffusers; Engine Inlets; Separated Flow

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Avionics and Aircraft Instrumentation; and 19 Spacecraft Instrumentation.

20020080803 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Low LET Radiation Spectrometer for Measuring Particle Doses in Space and Aircraft

Stassinopoulos, E. G., NASA Goddard Space Flight Center, USA; Stauffer, C. A., Stinger Ghaffarian Technologies, USA; Brucker, G. J., REC, Inc., USA; Dachev, T. P., Bulgarian Academy of Sciences, Bulgaria; Mar. 20, 2002; 14p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents experimental data that demonstrates the feasibility of fabricating a miniature nuclear particle dosimeter for monitoring doses in aircraft and satellites. The basic instrument is a Low Linear-Energy-Transfer (LET) Radiation Spectrometer (LoLRS) that is designed to measure the energy deposited by particles with low LET values. The heart of the instrument is a Silicon-Lithium Drifted Diode (SLDD). Test results show that the LoLRS can be used to monitor the radiation threat to personnel in flights of space- and aircraft and also to generate a comprehensive data base from aviation and satellite measurements that can contribute to the formulation of more accurate environmental radiation models for dose predictions with reduced uncertainty factors.

Author

Linear Energy Transfer (LET); Spectrometers; Dosimeters; Miniaturization; Nuclear Particles; Particle Energy

20020080822 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden

Transient Detection a Comparison Between the Quantile Detector and Two Higher Order Statistic Detectors

Nedgaerd, I.; Mar. 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-107038; FOA-R-00-01431-409-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Detectors based on Higher Order Statistics have frequently been used to detect transient signals buried in noise. In this report we compare two of these detectors, namely the normalized kurtosis detector and the normalized Skewness detector, with the Quantile detection (developed from a technique to estimate stable distribution parameters). There are many situations where we

are interested in detection of transient signals (i.e. nonstationary signals of short duration). One situation would be early warnings preceding major earthquakes, another situation is weather forecast by detection of electromagnetic lightning, and a third situation is monitoring a process control signal for stationarity. In a previously published report we have shown that Quantile detector only detects signals with high tail amplitude distribution and will ignore signals with more central amplitude distribution. A simulation study involving five different test signals in Gaussian noise was made. Two signals are transients (short duration pulses and sinusoid with exponentially decaying amplitude envelope) and three are of greater duration (sinusoid, square wave and chirp). All five signals were studied at three signal-to-noise levels. The detectors were also tested for the no signal situation by applying them to a noise realization different to the one used to set the thresholds. This was done to test for robustness against false alarms. The study shows that the Quantile detector well outperforms the normalized Skewness detector and the normalized kurtosis detector in detection of the transient signals in Gaussian noise. Other short time stationary signals of high energy may be present in the environment without risk to be detected as transients. This makes the Quantile detector very interesting to discern transients for further special study and classification.
NTIS
Signal Processing; Kurtosis; Comparison; Statistical Distributions

20020080835 Japan Broadcasting Corp., Display and Optical Devices, Tokyo, Japan
High-Definition Three-Dimension Camera: HDTV Version of an AXI-Vision Camera
Kawakita, Masahiro, Japan Broadcasting Corp., Japan; Kurita, Taiichro, Japan Broadcasting Corp., Japan; Kikuchi, Hiroshi, Japan Broadcasting Corp., Japan; Yamanouchi, Yuko, Japan Broadcasting Corp., Japan; Inoue, Seiki, Japan Broadcasting Corp., Japan; Iizuka, Keigo, Toronto Univ., Canada; August 2002; ISSN 0027-657X; 16p; In English; Copyright; Avail: Issuing Activity

We have developed a novel high-definition version of a three-dimension camera (an HDTV version of an Axi-vision camera) that can simultaneously capture both the HDTV colour image and the depth image of a scene at a video frame rate. The depth image is obtained by using intensity-modulated illuminators with a near-infrared spectrum combined with a high-resolution camera with an ultra-fast shutter using an image intensifier. A high signal-to-noise ratio of the depth image, which is necessary to realize this HDTV version of the Axi-vision camera, has been achieved by (1) a new highly sensitive image intensifiers (2) novel optics, and (3) high power light emitting diode array illuminators. As a result, the camera can capture a depth image with more than 920,000 pixels at a frame rate of 29.97 Hz or one with 410,000 pixels at a frame rate of 59.94 Hz. Such high performance makes this camera suitable for practical applications such as post-production in a virtual studio where images of objects at a specific distance can be selectively extracted and synthesized with other images in real time.
Author
Cameras; High Definition Television; Illuminators; Image Resolution; Imaging Techniques; Space Perception

20020080903 NASA Goddard Space Flight Center, Greenbelt, MD USA
Design and Fabrication of Two-Dimensional Semiconducting Bolometer Arrays for the High Resolution Airborne Wideband Camera (HAWC) and the Submillimeter High Angular Resolution Camera II (SHARC-II)
Voellmer, George M., NASA Goddard Space Flight Center, USA; Allen, Christine A., NASA Goddard Space Flight Center, USA; Amato, Michael J., NASA Goddard Space Flight Center, USA; Babu, Sachidananda R., NASA Goddard Space Flight Center, USA; Bartels, Arlin E., NASA Goddard Space Flight Center, USA; Benford, Dominic J., NASA Goddard Space Flight Center, USA; Derro, Rebecca J., NASA Goddard Space Flight Center, USA; Dowell, C. Darren, California Inst. of Tech., USA; Harper, D. Al, Chicago Univ., USA; Jhabvala, Murzy D., NASA Goddard Space Flight Center, USA; [2002]; 10p; In English; SPIE Conference of Astronomical Telescopes and Instrumentation, 22-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The High resolution Airborne Wideband Camera (HAWC) and the Submillimeter High Angular Resolution Camera II (SHARC 11) will use almost identical versions of an ion-implanted silicon bolometer array developed at the National Aeronautics and Space Administration's Goddard Space Flight Center (GSFC). The GSFC "Pop-Up" Detectors (PUD's) use a unique folding technique to enable a 12 x 32-element close-packed array of bolometers with a filling factor greater than 95 percent. A kinematic Kevlar(Registered Trademark) suspension system isolates the 200 mK bolometers from the helium bath temperature, and GSFC - developed silicon bridge chips make electrical connection to the bolometers, while maintaining thermal isolation. The JFET preamps operate at 120 K. Providing good thermal heat sinking for these, and keeping their conduction and radiation from reaching the nearby bolometers, is one of the principal design challenges encountered. Another interesting challenge is the preparation of the silicon bolometers. They are manufactured in 32-element, planar rows using Micro Electro Mechanical Systems (MEMS) semiconductor etching techniques, and then cut and folded onto a ceramic bar. Optical alignment using specialized jigs

ensures their uniformity and correct placement. The rows are then stacked to create the 12 x 32-element array. Engineering results from the first light run of SHARC II at the CalTech Submillimeter Observatory (CSO) are presented.
Author
Semiconductors (Materials); Bolometers; High Resolution; Angular Resolution; Cameras; Microelectromechanical Systems

20020081039 Universities Space Research Association, Greenbelt, MD USA
Dip Spectroscopy of the Low Mass X-Ray Binary XB 1254-690
Smale, Alan P., NASA Goddard Space Flight Center, USA; Church, M. J., Birmingham Univ., UK; BalucinskaChurch, M., Birmingham Univ., UK; [2002]; 18p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We observed the low mass X-ray binary XB 1254-690 with the Rossi X-ray Timing Explorer in 2001 May and December. During the first observation strong dipping on the 3.9-hr orbital period and a high degree of variability were observed, along with ”shoulders” approx. 15% deep during extended intervals on each side of the main dips. The first observation also included pronounced flaring activity. The non-dip spectrum obtained using the PCA instrument was well-described by a two-component model consisting of a blackbody with kT = 1.30 +/- 0.10 keV plus a cut-off power law representation of Comptonized emission with power law photon index 1.10 +/- 0.46 and a cut-off energy of 5.9(sup +3.0, sub -1.4) keV. The intensity decrease in the shoulders of dipping is energy-independent, consistent with electron scattering in the outer ionized regions of the absorber. In deep dipping the depth of dipping reached 100%, in the energy band below 5 keV, indicating that all emitting regions were covered by absorber. Intensity-selected dip spectra were well-fit by a model in which the point-like blackbody is rapidly covered, while the extended Comptonized emission is progressively overlapped by the absorber, with the, covering fraction rising to 95% in the deepest portion of the dip. The intensity of this component in the dip spectra could be modeled by a combination of electron scattering and photoelectric absorption. Dipping did not occur during the 2001 December observation, but remarkably, both bursting and flaring were observed contemporaneously.
Author
Spectroscopy; Mass; X Ray Binaries; Variability; Electron Scattering

20020081108 NASA Glenn Research Center, Cleveland, OH USA
Detection, Evaluation, and Optimization of Optical Signals Generated by Fiber Optic Bragg Gratings Under Dynamic Excitations
Adamovsky, Grigory, NASA Glenn Research Center, USA; Lekki, John, NASA Glenn Research Center, USA; Lock, James A., Cleveland State Univ., USA; August 2002; 17p; In English
Contract(s)/Grant(s): NCC3-909; RTOP 704-30-13
Report No.(s): NASA/TM-2002-211565; E-13343; NAS 1.15:211565; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The dynamic response of a fiber optic Bragg grating to mechanical vibrations is examined both theoretically and experimentally. The theoretical expressions describing the consequences of changes in the grating’s reflection spectrum are derived for partially coherent beams in an interferometer. The analysis is given in terms of the dominant wavelength, optical bandwidth, and optical path difference of the interfering signals. Changes in the reflection spectrum caused by a periodic stretching and compression of the grating were experimentally measured using an unbalanced Michelson interferometer, a Michelson interferometer with a non-zero optical path difference. The interferometer’s sensitivity to changes in dominant wavelength of the interfering beams was measured as a function of interferometer unbalance and was compared to theoretical predictions. The theoretical analysis enables the user to determine the optimum performance for an unbalanced interferometer.
Author
Spectra; Optical Measuring Instruments; Interferometers; Bragg Gratings; Fiber Optics; Wavelengths; Detection; Photonics

20020081113 NASA Goddard Space Flight Center, Greenbelt, MD USA
MODIS Snow-Cover Products
Hall, Dorothy K., NASA Goddard Space Flight Center, USA; Riggs, George A., Science Systems and Applications, Inc., USA; Salomonson, Vincent V., NASA Goddard Space Flight Center, USA; DiGirolamo, Nicole E., Science Systems and Applications, Inc., USA; Bayr, Klaus J., Keene State Coll., USA; [2002]; 13p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On December 18, 1999, the Terra satellite was launched with a complement of five instruments including the Moderate Resolution Imaging Spectroradiometer (MODIS). Many geophysical products are derived from MODIS data including global snow-cover products. MODIS snow and ice products have been available through the National Snow and Ice Data Center (NSIDC) Distributed Active Archive Center (DAAC) since September 13, 2000. MODIS snow-cover products represent potential

improvement to or enhancement of the currently-available operational products mainly because the MODIS products are global and 500-m resolution, and have the capability to separate most snow and clouds. Also the snow-mapping algorithms are automated which means that a consistent data set may be generated for long-term climate studies that require snow-cover information. Extensive quality assurance (QA) information is stored with the products. The MODIS snow product suite begins with a 500-m resolution, 2330-km swath snow-cover map which is then gridded to an integerized sinusoidal grid to produce daily and 8-day composite tile products. The sequence proceeds to a climate-modeling grid (CMG) product at about 5.6-km spatial resolution, with both daily and 8-day composite products. Each pixel of the CMG contains fraction of snow cover from 40 - 100%. Measured errors of commission in the CMG are low, for example, on the continent of Australia in the spring, they vary from 0.02 - 0.10%. Near-term enhancements include daily snow albedo and fractional snow cover. A case study from March 6, 2000, involving MODIS data and field and aircraft measurements, is presented to show some early validation work.
Author
Augmentation; Climate Models; Geophysics; Ice; Imaging Techniques; Mapping; Quality Control; Snow Cover; Spectroradiometers

20020081253 Boeing Co., Rocketdyne Propulsion and Power, Canoga Park, CA USA
Unsteady Phenomena During Operation of the SSME Fuel Flowmeter
Marcu, Bogdan, Boeing Co., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 253-262; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

This report describes a part of the analysis carried in support of the SSME Fuel Flowmeter redesign, addressing a particular phenomenon known as ”shifting” of the flowmeter constant value. It consists of a sudden change in the flowmeter indication, which occurs simultaneously with the onset of an oscillatory variation of the rotor speed. The change in the flowmeter indications does not correspond to a real change in the volumetric flow through the device. Several causes have been investigated in detail, in the past, without conclusive evidence towards a cause of this phenomenon. The present analysis addresses the flow physics through the flowmeter by assembling results from 3-D CFD calculations, airfoil C(sub D)/C(sub L) performance curves and mass moment of inertia characteristics of the rotor into a synergistic calculation which simulates the unsteady regime of the flowmeter operation. The results show that the 4-bladed rotor interacts with the periodic flow pattern created behind the flow straightener upstream in a manner that generates a steady, periodic fluctuation in the rotor’s speed. The amplitude of this fluctuation is significantly smaller than the 0.5% of mean speed threshold which constitutes a flight operational limit. When manufacturing variations occur, however, the fluctuations are amplified and can generate a significant apparent change in the flowmeter indication. Two types of possible fabrication variations.which can occur even for parts fabricated within the accepted tolerances for the blade airfoil.are presented, together with their effect on the flowmeter operation.
Author
Flowmeters; Rotor Speed; Oscillations; Velocity Measurement; Design Analysis; Rotor Blades (Turbomachinery)

20020081258 NASA Goddard Space Flight Center, Greenbelt, MD USA
Comparative Analysis of Radiometer Systems Using Non-Stationary Processes
Racette, Paul, NASA Goddard Space Flight Center, USA; Lang, Roger, George Washington Univ., USA; [2002]; 3p; In English; IEEE International Geoscience and Remote Sensing Symposium, 24-28 Jun. 2002, Toronto, Canada; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Radiometers require periodic calibration to correct for instabilities in the receiver response. Various calibration techniques exist that minimize the effect of instabilities in the receivers. The optimal technique depends upon many parameters. Some parameters are constrained by the particular application and others can be chosen in the system design. For example, the measurement uncertainty may be reduced to the limits of the resolution of the measurement (sensitivity) if periodic absolute calibration can be performed with sufficient frequency. However if the period between calibrations is long, a reference-differencing technique, i.e. Dicke-type design, can yield better performance. The measurement uncertainty not only depends upon the detection scheme but also on the number of pixels between calibrations, the integration time per pixel, integration time per calibration reference measurement, calibration reference temperature, and the brightness temperature of what is being measured. The best scheme for reducing the measurement uncertainty also depends, in large part, on the stability of the receiver electronics. In this presentation a framework for evaluating calibration schemes for a wide range of system architectures is presented. Two methods for treating receiver non-stationarity are compared with radiometer measurements.
Author
Radiometers; Mathematical Models; Systems Analysis; Regression Analysis; Stability

20020081273 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Airborne Conical Scanning Millimeter-Wave Imaging Radiometer (CoSMIR)

Piepmeier, J. R., NASA Goddard Space Flight Center, USA; Manning, W., Joint Center for Earth Systems Technology, USA; Wang, J. R., NASA Goddard Space Flight Center, USA; Racette, P., NASA Goddard Space Flight Center, USA; [2002]; 3p; In English; International Geoscience and Remote Sensing Symposium (IGARSS), USA; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Results of the first science flight of the airborne Conical Scanning Millimeter-wave Imaging Radiometer (CoSMIR) for high-altitude observations from the NASA ER-2 is discussed. Imagery collected from the flight demonstrates CoSMIR's unique conical/cross-track imaging mode and provides comparison of CoSMIR measurements to those of the Special Sensor Microwave/Temperature-2 (SSM/T-2) satellite radiometer.

Author

Airborne Equipment; Conical Scanning; Millimeter Waves; Radiometers; Imaging Techniques; Satellite Instruments

20020081278 NASA Goddard Space Flight Center, Greenbelt, MD USA

Experimental Investigations of Non-Stationary Properties In Radiometer Receivers Using Measurements of Multiple Calibration References

Racette, Paul, NASA Goddard Space Flight Center, USA; Lang, Roger, George Washington Univ., USA; Zhang, Zhao-Nan, NASA Goddard Space Flight Center, USA; Zacharias, David, ZAX Millimeter Wave Corp.; [2002]; 1p; In English; MicroCal 2002, 9 Oct. - 2 Nov. 2002, Barcelona, Spain; No Copyright; Avail: Issuing Activity; Abstract Only

Radiometers must be periodically calibrated because the receiver response fluctuates. Many techniques exist to correct for the time varying response of a radiometer receiver. An analytical technique has been developed that uses generalized least squares regression (LSR) to predict the performance of a wide variety of calibration algorithms. The total measurement uncertainty including the uncertainty of the calibration can be computed using LSR. The uncertainties of the calibration samples used in the regression are based upon treating the receiver fluctuations as non-stationary processes. Signals originating from the different sources of emission are treated as simultaneously existing random processes. Thus, the radiometer output is a series of samples obtained from these random processes. The samples are treated as random variables but because the underlying processes are non-stationary the statistics of the samples are treated as non-stationary. The statistics of the calibration samples depend upon the time for which the samples are to be applied. The statistics of the random variables are equated to the mean statistics of the non-stationary processes over the interval defined by the time of calibration sample and when it is applied. This analysis opens the opportunity for experimental investigation into the underlying properties of receiver non stationarity through the use of multiple calibration references. In this presentation we will discuss the application of LSR to the analysis of various calibration algorithms, requirements for experimental verification of the theory, and preliminary results from analyzing experiment measurements.

Author

Algorithms; Calibrating; Radiometers; Receivers; Least Squares Method

20020081289 NASA Goddard Space Flight Center, Greenbelt, MD USA

Calibration Design and Assessment of the Airborne Conical Scanning Millimeterwave Imaging Radiometer (CoSMIR)

Piepmeier, J. R., NASA Goddard Space Flight Center, USA; Racette, P., NASA Goddard Space Flight Center, USA; Walker, D. K., National Inst. of Standards and Technology, USA; Randa, J., National Inst. of Standards and Technology, USA; [2002]; 1p; In English; MicroCal 2002, 9 Oct. - 2 Nov. 2002, Barcelona, Spain; No Copyright; Avail: Issuing Activity; Abstract Only

The airborne Conical Scanning Millimeter-wave Imaging Radiometer (CoSMIR) will provide measurements useful for atmospheric studies and satellite calibration and validation (cal/val). Designed to match the tropospheric sounding channels of the Defense Meteorological Satellite Program QMSP) Special Sensor Microwave Imager/Sounder (SSMIS), the CoSMIR consists of four radiometers operating at 50-54 (3 channels - 50.3, 52.8, and 53.6), 91.655 (dual polarization), 150.0, and 193.31 (3 channels 11, 13, and 16.6) GHz. The design of CoSMIR was primarily driven by its intended initial use as an SSMIS cal/val sensor. In particular, three design features were directly affected by this requirement: frequency planning, calibration target design, and the mechanical gimbals. An initial calibration assessment of CoSMIR was performed to determine any needed improvements. We used a combination of laboratory and field measurements to do this. Laboratory measurements included comparisons to a liquid nitrogen standard, IF amplifier and diode linearity tests, LO leakage and reflection testing, and antenna to calibration target coupling tests. Results of these tests will be reported. We also performed a satellite underflight under DM SP

F-15 and have compared CoSMIR imagery to SSM/T-2 and SSM/I imagery. Additional information is included in the original extended abstract.
Author
Airborne Equipment; Radiometers; Microwave Radiometers; Microwave Imagery; Millimeter Waves; Conical Scanning; Calibrating

20020081320 NASA Goddard Space Flight Center, Greenbelt, MD USA
Stellar Imager
Carpenter, Kenneth G., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; AAS Conference, 12-14 Nov. 2001, Pasadena, CA, USA; Sponsored by American Astronautical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Stellar Imager (SI) is envisioned as a space-based, UV-optical interferometer composed of 10 or more one-meter class elements distributed with a maximum baseline of approx. 0.5 km. It will image stars and binaries with one hundred to one thousand resolution elements on their surface and enable long-term studies of stellar magnetic activity patterns and their evolution with time, for comparison with those on the sun. It will also sound their interiors through asteroseismology to image internal structure, differential rotation, and large-scale circulations. SI will enable us to understand the various effects of magnetic fields of stars, the dynamos that generate them, and the internal structure and dynamics of the stars in which they exist. The ultimate goal is to achieve the best-possible forecasting of solar activity on time scales ranging up to decades, and an understanding of the impact of stellar magnetic activity on astrobiology and life in the Universe. The road to that goal will revolutionize our understanding of stars and stellar systems, the building blocks of the Universe. Fitting naturally within the NASA and ESA long-term time lines, SI complements defined missions, and with them will show us entire other solar systems, from the central star to their orbiting planets. In this paper we will describe the scientific goals of the mission, the performance requirements needed to address those goals, and the design concepts now under study.
Author
Interferometers; Astronomical Interferometry; Satellite Constellations; Stellar Magnetic Fields; Asteroseismology; Astronomical Satellites

20020081321 NASA Goddard Space Flight Center, Greenbelt, MD USA
Ideal Integrating Bolometer
Kogut, Alan, NASA Goddard Space Flight Center, USA; DiPirro, Michael, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 2nd Workshop on New Concepts for Far-IR/Submillimeter Space Astronomy, 7-8 Mar. 2002, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We describe a new 'ideal integrator' bolometer as a prototype for a new generation of sensitive, flexible far-IR detectors suitable for use in large arrays. The combination of a non-dissipative sensor coupled with a fast heat switch provides breakthrough capabilities in both sensitivity and operation. The bolometer temperature varies linearly with the integrated infrared power incident on the detector, and may be sampled intermittently without loss of information between samples. The sample speed and consequent dynamic range depend only on the heat switch reset cycle and can be selected in software. Between samples, the device acts as an ideal integrator with noise significantly lower than resistive bolometers. Since there is no loss of information between samples, the device is well-suited for large arrays. A single SQUID readout could process an entire column of detectors, greatly reducing the complexity, power requirements, and cost of readout electronics for large pixel arrays.
Author
Bolometers; Infrared Detectors; Switches; Integrators

20020081322 NASA Goddard Space Flight Center, Greenbelt, MD USA
Seasonal and Global Variations of Water Vapor and High Clouds Observed with MODIS near-IR Channels
Gao, Bo-Cai, Naval Research Lab., USA; Yang, Ping, Texas A&M Univ., USA; Kaufman, Yoram J., NASA Goddard Space Flight Center, USA; Wiscombe, Warren J., NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; Optical Remote Sensing of the Atmosphere and Clouds III, 23-27 Oct. 2002, Hangzhou, China; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA Moderate Resolution Imaging Spectrometer (MODIS) on the Terra Spacecraft has been collecting scientific data since February of 2000. MODIS is a major facility instrument for remote sensing of the atmosphere, land surfaces, and ocean color. On the MODIS instruments, there are five channels located within and around the .0.94 micron water vapor band absorption region for remote sensing of atmospheric water vapor. There is also a channel located at 1.375 micron for detecting thin cirrus clouds. We will describe the basic principles for using these near-IR channels for remote sensing of water vapor and high clouds. Based on our analysis of two years# measurements with these channels, we have found that reliable observations of water vapor and high

clouds on regional and global scales can be made. We will present results on daily, seasonal and annual variations of water vapor and high clouds.
Author
Annual Variations; Water Vapor; Cirrus Clouds; Frequencies

20020081344 NASA Goddard Space Flight Center, Greenbelt, MD USA
Neutral Gas and Ion Measurements by the CONTOUR Mission
Mahaffy, Paul R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 34th COSPAR Scientific Assembly/2nd World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Neutral Gas and Ion Mass Spectrometer (NGIMS) on the Comet Nucleus Tour (CONTOUR) Mission will measure the chemical and isotopic composition of neutral and ion species in the coma of comet Encke and the subsequent targets of this mission. Currently the second target of this mission is comet Schwassmann-Wachmann 3. This neutral gas and ion data together with complementary data from the dust analyzer and the imaging spectrometer is designed to allow a broad characterization of the molecular and elemental composition of each cometary nucleus. These experiments enable the study of the of the likely variations in chemical conditions present in different regions of the early solar nebula where the comets formed. With these experiments we will also test ideas about cometary contributions of organics, water, and other volatiles to the inner planets. The CONTOUR NGIMS data set from multiple comets is expected to provide an important extension of to the only other detailed in situ data set from a close flyby of a nucleus, that from Halley. CONTOUR will extend this measurement of an Oort cloud comet to the class of short period comets thought to originate in the Kuiper belt. This data will complement the detailed measurements to be carried out at a single nucleus by the Rosetta Mission.
Author
Neutral Gases; Ions; Mass Spectrometers; Comet Nucleus Tour; Encke Comet; Schwassmann-Wachmann Comet; Comet Nuclei; Cometary Atmospheres; Chemical Composition

20020082921 NASA Glenn Research Center, Cleveland, OH USA
Application of DPIV to Enhanced Mixing Heated Nozzle Flows
Wernet, Mark P., NASA Glenn Research Center, USA; Bridges, James, NASA Glenn Research Center, USA; May 2002; 12p; In English; 40th Aerospace Sciences Meeting and Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 781-30-12
Report No.(s): NASA/TM-2002-211517; E-13311; NAS 1.15:211517; AIAA Paper 2002-0691; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Digital Particle Imaging Velocimetry (DPIV) is a planar velocity measurement technique that continues to be applied to new and challenging engineering research facilities while significantly reducing facility test time. DPIV was used in the GRC Nozzle Acoustic Test Rig (NATR) to characterize the high temperature (560 C), high speed (is greater than 500 m/s) flow field properties of mixing enhanced jet engine nozzles. The instantaneous velocity maps obtained using DPIV were used to determine mean velocity, rms velocity and two-point correlation statistics to verify the true turbulence characteristics of the flow. These measurements will ultimately be used to properly validate aeroacoustic model predictions by verifying CFD input to these models. These turbulence measurements have previously not been possible in hot supersonic jets. Mapping the nozzle velocity field using point based techniques requires over 60 hours of test time, compared to less than 45 minutes using DPIV, yielding a significant reduction in testing time. A dual camera DPIV configuration was used to maximize the field of view and further minimize the testing time required to map the nozzle flow. The DPIV system field of view covered 127 by 267 mm. Data were acquired at 19 axial stations providing coverage of the flow from the nozzle exit to 2.37 in downstream. At each measurement station, 400 image frame pairs were acquired from each camera. The DPIV measurements of the mixing enhanced nozzle designs illustrate the changes in the flow field resulting in the reduced noise signature.
Author
Computational Fluid Dynamics; Nozzle Design; Nozzle Flow; Particle Image Velocimetry; Aeroacoustics; Mathematical Models; Multiphase Flow

20020082950 NASA Glenn Research Center, Cleveland, OH USA
Thin Film Heat Flux Sensor of Improved Design
Fralick, Gus, NASA Glenn Research Center, USA; Wrbanek, John, NASA Glenn Research Center, USA; Blaha, Charles, Akima Corp., USA; September 2002; 14p; In English; 48th International Instrumentation Symposium, 5-9 May 2002, San Diego, CA,

USA; Sponsored by Instrumentation, Systems and Automation Society, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-48-13
Report No.(s): NASA/TM-2002-211566; E-13350; NAS 1.15:211566; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new design for a thin film heat flux sensor is presented. It is easier to fabricate than previous designs, for a given heat flux has an order of magnitude larger signal, and is more easily scalable than previous designs. Transient and steady state data are also presented.

Author

Thin Films; Heat Flux; Sensors

20020082982 Dakota Technologies, Inc., Fargo, ND USA

Real-Time Fuel Vapor Detector

Gillespie, Greg; Jul. 01, 2002; 54p; In English
Contract(s)/Grant(s): F08637-99-C-6005; Proj-3005
Report No.(s): AD-A405907; AFRL-ML-TY-TR-2002-4544; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Report describes a resonance enhanced multiphoton ionization (REMPI) technique to measure vapor leakage from fuel tanks. The technique is a nonlinear optical process where two photons are simultaneously absorbed by an analyte resulting in the ejection of an electron to form a positively charged parent ion. Leak detector is comprised of three major components: a pulsed UV laser, an ionization cell, and electronics to convert the generated ion current to a measurable voltage.

DTIC

Optical Properties; Leakage

20020082997 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA

Biomimetic Infrared (IR) Sensors ***Final Report, 1 Oct. 1997-30 Sep. 2000***

Stone, Morley O.; Aug. 2002; 8p; In English
Contract(s)/Grant(s): Proj-2312
Report No.(s): AD-A406041; AFRL-ML-WP-TM-2002-4142; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

No abstract available.

DTIC

Biomimetics; Infrared Detectors

20020083028 Naval Postgraduate School, Monterey, CA USA

Two-Color Photodetector Using an Asymmetric Quantum Well Structure

Lantz, Kevin R.; Jun. 2002; 89p; In English; Original contains color images
Report No.(s): AD-A405808; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The past twenty years have seen an explosion in the realm of infrared detection technology fueled by improvements in III-V semiconductor technology and by new semiconductor growth methods. One of the fastest growing areas of this research involves the use of bandgap engineering in order to create artificial quantum wells for use in Quantum Well Infrared Photodetectors (QWIPs) . QWIPs have an advantage over other infrared detectors such as Mercury Cadmium Telluride (MCT) because they have larger bandgaps and are therefore stronger and cheaper to manufacture. This thesis introduces one method of multi-color' detection through the use of an asymmetries quantum well structure in which all energy transitions are possible. The QWIP structure in this thesis was designed to detect a laser wavelength of 1.06 micrometers and a wavelength in the 8-10 micrometers atmosphere window. The relevance of a detector that is tuned to these wavelengths is that it can be used on military aircraft as a laser spot tracker and an infrared imager providing much greater accuracy and dependability than older systems.

DTIC

Quantum Wells; Color; Infrared Detectors; Mercury Cadmium Tellurides; Semiconductors (Materials); Photometers

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LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also 76 Solid-State Physics.

20020080813 NASA Goddard Space Flight Center, Greenbelt, MD USA
High Pulse Repetition Rate, Eye Safe, Visible Wavelength Lidar Systems: Design, Results and Potential
Spinhirne, James, NASA Goddard Space Flight Center, USA; Berkoff, Timothy, Maryland Univ. Baltimore County, USA; Welton, Elsworth, Maryland Univ. Baltimore County, USA; Campbell, James, Science Systems and Applications, Inc., USA; [2002]; 3p; In English; IGARSS, 24-28 Jun. 2002, Toronto, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In 1993 the first of the eye safe visible wavelength lidar systems known now as Micro Pulse Lidar (MPL) became operational. Since that time there have been several dozen of these systems produced and applied for full time profiling of atmospheric cloud and aerosol structure. There is currently an observational network of MPL sites to support global climate research. In the course of application of these instruments there have been significant improvements in understanding, design and performance of the systems. There are addition potential and applications beyond current practice for the high repetition rate, eye safe designs. The MPL network and the current capability, design and future potential of MPL systems are described.
Author
Infrared Radar; Wavelengths; Design Analysis; Performance Prediction; Optical Radar

20020080917 Scientific Materials Corp., Bozeman, MT USA
Laser Analyzer
Spinoff 1993; 1993, pp. 125; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Dopant level analysis is important to the laser system designer because it allows him to model the laser's performance. It also allows the end user to determine what went wrong when a laser fails to perform as expected. Under a Small Business Innovation Research (SBIR) contract, Scientific Materials Corporation has developed a process for producing uniform laser rods in which the amount of water trapped in the crystal during growth is reduced. This research led to the formation of a subsidiary company, Montana Analytical Services, which conducts analysis of laser rods for dopant ion concentrations. This is a significant advance in laser technology.
Author
Laser Applications; Technology Utilization; Yttrium-Aluminum Garnet; Crystal Growth

20020081031 NASA Goddard Space Flight Center, Greenbelt, MD USA
Geoscience Laser Altimeter System (GLAS) for the ICESat Mission
Abshire, James B., NASA Goddard Space Flight Center, USA; Sun, Xiaoli, NASA Goddard Space Flight Center, USA; Ketchum, Eleanor A., NASA Goddard Space Flight Center, USA; Millar, Pamela S., NASA Goddard Space Flight Center, USA; Riris, Haris, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; International Geoscience and Remote Sensing Symposium (IGARSS 2002), 24-28 Jun. 2002, Toronto, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

The Geoscience Laser Altimeter System (GLAS) is a new generation lidar and is the primary science payload for NASA's ICESat Mission. The GLAS design combines a 10 cm precision surface lidar with a sensitive dual wavelength cloud and aerosol lidar. GLAS will precisely measure the heights of the Earth's polar ice sheets, establish a grid of accurate height profiles of the Earth's land topography, and profile the vertical distribution of clouds and aerosols on a global scale. GLAS will be integrated onto a small spacecraft built by Ball Aerospace, and will be launched into a polar orbit with a 590-630 km altitude at an inclination of 94 degrees. ICESat is is currently planned to launch in winter 2002/03 and GLAS is designed to operate continuously in space for a minimum of 3 years. GLAS will measure the vertical distance from orbit to the Earth's surface with pulses from a ND:YAG laser at a 40 Hz rate. Each 6 nsec wide 1064 nm laser pulse is used to produce a single range measurement. On the surface, the laser footprints have 66 m diameter and approx. 170 m center-center spacings. The GLAS receiver uses a I m diameter telescope to detect laser backscatter and a Si APD to detect the 1064 nm signals. The detector's output is sampled by a digital ranging receiver, which records each transmitted pulse and surface echo waveform with 1 nsec (15 cm) resolution. Each echo pulse is digitized and is reported to ground with a record length of from 200 to 544 samples, depending on the spacecraft's location . The GLAS location and epoch times are measured by a precision GPS receiver carried on the ICESat spacecraft. Initial processing of the echo waveforms within GLAS permits discrimination between cloud and surface echoes for selecting appropriate waveform

samples. This selection is guided by an on-board DEM which is used to set the boundaries for the echo pulse search algorithm. Subsequent ground-based echo pulse analysis, along with GPS-based clock frequency estimates, permit final determination of the range to the surface, degree of pulse spreading, and vertical distribution of any vegetation illuminated by the laser. Accurate knowledge of the laser beam's pointing angle is needed to prevent height biases when measuring over tilted surfaces, such as near the boundaries of ice sheets. For surfaces with 2 deg. slopes, knowledge of pointing angle of the beam's centroid angle to better than 10 urad is needed. GLAS uses a stellar reference system (SRS) to measure the pointing angle of each laser firing relative to inertial space. The SRS uses a high precision star camera oriented toward local zenith and a gyroscope to determine the inertial orientation of the SRS optical bench. The far field pattern of each laser is measured pulse relative to the star camera with a laser reference system (LRS). GLAS will also measure the vertical distributions of clouds and aerosols by recording the vertical profiles of laser pulse backscatter at both 1064 and 532 nm. The 1064 rim measurements use the Si APD detector and will be used to measure the height and echo pulse shape from thicker clouds. The lidar receiver at 532 nm uses a narrow bandwidth etalon filter and highly sensitive photon counting detectors. The 532 nm backscatter profiles will be used to measure the vertical extent of thinner clouds and the atmospheric boundary layer. The GLAS instrument component development is complete and the instrument is undergoing final testing and qualification at NASA-Goddard. The GLAS "as-built" characteristics and its expected measurement performance will be discussed.
Author
Laser Altimeters; Optical Radar; Rangefinding

20020081262 Norfolk State Univ., Center for Materials Research, VA USA
Development of Novel Composite and Random Materials for Nonlinear Optics and Lasers ***Progress Report, 15 Sep. 2001 - 14 Sep. 2002***
Noginov, Mikhail, Norfolk State Univ., USA; [2002]; 55p; In English
Contract(s)/Grant(s): NCC1-01049; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A qualitative model explaining sharp spectral peaks in emission of solid-state random laser materials with broad-band gain is proposed. The suggested mechanism of coherent emission relies on synchronization of phases in an ensemble of emitting centers, via time delays provided by a network of random scatterers, and amplification of spontaneous emission that supports the spontaneously organized coherent state. Laser-like emission from powders of solid-state luminophosphors, characterized by dramatic narrowing of the emission spectrum and shortening of emission pulses above the threshold, was first observed by Markushev et al. and further studied by a number of research groups. In particular, it has been shown that when the pumping energy significantly exceeds the threshold, one or several narrow emission lines can be observed in broad-band gain media with scatterers, such as films of ZnO nanoparticles, films of pi-conjugated polymers or infiltrated opals. The experimental features, commonly observed in various solid-state random laser materials characterized by different particle sizes, different values of the photon mean free path l*, different indexes of refraction, etc.. can be described as follows. (Liquid dye random lasers are not discussed here.)
Author
Dye Lasers; Emission Spectra; Laser Materials; Mean Free Path; Nanoparticles; Scattering; Solid State Lasers; Spectral Emission

20020082951 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Development and Implementation of Joint Programs in Laser Ranging and Other Space Geodetic Techniques ***Quarterly Report, 1 Jul. - 30 Sep. 2002***
Pearlman, Michael R., Smithsonian Astrophysical Observatory, USA; October 2002; 24p; In English
Contract(s)/Grant(s): NAS5-01113; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On-going activities of the NASA special consultant to WEGENER (Working group of European Geoscientists for the Establishment of Networks for Earth-science Research) program are reported. Topics cover include: the WEGENER 2002 conference in Greece and the International Laser Ranging Service (ILRS).
CASI
Earth Sciences; International Cooperation; Satellite Laser Ranging; Celestial Geodesy

20020083050 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Micro-Pulse Lidar Network (MPL-Net)

Welton, Ellsworth J., NASA Goddard Space Flight Center, USA; Campbell, James R., NASA Goddard Space Flight Center, USA; Berkoff, Timothy A., NASA Goddard Space Flight Center, USA; Spinhirne, James D., NASA Goddard Space Flight Center, USA; Tsay, Si-Chee, NASA Goddard Space Flight Center, USA; Holben, Brent, NASA Goddard Space Flight Center, USA; Shiobara, Masataka, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Twenty-first International Laser Radar Conference (ILRC21), 8-12 Jul. 2002, Quebec City, Quebec, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

In the early 1990s, the first small, eye-safe, and autonomous lidar system was developed, the Micro-pulse Lidar (MPL). The MPL has proven to be useful in the field because it can be automated, runs continuously (day and night), is eye-safe, can easily be transported and set up, and has a small field-of-view which limits multiple scattering concerns. The MPL acquires signal profiles of backscattered laser light from aerosols and clouds. The signals are analyzed to yield multiple layer heights, optical depths of each layer, average extinction-to-backscatter ratio of each layer, and profiles of extinction in each layer. The MPL has been used in a wide variety of field studies over the past 10 years, leading to nearly 20 papers and many conference presentations. In 2000, a new project using MPL systems was started at NASA Goddard Space Flight Center. The MPL-Net project is currently working to establish a worldwide network of MPL systems, all co-located with NASA's AERONET sunphotometers for joint measurements of optical depth and sky radiance. Automated processing algorithms have been developed to produce data products on a next day basis for all sites and some field experiments. Initial results from the first several sites are shown, along with aerosol data collected during several major field campaigns. Measurements of the aerosol extinction-to-backscatter ratio at several different geographic regions, and for various aerosol types are shown. This information is used to improve the construction of look up tables of the ratio, needed to process aerosol profiles acquired with satellite based lidars.

Author

Optical Radar; Aerosols; Backscattering; Extinction; Field of View; Laser Outputs

20020083207 Air Force Research Lab., Sensors Directorate, Wright-Patterson AFB, OH USA

Reduced Power Consumption in GaAs-Based Bipolar Cascade Lasers

Siskaninetz, W. J.; Dang, T. N.; Nelson, T. R.; Ehret, J. E.; Van Nostrans, J. E.; Aug. 2002; 12p; In English

Report No.(s): AD-A406308; AFRL-SN-WP-TP-2002-104; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A systematic study of GaAs tunnel junctions for use in bipolar cascade laser diodes was performed. We investigate the current voltage characteristics of individual degenerately doped n(+) and p(+) regions grown by MBE and then place the most promising designs within the individual laser substructures. This has resulted in a 1 V reduction in operating voltage, as verified by comparing the lasing characteristics of several edge-emitting laser devices.

DTIC

Gallium Arsenide Lasers; Electron Tunneling

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 Cybernetics, Artificial Intelligence, and Robotics; and 54 Man/System Technology and Life Support.

20020080818 Tsentralni Aerogidrodinamicheskii Inst., Zhukovsky, Russia

The Study of Stability of Compression-Loaded Multispan Composite Panel Upon Failure of Elements Binding it to Panel Supports *Final Report*

Zamula, G. N., Tsentralni Aerogidrodinamicheskii Inst., Russia; Ierusalimsky, K. M., Tsentralni Aerogidrodinamicheskii Inst., Russia; Fomin, V. P., Tsentralni Aerogidrodinamicheskii Inst., Russia; Grishin, V. I., Tsentralni Aerogidrodinamicheskii Inst., Russia; Kalmykova, G. S., Tsentralni Aerogidrodinamicheskii Inst., Russia; 1999; 56p; In English

Contract(s)/Grant(s): NCC1-233; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The present document is a final technical report carried out within co-operation between USA'NASA Langley RC and Russia's Goskomoboronprom in aeronautics, and continues similar programs, accomplished in 1996, 1997, and 1998, respectively). The report provides results of "The study of stability of compression-loaded multispan composite panels upon

failure of elements binding it to panel supports"; these comply with requirements established at TsAGI on 24 March 1998 and at NASA on 15 September 1998.
Author
Composite Structures; Compression Loads; Stability

20020080838 South Carolina Univ., Office of Sponsored Programs and Research, Columbia, SC USA
Fundamental Study of Material Flow in Friction Stir Welds, *1 Aug. 1998 - 31 Jul. 1999*
Reynolds, Anthony P., South Carolina Univ., USA; [1999]; 253p; In English
Contract(s)/Grant(s): NAG1-2108; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The presented research project consists of two major parts. First, the material flow in solid-state, friction stir, butt-welds as been investigated using a marker insert technique. Changes in material flow due to welding parameter as well as tool geometry variations have been examined for different materials. The method provides a semi-quantitative, three-dimensional view of the material transport in the welded zone. Second, a FSW process model has been developed. The fully coupled model is based on fluid mechanics; the solid-state material transport during welding is treated as a laminar, viscous flow of a non-Newtonian fluid past a rotating circular cylinder. The heat necessary for the material softening is generated by deformation of the material. As a first step, a two-dimensional model, which contains only the pin of the FSW tool, has been created to test the suitability of the modeling approach and to perform parametric studies of the boundary conditions. The material flow visualization experiments agree very well with the predicted flow field. Accordingly, material within the pin diameter is transported only in the rotation direction around the pin. Due to the simplifying assumptions inherent in the 2-D model, other experimental data such as forces on the pin, torque, and weld energy cannot be directly used for validation. However, the 2-D model predicts the same trends as shown in the experiments. The model also predicts a deviation from the "normal" material flow at certain combinations of welding parameters, suggesting a possible mechanism for the occurrence of some typical FSW defects. The next step has been the development of a three-dimensional process model. The simplified FSW tool has been designed as a flat shoulder rotating on the top of the workpiece and a rotating, cylindrical pin, which extends throughout the total height of the flow domain. The thermal boundary conditions at the tool and at the contact area to the backing plate have been varied to fit experimental data such as temperature profiles, torque and tool forces. General aspects of the experimentally visualized material flow pattern are confirmed by the 3-D model.
Author
Butt Joints; Friction Stir Welding; Welded Joints; Flow Distribution; Flow Visualization; Viscous Flow; Laminar Flow; Fluid Mechanics

20020080861 Reflange, Inc., Houston, TX USA
Piping Connector
Spinoff 1993; 1993, pp. 127; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

A complex of high pressure piping at Stennis Space Center carries rocket propellants and other fluids/gases through the Center's Component Test Facility. Conventional clamped connectors tend to leak when propellant lines are chilled to extremely low temperatures. Reflange, Inc. customized an existing piping connector to include a secondary seal more tolerant of severe thermal gradients for Stennis. The T-Con connector solved the problem, and the company is now marketing a commercial version that permits testing, monitoring or collecting any emissions that may escape the primary seal during severe thermal transition.
Author
High Pressure; Pipes (Tubes); Connectors; Rocket Propellants

20020080920 Applied Research, Inc., Huntsville, AL USA
Welding Sensor System
Spinoff 1993; 1993, pp. 122; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

A system originally designed for welding components of the huge Space Shuttle external tank led to a laser-based automated welder for industrial use. A laser sensor tracks the seam where two pieces of metal are to be joined, measures gaps, misfits and automatically corrects welding of torch distance and height. A small industrial computer translates the sensor's information to the weld head and records and displays weld data for control purposes and analysis. The system was modified for commercial

use by Marshall Space Flight Center (MSFC), Martin Marietta and Applied Research, Inc., which produces the commercial system. Applications are in industrial welding processes that require repetitive operations and a high degree of reliability.
Author
Welding; Lasers; Sensors; Automatic Control

20020080967 Ferrofluidics Corp., Nashua, NH USA
The Ferrofluids Story
Spinoff 1993; 1993, pp. 116-117; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

A new Ferrofluidics exclusion seal promises improvement in controlling ”fugitive emissions” -vapors that escape into the atmosphere from petroleum refining and chemical processing facilities. These are primarily volatile organic compounds, and their emissions are highly regulated by the EPA. The ferrofluid system consists of a primary mechanical seal working in tandem with a secondary seal. Ferrofluids are magnetic liquids - fluids in which microscopic metal particles have been suspended, allowing the liquid to be controlled by a magnetic force. The concept was developed in the early years of the Space program, but never used. Two Avco scientists, however, saw commercial potential in ferrofluids and formed a company. Among exclusion seal commercial applications are rotary feedthrough seals, hydrodynamic bearings and fluids for home and automotive loudspeakers. Ferrofluidics has subsidiaries throughout the world.
Author
Ferrofluids; Refining; Metal Particles; Exhaust Emission; Hydrodynamics

20020081111 NASA Glenn Research Center, Cleveland, OH USA
Predictive Failure of Cylindrical Coatings Using Weibull Analysis
Vlcek, Brian L., Georgia State Univ., USA; Hendricks, Robert C., NASA Glenn Research Center, USA; Zaretsky, Erwin V., NASA Glenn Research Center, USA; July 2002; 12p; In English; Ninth International Symposium on Transport Phenomena and Dynamics of Rotating Machinery, 10-14 Feb. 2002, Honolulu, HI, USA; Sponsored by Pacific Centre of Thermal Fluids Engineering, Unknown
Contract(s)/Grant(s): RTOP 274-00-SR
Report No.(s): NASA/TM-2002-211381; E-13128-1; NAS 1.15:211381; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Rotating, coated wiping rollers used in a high-speed printing application failed primarily from fatigue. Two coating materials were evaluated: a hard, cross-linked, plasticized polyvinyl chloride (PVC) and a softer, plasticized PVC. A total of 447 tests was conducted with these coatings in a production facility. The data were evaluated using Weibull analysis. The softer coating produced more than twice the life of the harder cross-linked coating and reduced the wiper replacement rate by two-thirds, resulting in minimum production interruption.
Author
Failure Analysis; Fatigue Life; Rollers; Protective Coatings; Polyvinyl Chloride

20020081123 NASA Glenn Research Center, Cleveland, OH USA
Transient Vibration Prediction for Rotors on Ball Bearings using Load-Dependent Non-Linear Bearing Stiffness
Fleming, David P., NASA Glenn Research Center, USA; Poplawski, J. V., Poplawski (J. V.) and Associates, USA; August 2002; 14p; In English; IFToMM Sixth International Conference on Rotor Dynamics, 30 Sep. - 3 Oct. 2002, Sydney, Australia; Sponsored by Institution of Engineers, Australia
Contract(s)/Grant(s): RTOP 728-30-10
Report No.(s): NASA/TM-2002-211829; NAS 1.15:211829; E-13523; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Rolling-element bearing forces vary nonlinearly with bearing deflection. Thus an accurate rotordynamic transient analysis requires bearing forces to be determined at each step of the transient solution. Analyses have been carried out to show the effect of accurate bearing transient forces (accounting for non-linear speed and load dependent bearing stiffness) as compared to conventional use of average rolling-element bearing stiffness. Bearing forces were calculated by COBRA-AHS (Computer Optimized Ball and Roller Bearing Analysis - Advanced High Speed) and supplied to the rotordynamics code ARDS (Analysis of Rotor Dynamic Systems) for accurate simulation of rotor transient behavior. COBRA-AHS is a fast-running 5 degree-of-freedom computer code able to calculate high speed rolling-element bearing load-displacement data for radial and

angular contact ball bearings and also for cylindrical and tapered roller beatings. Results show that use of nonlinear bearing characteristics is essential for accurate prediction of rotordynamic behavior.
Author
Rotor Dynamics; Ball Bearings; Roller Bearings; Stiffness; Loads (Forces)

20020082953 NASA Glenn Research Center, Cleveland, OH USA
Comparative Fatigue Lives of Rubber and PVC Wiper Cylindrical Coatings
Vlcek, Brian L., University of Southern Georgia, USA; Hendricks, Robert C., NASA Glenn Research Center, USA; Zaretsky, Erwin V., NASA Glenn Research Center, USA; Savage, Michael, Akron Univ., USA; August 2002; 25p; In English; 2002 Annual Meeting, 19-23 May 2002, Houston, TX, USA
Contract(s)/Grant(s): RTOP 274-00-SR
Report No.(s): NASA/TM-2002-211819; NAS 1.15:211819; E-13196; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Three coating materials for rotating cylindrical-coated wiping rollers were fatigue tested in 2 Intaglio printing presses. The coatings were a hard, cross-linked, plasticized PVC thermoset (P-series); a plasticized PVC (A-series); and a hard, nitryl rubber (R-series). Both 2- and 3-parameter Weibull analyses as well as a cost-benefit analysis were performed. The mean value of life for the R-series coating is 24 and 9 times longer than the P- and A-series coatings, respectively. Both the cost and replacement rate for the R-series coating was significantly less than those for the P- and A-series coatings. At a very high probability of survival the R-series coating is approximately 2 and 6 times the lives of the P- and A-series, respectively, before the first failure occurs. Where all coatings are run to failure, using the mean (life) time between removal (MTBR) for each coating to calculate the number of replacements and costs provides qualitatively similar results to those using a Weibull analysis.
Author
Coatings; Fatigue (Materials); Rubber; Rollers; Life (Durability); Cylindrical Bodies

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

20020080758 Department of Energy, Washington, DC USA
RPP Computer Automated Surveillance System (CASS) to Tank Monitor and Control System (TMACS) transfer project plan
Shipler, C. E.; Jul. 13, 1999; 22p; In English
Report No.(s): DE2002-797503; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document summarizes the results of the U.S. Department of Energy's Near-Facility Environmental Monitoring program conducted by Waste Management Federal Services of Hanford, Inc. for Fluor Daniel Hanford, Inc. for 1998 in the 100,200/600, and 300/400 Areas of the Hanford Site, in southcentral Washington State. Surveillance activities included sampling and analyses of ambient air, surface water, groundwater, soil, sediments, and biota. Also, external radiation measurements and radiological surveys were taken at waste disposal sites, radiologically controlled areas, and roads. These activities were conducted to assess and control the effects of nuclear facilities and waste sites on the local environment. In addition, diffuse sources were monitored to determine compliance with federal, state, and/or local regulations. In general, although effects from nuclear facilities can still be observed on the Hanford Site and radiation levels are slightly elevated when compared to offsite locations, the differences are less than in previous years.
NTIS
Ground Based Control; Environmental Monitoring; Project Planning

20020080764 Department of Energy, Washington, DC USA
Tank Monitor and Control System (TMACS) Rev 11.0 Acceptance Test Review
Holm, M. J.; Aug. 25, 1999; 112p; In English
Report No.(s): DE2002-797689; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document contains the test results of the Revision 11.0 Acceptance Test Procedure for the Tank Monitor and Control System (TMACS).
NTIS
Monitors; Acceptability

20020080765 Department of Energy, Washington, DC USA

Acceptance and Operational Test Report for Neutron and Gamma Probe Application to Tank 241-SY-101 MITs

Cannon, N. S.; Aug. 12, 1999; 51p; In English

Report No.(s): DE2002-797690; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This Operational Test Report (OTR) presents the results of the ATP/OTP testing performed to verify that newly procured neutron and gamma probes (reduced diameter design modifications) for operation in the Tank 241-SY-101 MITs are compatible with existing LOW van instrumentation and hardware. This verification was accomplished and a set of moisture data versus elevation were obtained from the Tank 241-SY-101 MITs as part of this testing program.

NTIS

Probes; Acceptability; Adenosine Triphosphate; Elevation

20020080767 Department of Energy, Washington, DC USA

Final results of double-shell tank 241-AN-105 ultrasonic inspection

Jensen, C. E.; Aug. 23, 1999; 141p; In English

Report No.(s): DE2002-797735; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document presents the results and documentation of the nondestructive ultrasonic examination of tank 241-AN-105. A tank inspection supplier was retained to provide and use an ultrasonic examination system (equipment, procedures, and inspectors) to scan a limited area of double-shell tank 241-AN-105 primary tank wall primary knuckle, and secondary tank bottom. The inspection found some indication of general and local wall thinning with no cracks detected.

NTIS

Ultrasonic Tests; Tanks (Containers); Cracks; Radioactive Wastes

20020080768

Final results of double-shell tank 241-AN-106 ultrasonic inspection

Jensen, C. E.; Aug. 23, 1999; 65p; In English

Report No.(s): DE2002-797736; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document presents the results and documentation of the nondestructive ultrasonic examination of tank 241-AN-106. A tank inspection supplier was retained to provide and use an ultrasonic examination system (equipment, procedures, and inspectors) to scan a limited area of double-shell tank 241-AN-106 primary tank wall and welds. The inspection found no reportable indications of thinning, pitting, corrosion, or cracking.

NTIS

Storage Tanks; Radioactive Wastes; Ultrasonic Flaw Detection

20020080769

Final results of double-shell tank 241-AY-102 ultrasonic inspection

Jensen, C. E.; Aug. 23, 1999; 61p; In English

Report No.(s): DE2002-797737; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document presents the results and documentation of the nondestructive ultrasonic examination of tank 241-AY-102. A tank inspection supplier was retained to provide and use an ultrasonic examination system (equipment, procedures, and inspectors) to scan a limited area of double-shell tank 241-AY-102 primary tank wall and welds. The inspection found some indication of insignificant general and local wall thinning with no cracks detected.

NTIS

Storage Tanks; Radioactive Wastes; Ultrasonic Flaw Detection

20020080770

Final results of double-shell tank 241-AZ-101 ultrasonic inspection

Jensen, C. E.; Aug. 23, 1999; 66p; In English

Report No.(s): DE2002-797738; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document presents the results and documentation of the nondestructive ultrasonic examination of tank 241-AZ-101. A tank inspection supplier was retained to provide and use an ultrasonic examination system (equipment, procedures, and inspectors) to scan a limited area of double-shell tank 241-AZ-101 primary tank wall and welds. The inspection found one reportable indication of thinning and no reportable pitting, corrosion, or cracking.

NTIS

Storage Tanks; Radioactive Wastes; Ultrasonic Flaw Detection

20020080908

Tank Monitoring and Control System (TMACS) Acceptance Test Procedure

Holm, M. J.; Jul. 06, 1999; 91p; In English

Report No.(s): DE2002-797489; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document is used to validate Revision 11.1 of the Tank Monitor and Control System (TMACS) and verify its functions as intended by design.

NTIS

Applications Programs (Computers); Storage Tanks; Program Verification (Computers)

20020080909

Tank Monitoring and Control System (TMACS) Acceptance Test Procedure

Holm, M. J.; Jun. 30, 1999; 91p; In English

Report No.(s): DE2002-797488; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document is used to validate Revision 11.1 of the Tank Monitor and Control System (TMACS) and verify its functions as intended by design.

NTIS

Program Verification (Computers); Applications Programs (Computers); Storage Tanks

20020080910

Tank Monitor and Control System (TMACS) Version Description Document

Holm, M. J.; Jul. 01, 1999; 33p; In English

Report No.(s): DE2002-797481; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document updates the Version Description Document with the changes incorporated in the Revision 11.0 software installation on the Tank Monitor and Control System (TMACS).

NTIS

Storage Tanks; Applications Programs (Computers)

20020080928 Lixi, Inc., Downers Grove, IL USA

Industrial Inspection System

Spinoff 1993; 1993, pp. 100-101; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Lixi, Inc. has built a thriving business on NASA-developed x-ray technology. The Low Intensity X-ray Imaging scope (LIXI) was designed to use less than one percent of radiation required by conventional x-ray devices. It is portable and can be used for a variety of industrial inspection systems as well as medical devices. A food processing plant uses the new LIXI Conveyor system to identify small bone fragments in chicken. The chicken packages on a conveyor belt enter an x-ray chamber and the image is displayed on a monitor. Defects measuring less than a millimeter can be detected. An important advantage of the system is its ability to inspect 100 percent of the product right on the production line.

Author

Inspection; Lixiscopes; Radiation; Fluoroscopy

20020080948 Trace Labs. - Central, Chicago, IL USA

Testing Services

Spinoff 1993; 1993, pp. 105; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Trace Laboratories is an independent testing laboratory specializing in testing printed circuit boards, automotive products and military hardware. Technical information from NASA Tech Briefs and two subsequent JPL Technical Support packages have assisted Trace in testing surface insulation resistance on printed circuit board materials. Testing time was reduced and customer service was improved because of Jet Propulsion Laboratory technical support packages.

Author

Performance Tests; Hardware; Printed Circuits

20020080956 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Nondestructive Technique Survey for Assessing Integrity of Composite Firing Vessel

Tran, A.; Aug. 01, 2000; 45p; In English

Report No.(s): DE2002-793684; UCRL-ID-139849; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The repeated use and limited lifetime of a composite tiring vessel compel a need to survey techniques for monitoring the structural integrity of the vessel in order to determine when it should be retired. Various nondestructive techniques were researched and evaluated based on their applicability to the vessel. The methods were visual inspection, liquid penetrant testing, magnetic particle testing, surface mounted strain gauges, thermal inspection, acoustic emission, ultrasonic testing, radiography, eddy current testing, and embedded fiber optic sensors. It was determined that embedded fiber optic sensor is the most promising technique due to their ability to be embedded within layers of composites and their immunity to electromagnetic interference.

NTIS

Electromagnetic Interference; Nondestructive Tests; Surveys; Composite Materials; Fiber Optics

20020080968 Bio-Imaging Research, Inc., Lincolnshire, IL USA

Industrial Inspection System

Spinoff 1993; 1993, pp. 110-111; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

ACTIS+ is a smaller, personal computer version of ACTIS, a computed tomography system which finds its origins in the Apollo lunar landing research. It is used to identify imperfections in aerospace structures and components. Designed to be added to an existing real time radiography system, its components include a high precision rotation/elevation manipulator, color image monitor, graphical user interface monitor, and PC compatible workstation. Cross-sectional CT images are more detailed than radiographic images and the high speed scanning feature offers the capability for 100 percent inspection in a production environment. Bio-Imaging Research, Inc. (BIR) originally developed ACTIS for Marshall Space Flight Center (MSFC), and commercial units were sold to aerospace manufacturers. The technology was refined for ACTIS+, which is principally used in non-destructive testing.

Author

Inspection; Personal Computers; Computer Aided Tomography; Aerospace Engineering

20020081251 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Reliability Engineering and Robust Design: New Methods for Thermal/Fluid Engineering

Cullimore, Brent A., C and R Technologies, Inc., USA; Tsuyuki, Glenn T., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 225-240; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Recent years have witnessed more improvement to the SINDA/FLUINT thermohydraulic analyzer than at any other time in its long history. These improvements have included not only expansions in analytic power, but also the additions of high-level modules that offer revolutions in thermal/fluid engineering itself. One such high-level module, ”Reliability Engineering,” is described in this paper. Reliability Engineering means considering tolerances in design parameters, uncertainties in environments, uncertainties in application (e.g. usage scenarios), and variations in manufacturing as the stochastic phenomena that they are. Using this approach, the probability that a design will achieve its required performance (i.e., the reliability) is calculated, providing an assessment of risk or confidence in the design, and quantifying the amount of over- or under-design present. The design to be evaluated for reliability will likely have been produced using traditional methods. Possibly, the design was generated using the Solver optimizer, another high-level module available in SINDA/FLUINT. Using design optimization, the user quantifies the goals that make one design better than another (mass, efficiency, etc.), and specifies the thresholds or requirements which render a given design viable or useless (exceeding a performance limit, etc.). SINDA/FLUINT then automatically searches for an optimal design. Robust Design means factoring reliability into the development of the design itself: designing for a target reliability and thereby avoiding either costly over-design or dangerous under-design in the first place. Such an approach eliminates a deterministic stack-up of tolerances, worst-case scenarios, safety factors, and margins that have been the traditional approaches for treating uncertainties. In any real system or product, heat transfer and fluid flow play a limited role: there are many other aspects to a successful design than the realm of thermal/fluids that is encompassed by SINDA/FLUINT. Therefore, this paper concludes with brief descriptions of methods for performing interdisciplinary design tasks.

Author

Reliability Engineering; Applications Programs (Computers); Design Analysis; Multidisciplinary Design Optimization; Computer Aided Design

20020082900 NASA Glenn Research Center, Cleveland, OH USA

Ultrasonic Resonance Spectroscopy of Composite Rims for Flywheel Rotors

Harmon, Laura M., Cleveland State Univ., USA; Baaklini, George Y., NASA Glenn Research Center, USA; September 2002; 20p; In English; 28th Annual Review in Progress in Quantitative Nondestructive Evaluation (QNDE), 29 Jul. - 3 Aug. 2001, Brunswick, ME, USA; Sponsored by Iowa State Univ. of Science and Technology, USA

Contract(s)/Grant(s): RTOP 755-1A-09

Report No.(s): NASA/TM-2002-211104; NAS 1.15:211104; E-12949; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flywheel energy storage devices comprising multilayered composite rotor systems are being studied extensively for utilization in the International Space Station. These composite material systems were investigated with a recently developed ultrasonic resonance spectroscopy technique. The ultrasonic system employs a continuous swept-sine waveform and performs a fast Fourier transform (FFT) on the frequency response spectrum. In addition, the system is capable of equalizing the amount of energy at each frequency. Equalization of the frequency spectrum, along with interpretation of the second FFT, aids in the evaluation of the fundamental frequency. The frequency responses from multilayered material samples, with and without known defects, were analyzed to assess the capabilities and limitations of this nondestructive evaluation technique for material characterization and defect detection. Amplitude and frequency changes were studied from ultrasonic responses of thick composite rings and a multiring composite rim. A composite ring varying in thickness was evaluated to investigate the full thickness resonance. The frequency response characteristics from naturally occurring voids in a composite ring were investigated. Ultrasonic responses were compared from regions with and without machined voids in a composite ring and a multiring composite rim. Finally, ultrasonic responses from the multiring composite rim were compared before and after proof spin testing to 63,000 rpm.

Author

Flywheels; Rims; Rotor Dynamics; Ultrasonic Spectroscopy; Resonant Frequencies; Composite Materials

20020083348 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Victoria, Australia

Principal Component Thermography

Rajic, N.; Apr. 2002; 38p; In English

Report No.(s): AD-A405857; DSTO-TR-1298; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes a robust computational framework for the qualitative enhancement and quantitative interpretation of active thermographic inspection data. Singular Value Decomposition is used to reduce an appropriately constructed matrix of raw pixel values to a set of orthogonal functions that compactly describe the key spatial and temporal variations relating to underlying structural anomalies. Tests against synthetic and experimental data are described that underscore the practical efficacy of the methodology, and demonstrate significant advantages compared to more traditional methods of processing.

DTIC

Thermography; Computation; Data Acquisition; Qualitative Analysis; Quantitative Analysis

39
STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

20020080875 Technische Univ., Faculty of Aerospace Engineering, Delft Netherlands

Flange Efficiency of Curved Beams

Rothwell, A.; Jun. 1998; 21p

Report No.(s): PB2002-106858; MEMO-M-821; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The loss of stiffness in the flanges of a beam such as a channel, Z- of I-section, curved in the plane of the web, is well known. by deformation of the cross-section under an in-plane bending moment there is relief of bending stress in the flanges, and loss of stiffness of the beam as a whole. The classical solution of this problem (1) (2) has involved treating each flange as part of a cylindrical shell and solving the differential equation with appropriate edge conditions. The resulting formulae are rather complex and, while representing an exact solution, unsuitable for routine use in what is in fact a very commonly occurring engineering situation. The aim of this paper is to develop simple, explicit formulae which are both sufficiently accurate and easy to use. The derivation makes clear the cause of loss of stiffness in a curved beam, and identifies the geometric parameters on which flange

efficiency depends. An energy approach is adopted, coupled with an assumed mode of deformation of the cross-section. However, a somewhat different procedure is required for the three different types of curved beam, namely channel, Z- or I-section, with or without a lip on the edge of each flange. Therefore each of these is treated separately.
NTIS
Stiffness; Curved Beams; Flanges; Structural Analysis; Deformation; Bending Fatigue

20020080893 Ohio Aerospace Inst., Brook Park, OH USA
Design and Analysis of UHTC Leading Edge Attachment ***Final Report***
Thomas, David J., Ohio Aerospace Inst., USA; July 2002; 70p; In English; Original contains color illustrations
Contract(s)/Grant(s): NCC3-756; RTOP 706-85-31
Report No.(s): NASA/CR-2002-211505; E-13271; NAS 1.26:211505; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

NASA Glenn Research Center was contacted to provide technical support to NASA Ames Research Center in the design and analysis of an ultra high temperature ceramic (UHTC) leading edge. UHTC materials are being considered for reusable launch vehicles because their high temperature capability may allow for un-cooled sharp leading edge designs. While ceramic materials have the design benefit of allowing subcomponents to run hot, they also provide a design challenge in that they invariably must be in contact with cooler subcomponents elsewhere in the structure. NASA Glenn Research Center proposed a modification to an existing attachment design. Thermal and structural analyses of the leading edge assembly were carried out using ABAQUS finite element software. Final results showed that the proposed modifications aided in thermally isolating hot and cold subcomponents and reducing bearing stresses at the attachment location.
Author
Ceramics; Design Analysis; High Temperature; Mathematical Models; Sharp Leading Edges

20020080911 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Wavelet Based Dissipation Method for ALE Schemes
Cabot, B.; Eliason, D.; Jameson, L.; Jul. 01, 2000; 20p; In English
Report No.(s): DE2002-793693; UCRL-ID-140074; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Wavelet analysis is natural tool to detect the presence of numerical noise, shocks and other features which might drive a calculation to become unstable. Here we suggest ways where wavelets can be used effectively to define a dissipation flag to replace dissipation flags traditionally used in ALE numerical schemes.
NTIS
Wavelet Analysis; Dissipation; Numerical Analysis; Euler-Lagrange Equation

20020080987 NASA Glenn Research Center, Cleveland, OH USA
Slow Crack Growth of Brittle Materials With Exponential Crack-Velocity Formulation, Part 3, Constant Stress and Cyclic Stress Experiments
Choi, Sung R., Ohio Aerospace Inst., USA; Nemeth, Noel N., NASA Glenn Research Center, USA; Gyekenyesi, John P., NASA Glenn Research Center, USA; July 2002; 29p; In English
Contract(s)/Grant(s): RTOP 708-31-13
Report No.(s): NASA/TM-2002-211153/PT3; E-13009-3/PT3; NAS 1.15:211153/PT3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The previously determined life prediction analysis based on an exponential crack-velocity formulation was examined using a variety of experimental data on advanced structural ceramics tested under constant stress and cyclic stress loading at ambient and elevated temperatures. The data fit to the relation between the time to failure and applied stress (or maximum applied stress in cyclic loading) was very reasonable for most of the materials studied. It was also found that life prediction for cyclic stress loading from data of constant stress loading in the exponential formulation was in good agreement with the experimental data, resulting in a similar degree of accuracy as compared with the power-law formulation. The major limitation in the exponential crack-velocity formulation, however, was that the inert strength of a material must be known a priori to evaluate the important slow-crack-growth (SCG) parameter n, a significant drawback as compared with the conventional power-law crack-velocity formulation.
Author
Crack Propagation; Brittle Materials; Mechanical Properties; High Temperature

20020081038 NASA Goddard Space Flight Center, Greenbelt, MD USA

Automation Tools for Finite Element Analysis of Adhesively Bonded Joints

Tahmasebi, Farhad, NASA Goddard Space Flight Center, USA; [2002]; 5p; In English; ASME/JSME International Conference on Materials and Processing, 15-18 Oct. 2002, Honolulu, HI, USA; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This article presents two new automation creation tools that obtain stresses and strains (Shear and peel) in adhesively bonded joints. For a given adhesively bonded joint Finite Element model, in which the adhesive is characterised using springs, these automation tools read the corresponding input and output files, use the spring forces and deformations to obtain the adhesive stresses and strains, sort the stresses and strains in descending order, and generate plot files for 3D visualisation of the stress and strain fields. Grids (nodes) and elements can be numbered in any order that is convenient for the user. Using the automation tools, trade-off studies, which are needed for design of adhesively bonded joints, can be performed very quickly.

Author

Adhesive Bonding; Bonded Joints; Stress-Strain Relationships; Finite Element Method

20020081117 NASA Glenn Research Center, Cleveland, OH USA

Residual Stresses in Thermal Barrier Coatings for a Cu-8Cr-4Nb Substrate System

Ghosn, Louis J., Ohio Aerospace Inst., USA; Raj, Sai V., NASA Glenn Research Center, USA; July 2002; 13p; In English; 26th Annual International Conference on Advanced Ceramics and Composites, 13-18 Jan. 2002, Cocoa Beach, FL, USA; Sponsored by American Ceramic Society, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 708-73-21

Report No.(s): NASA/TM-2002-211561; E-13341; NAS 1.15:211561; ECD4-A-09-2002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Analytical calculations were conducted to determine the thermal stresses developed in a coated copper-based alloy, Cu-8%(at.%)Cr-4%Nb (designated as GRCop-84), after plasma spraying and during heat-up in a simulated rocket engine environment. Finite element analyses were conducted for two coating systems consisting of a metallic top coat, a pure copper bond coat and the GRCop-84. The through thickness temperature variations were determined as a function of coating thickness for two metallic coatings, a Ni-17%(wt%)Cr-6%Al-0.5%Y alloy and a Ni-50%(at.%)Al alloy. The residual stresses after low-pressure plasma spraying of the NiCrAlY and NiAl coatings on GRCop-84 substrate were also evaluated. These analyses took into consideration a 50.8 mm copper bond coat and the effects of an interface coating roughness. The through the thickness thermal stresses developed in coated liners were also calculated after 15 minutes of exposure in a rocket environment with and without an interfacial roughness.

Author

Finite Element Method; Residual Stress; Rocket Engines; Thermal Control Coatings; Plasma Spraying; Thermal Analysis

20020081252 Concepts ETI, Inc., White River Jct, VT USA

Design Study of a Low-Cost LOX Turbopump

Japikse, David, Concepts ETI, Inc., USA; Baines, Nicholas, Concepts ETI, Inc., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 241-251; In English; Also announced as 20020081233; Copyright; Avail: Issuing Activity

A preliminary design study, focusing on potential component selections and Design for Manufacturing and Assembly (DFMA(R)) analysis, is presented in this study. The investigation was focused on a nominal cost liquid oxygen turbopump suitable for a private launch class vehicle. Utilizing a ”turbocharger-like” design philosophy, preliminary feasibility studies of the basic pump design class, the rotordynamic design class, and the turbine design class were conducted with associated DFMA evaluations. Reasonable cost levels and sensible levels of product assurance have been established.

Author

Design Analysis; Feasibility Analysis; Turbine Pumps; Rotor Dynamics; Design Optimization

20020082888 Akron Univ., Dept. of Civil Engineering, Akron, OH USA

Defect Localization Capabilities of a Global Detection Scheme: Spatial Pattern Recognition Using Full-Field Vibration Test Data in Plates ***Final Report***

Saleeb, A. F., Akron Univ., USA; Prabhu, M., Akron Univ., USA; August 2002; 165p; In English; Original contains color illustrations

Contract(s)/Grant(s): NCC3-808; RTOP 708-87-13

Report No.(s): NASA/CR-2002-211685; E-13414; NAS 1.26:211685; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Recently, a conceptually simple approach, based on the notion of defect energy in material space has been developed and extensively studied (from the theoretical and computational standpoints). The present study focuses on its evaluation from the viewpoint of damage localization capabilities in case of two-dimensional plates; i.e., spatial pattern recognition on surfaces. to this end, two different experimental modal test results are utilized; i.e., (1) conventional modal testing using (white noise) excitation and accelerometer-type sensors and (2) pattern recognition using Electronic speckle pattern interferometry (ESPI), a full field method capable of analyzing the mechanical vibration of complex structures. Unlike the conventional modal testing technique (using contacting accelerometers), these emerging ESPI technologies operate in a non-contacting mode, can be used even under hazardous conditions with minimal or no presence of noise and can simultaneously provide measurements for both translations and rotations. Results obtained have clearly demonstrated the robustness and versatility of the global NDE scheme developed. The vectorial character of the indices used, which enabled the extraction of distinct patterns for localizing damages proved very useful. In the context of the targeted pattern recognition paradigm, two algorithms were developed for the interrogation of test measurements; i.e., intensity contour maps for the damaged index, and the associated defect energy vector field plots.

Author

Experimentation; Nondestructive Tests; Damage; Defects; Speckle Patterns; Pattern Recognition; Systems Health Monitoring

20020083064 NASA Langley Research Center, Hampton, VA USA

Meshless Local Petrov-Galerkin Method for Bending Problems

Phillips, Dawn R., Lockheed Martin Space Operations, USA; Raju, Ivatury S., NASA Langley Research Center, USA; September 2002; 164p; In English

Contract(s)/Grant(s): RTOP 706-21-21-06

Report No.(s): NASA/TM-2002-211936; NAS 1.15:211936; L-18236; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Recent literature shows extensive research work on meshless or element-free methods as alternatives to the versatile Finite Element Method. One such meshless method is the Meshless Local Petrov-Galerkin (MLPG) method. In this report, the method is developed for bending of beams - C1 problems. A generalized moving least squares (GMLS) interpolation is used to construct the trial functions, and spline and power weight functions are used as the test functions. The method is applied to problems for which exact solutions are available to evaluate its effectiveness. The accuracy of the method is demonstrated for problems with load discontinuities and continuous beam problems. A Petrov-Galerkin implementation of the method is shown to greatly reduce computational time and effort and is thus preferable over the previously developed Galerkin approach. The MLPG method for beam problems yields very accurate deflections and slopes and continuous moment and shear forces without the need for elaborate post-processing techniques.

Author

Bending; Galerkin Method; Finite Element Method; Least Squares Method; Mathematical Models

20020083252 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Victoria, Australia

A Strain-based Cohesive Zone Model for a Crack in a Power-Law Material under Grossly Plastic Conditions

Chen, G. X.; Wang, C. H.; Rose, L. R.; Apr. 2002; 29p; In English

Report No.(s): AD-A405982; DSTO-RR-0235; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To develop an analytical method for quantifying the growth behavior of short cracks embedded in notch plastic zones for power law strain hardening materials, a strain-based cohesive zone model is proposed in which the conventional equilibrium equation in the stress-based model is replaced by strain compatibility. A comparison with finite element results shows that this strain-based model provides accurate values of the crack-tip-opening displacement for applied strains up to four times the yield strain under general yielding conditions. Furthermore, it is shown that the cohesive stress determined by a method proposed in this work gives better results than the existing method, which are appropriate only for small-scale yielding conditions.

DTIC

Strain Hardening; Plastic Properties; Stress Analysis; Short Cracks

20020083321 Massachusetts Inst. of Tech., Cambridge, MA USA

Comparison of Approaches for Determining the Failure of Stiffened Cylindrical Shells

Price, David J.; Jun. 2002; 224p; In English

Report No.(s): AD-A405710; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The thesis compares the analytical solution, two marine classification society design rules, and two design guides against experimental results for predicting the failure modes (general instability, axisymmetric buckling, and asymmetric collapse of the

shell LOBAR BUCKLING) and failure pressures of ring-stiffened cylinders The analytical solution is first summarized based on several sources. The design rules for the classification societies and the design guidance from two sources are then presented with brief explanations for each one. The design rules used are: American Bureau of Shipping (Rules for Building and Classing Underwater Vehicles, Systems, and Hyperbaric Facilities, 1990) and Germanischer Lloyd (Rules for Underwater Technology, 1988). The design guides used were Society of Naval Architects and Marine Engineers (Submersible Vehicle Systems Design, 1990) and Massachusetts Institute of Technology Course 13A professional Summer Notes (MIT 13A Submarine Design Trends, 2001). The USA Navy Naval Sea Systems Command, Submarine Structural Integrity Division supplied experimental data for four cylinders that covered the failure modes and allowed comparison between experiment and design rules/guidance. The comparison of experimental to predicted data found that the design codes and design guides performed adequately in predicting axisymmetric yield and asymmetric buckling. The performance of the design codes and guides in predicting failure by general instability was unsatisfactory. For the experimental failures by general instability, the design codes and guides predicted significantly higher failure pressures than those experimentally determined; resulting in the design codes and guides actually predicting failure by axisymmetric yield in stead of general instability. These inconsistencies in the predictions of failure mode and pressures for general instability should be further explored to determine causes and corrections.
DTIC
Cylindrical Shells; Failure Modes; Structural Failure; Systems Engineering; Rigid Structures

20020083324 Naval Research Lab., Washington, DC USA
Subcritical Flaw Growth in 9Ni-4Co-0,25C Steel - A Fatigue and Fractographic Investigation and Its Relationship to Plane Strain Fracture Toughness
Crooker, T. W.; Cooley, L. A.; Lange, E. A.; Freed, C. N.; May 01, 1968; 25p; In English
Report No.(s): AD-A405714; NRL-6698; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Fatigue crack propagation and plane strain fracture toughness (K(sub Ic)) studies were conducted on a 9Ni-4Co-0.25C steel which had been quenched and tempered to a yield strength of 180 ksi. Fatigue specimens were cycled to failure in a room air environment under several combinations of cyclic and tensile mean loads. It was observed that fatigue crack propagation became unstable at a critical level of stress-intensity which led to rapid failure. This critical stress-intensity level in fatigue was consistently below the stress-intensity value for crack instability predicted by conventional rising load K(sub Ic) tests. Electron fractography studies were conducted on the fatigue surfaces. A gradual change in fracture surface appearance with cyclic stress-intensity level was found to occur. Fatigue striations predominated at low cyclic stress-intensity levels, changing to dimpled rupture at high cyclic stress-intensity levels. No abrupt change in fracture surface appearance was observed to coincide with the critical stress-intensity level in fatigue. It is concluded from this study that, although K(sub Ic) provides a lower-bound estimate of stress-intensity for terminal fracture in monotonic loading, subcritical flaw growth by fatigue in some high-strength materials may define a more conservative estimate of structural material performance.
DTIC
Fatigue (Materials); Fractography; Fracture Strength; Plane Strain; Steels

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20020080762 Department of Energy, Washington, DC USA
Seismic Adequacy Review of PC012 SCEs that are Potential Seismic Hazards with PC3 SCEs at Cold Vacuum Dryer (CVD) Facility
Ocoma, E. C.; Aug. 12, 1999; 61p; In English
Report No.(s): DE2002-797683; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This document provides seismic adequacy review of PCO12 Systems, Components L Equipment anchorage that are potential seismic interaction hazards with PC3 SCEs during a Design Basis Earthquake. The PCO12 items are identified in the Safety Equipment List as 3/1 SCEs.
NTIS
Hazards; Drying Apparatus

20020080775 Kuwait Univ., Safat Kuwait
Kuwait Journal of Science and Engineering, Volume 28 ***Annual Report***
Thomas, M.; 2001; 222p; In English
Report No.(s): PB2002-104601; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
The Kuwait Journal of Science and Engineering publishes papers on various facets of life, natural and applied sciences and engineering.
NTIS
Science; Engineering; Research Projects; Kuwait

20020080789 National Defence Research Establishment, Div. of Command and Control Warfare, Linkoeping, Sweden
Converting Laser-Radar Data into a Digital Terrain Model without Forest ***Konvertering av Laserradardata till Digital Terraeng Utan Skog***
Hoerling, P.; Lantz, F.; Neider, G.; Dec. 1999; In Swedish; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-107182; FOA-R-99-01380-408-SE; No Copyright; Avail: National Technical Information Service (NTIS)
This report describes methods and tools to handle data collected by a helicopter-mounted laser scanning system with the objective to create a high resolution digital terrain model. An important subproblem is how to separate forestry data from the digital description and to analyze and visualize the result. The report delineates the conversion process from laser radar data to regular grids for different altitude layers. This gives a basis for adaptations for the data for various purposes. Experience gained from measurements made in the Valla area in Linkoping 1998 serve to exemplify the use of the tools.
NTIS
Lasers; Digital Data; Imaging Radar; Digital Elevation Models

20020080794 Geological Survey, Albuquerque, NM USA
Spatial Patterns and Temporal Variability in Water Quality from City of Albuquerque Drinking-Water Supply Wells and Piezometer Nests, with Implications for the Ground-Water Flow System ***Final Report***
Bexfield, L. M.; Anderholm, S. K.; 2002; 112p; In English
Report No.(s): PB2002-106851; USGS-WRI-01-4244; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report examines water-quality data for City drinking-water supply wells and deep piezometer nests to improve understanding of the regional geohydrologic framework. Water-level data for the deep piezometer nests were also examined to better define the ground-water flow system and its response to ground-water pumpage. Examination of water-quality data is limited to a subset of 10 water-quality parameters (dissolved solids, calcium, sodium, bicarbonate, sulfate, chloride, silica, arsenic, field pH, and water temperature) selected to represent major-element and trace-element chemistry and physical properties of water from the aquifer. These 10 water-quality parameters are examined for spatial patterns, both areally and with depth, and implications for ground-water source areas and flow paths.
NTIS
Water Quality; New Mexico; Potable Water; Wells

20020080816 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Impact of Amazonian Deforestation on Dry-Season Rainfall
Negri, Andrew J., NASA Goddard Space Flight Center, USA; Adler, Robert F., NASA Goddard Space Flight Center, USA; Xu, Li-Ming, Arizona Univ., USA; Surratt, Jason, North Carolina State Univ., USA; [2002]; 17p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Many modeling studies have concluded that widespread deforestation of Amazonia would lead to decreased rainfall. We analyze geosynchronous infrared satellite data with respect percent cloudiness, and analyze rain estimates from microwave sensors aboard the Tropical Rainfall Measuring Mission satellite. We conclude that in the dry-season, when the effects of the surface are not overwhelmed by synoptic-scale weather disturbances, deep convective cloudiness, as well as rainfall occurrence, all increase over the deforested and non-forested (savanna) regions. This is in response to a local circulation initiated by the differential heating of the region's varying forestation. Analysis of the diurnal cycle of cloudiness reveals a shift toward afternoon hours in the deforested and savanna regions, compared to the forested regions. Analysis of 14 years of data from the Special Sensor Microwave/Imager data revealed that only in August did rainfall amounts increase over the deforested region.
Author
Amazon Region (South America); Deforestation; Diurnal Variations; Rain; Weather

20020080827 Bureau of Reclamation, Technical Service Center, Denver, CO USA

Ground Water and River Flow Analysis

Apr. 2002; 48p; In English

Report No.(s): PB2002-106737; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The issue discussed in this summary is High Ground Water Levels. The purpose of this summary is to determine the range of potential effects from the Program's proposed environmental water account.

NTIS

Ground Water; Base Flow

20020080829 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden

Geoacoustic Sediment Properties in the Baltic

Dalberg, E.; Levonen, M.; Nilsson, B.; Olsson, M.; Phil, J.; Mar. 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-106386; FOA-R-00-1466-409-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The main limiting factor for the active sonar in shallow water is the bottom reverberation, due to scattering of the acoustic signal. In monostatic sonar the transmitter and receiver are co-located, where the main contributing factor to reverberation is the backscattering, and the scattering can be fairly easily measured. In bistatic sonar, the transmitter and receiver are separated, and scattering depends both on the grazing and scattering angle. Furthermore, there is a dependence on an azimuthal angle (i.e. scattering out of the plane), which makes it much more tedious to investigate the angular dependence of the scattering. The authors have designed an experimental procedure to measure bistatic scattering, and report here on the first measurements in the Baltic. The experiments are carried out using a ROV (Remotely Operated Vehicle) with a parametric source TOPAS 120 mounted to it. The receiver was a stationary vertical hydrophone array consisting of eight equidistant elements. At both experiment sites A and B, the authors found that the angular dependence of the scattering strength is weaker than the effect from different areas of the seafloor being insonified. Keeping in mind that hitting a pockmark with a narrow beam will give a totally different effect than hitting a flat undisturbed area.

NTIS

Baltic Sea; Sediments; Surveillance Radar

20020080849 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Simulating Perforation Permeability Damage and Cleanup

Morris, J. P.; Lomov, I. N.; Glenn, L. A.; Sep. 01, 2000; 26p; In English

Report No.(s): DE2002-793699; UCRL-ID-140438; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Completion of cased and cemented wells by shaped charge perforation causes its own damage to the formation, potentially reducing well productivity. In practice it is found that underbalance conditions clean up the damaged zone to some extent, however, the mechanisms of these processes are poorly understood. Most hydrocodes typically used to simulate rock response to shaped charge penetration do not provide permeability estimates. Furthermore, the time scales for formation clean up are potentially much longer than the period of jet penetration. We have developed a simple, yet accurate model for the evolution of porosity and permeability which can easily be incorporated into existing hydrocodes using information from the history of each cell. In addition, we have developed a code that efficiently simulates fines migration during the post-shot surge period using initial conditions taken directly from hydrocode simulations of jet penetration. Results from a one-dimensional model simulation are in excellent agreement with measured fines and permeability distributions. We also present two-dimensional numerical results which qualitatively reproduce experimentally obtained permeability maps for different values of underbalance. Although initial results have been promising, further comparison with experiment is essential to tune the coupling between the hydrocode and fines migration simulator. Currently the permeability model is most appropriate for high permeability sandstones (such as Berea), but with little effort, the model can be extended to other rock types, given sufficient experimental data.

NTIS

Permeability; Wells

20020080978 Geological Survey, Water Resources Div., Salt Lake City, UT USA

Water Resources Data Utah: Water Year 2001 ***Final Report***

Herbert, L. R.; Wilberg, D. E.; Tibbetts, J. R.; Jun. 2002; 488p; In English

Report No.(s): PB2002-107978; USGS-WDR-UT-01-1; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

Water-resources data for the year 2001 water year for Utah consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground water.
NTIS
Water Resources; Hydrology; Water Quality; Utah

20020080980 Environmental Protection Agency, National Exposure Research Lab., Las Vegas, NV USA
Landscape Assessment of the Catskill/Delaware Watersheds 1975-1998: New York City's Water Supply Watersheds
Mehaffey, M. H.; Nash, M. S.; Wade, T. G.; Edmonds, C. M.; Ebert, D. W.; Sep. 2001; In English; This document is color dependent and/or in landscape layout. It is currenlty only available on CD-ROM
Report No.(s): PB2002-107277; EPA/600/R-01/075; No Copyright; Avail: National Technical Information Service (NTIS)
The study reported here takes advantage of a set of new technologies for assessing environmental conditions at a landscape scale. The focus of this report is the watersheds of the Catskill Delaware (CD) water supply system located in Region 2 of the U.S. Environmental Protection Agency's (EPA). These watersheds and their reservoirs provide the majority of the drinking water for New York City. High speed computers, satellite imagery and historical databases with extensive spatial and temporal coverage now facilitate analyses of regional issues such as the status of the CD water supply system over time. The purpose of this document is to provide (1) regional and local scale data that will assist land managers, policy makers, and the general public in making informed decisions on environmental and water resources issues; and (2) data analyses that help direct future land cover and land use practices critical to maintaining water quality.
NTIS
Watersheds; Potable Water; Environmental Monitoring; Water Resources

20020082961 NASA Goddard Space Flight Center, Greenbelt, MD USA
1999 NCCS Highlights
July 2002; 103p; In English; Also announced as 20020082962 through 20020082972; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The NASA Center for Computational Sciences (NCCS) is a high-performance scientific computing facility operated, maintained and managed by the Earth and Space Data Computing Division (ESDCD) of NASA Goddard Space Flight Center's (GSFC) Earth Sciences Directorate. The mission of the NCCS is to advance leading-edge science by providing the best people, computers, and data storage systems to NASA's Earth and space sciences programs and those of other U.S. Government agencies, universities, and private institutions. Among the many computationally demanding Earth science research efforts supported by the NCCS in Fiscal Year 1999 (FY99) are the NASA Seasonal-to-Interannual Prediction Project, the NASA Search and Rescue Mission, Earth gravitational model development efforts, the National Weather Service's North American Observing System program, Data Assimilation Office studies, a NASA-sponsored project at the Center for Ocean-Land-Atmosphere Studies, a NASA-sponsored microgravity project conducted by researchers at the City University of New York and the University of Pennsylvania, the completion of a satellite-derived global climate data set, simulations of a new geodynamo model, and studies of Earth's torque. This document presents highlights of these research efforts and an overview of the NCCS, its facilities, and its people.
Author
Aerospace Engineering; Climatology; Computer Storage Devices; Data Storage; Meteorological Services; Microgravity; Mission Planning

20020082969 NASA Goddard Space Flight Center, Greenbelt, MD USA
Enabling Earth Science: The Facilities and People of the NCCS
1999 NCCS Highlights; July 2002, pp. 1-12; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche
The NCCS's mass data storage system allows scientists to store and manage the vast amounts of data generated by these computations, and its high-speed network connections allow the data to be accessed quickly from the NCCS archives. Some NCCS users perform studies that are directly related to their ability to run computationally expensive and data-intensive simulations. Because the number and type of questions scientists research often are limited by computing power, the NCCS continually pursues the latest technologies in computing, mass storage, and networking technologies. Just as important as the processors, tapes, and routers of the NCCS are the personnel who administer this hardware, create and manage accounts, maintain security, and assist the scientists, often working one on one with them.
Derived from text
Data Simulation; Data Storage; Computation; Research Facilities

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20020080899 NASA Goddard Space Flight Center, Greenbelt, MD USA
Contribution of Chlorophyll Fluorescence to the Reflectance of Corn Foliage
Campbell, Petya K. Entcheva, NASA Goddard Space Flight Center, USA; Middleton, Elizabeth M., NASA Goddard Space Flight Center, USA; Corp, L. A., NASA Goddard Space Flight Center, USA; McMurtrey, J. E., Agricultural Research Service, USA; Kim, M. S., Agricultural Research Service, USA; Chappelle, E. W., NASA Goddard Space Flight Center, USA; Butcher, L. M., NASA Goddard Space Flight Center, USA; [2002]; 3p; In English; International Geoscience and Remote Sensing Symposium, 24-28 Jun. 2002, Toronto, Canada; Original contains color illustrations
Contract(s)/Grant(s): NAS/NRC Order 003790; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To assess the contribution of chlorophyll fluorescence (ChlF) to apparent reflectance (Ra) in the red/far-red, spectra were collected on a C4 agricultural species (corn, Zea Mays L.) under conditions ranging from nitrogen deficiency to excess. A significant contribution of ChlF to Ra was observed, with on average 10-25% at 685nm and 2-6% at 740nm of Ra being due to ChlF. Higher ChlF was consistently measured from the abaxial leaf surface as compared to the adaxial. Using 350-665nm excitation, the study confirms the trends in three ChlF ratios established previously by active F technology, suggesting that the ChlF utility this technology has developed for monitoring vegetation physiological status is likely applicable also under natural solar illumination.
Author
Chlorophylls; Corn; Fluorescence; Reflectance; Foliage

20020080934 Forest Service, USA
Fighting Forest Fires
Spinoff 1993; 1993, pp. 96-97; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Firefly is an airborne system for imaging forest fires. It uses satellite-based navigation for greater positioning accuracy and offers timeliness in fire location data delivery with on board data processing and a direct aircraft-to-fire camp communications link. Developed by Jet Propulsion Laboratory and the USFS, it has an infrared line scanner to identify fire boundaries and an infrared sensor system that can penetrate smoke to image the ground. Firefly is an outgrowth of a previous collaboration that produced FLAME, an airborne fire mapping instrument. Further refinements are anticipated by NASA and the USA Forest Service (USFS).
Author
Airborne Equipment; Forest Fires; Imaging Techniques; Onboard Data Processing; Communication Networks

20020080944 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Finding the Lost City
Spinoff 1993; 1993, pp. 64-65; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Nicholas Clapp, a filmmaker and archeology enthusiast, had accumulated extensive information concerning Ubar, the fabled lost city of ancient Arabia. When he was unable to identify its exact location, however, he turned to the Jet Propulsion Laboratory (JPL) for assistance in applying orbital remote sensing techniques. JPL scientists searched NASA's shuttle imaging radar, as well as LANDSAT and SPOT images and discovered ancient caravan tracks. This enabled them to prepare a map of the trails, which converged at a place known as Ash Shisr. An expedition was formed, which found structures and artifacts from a city that predates previous area civilization by a thousand years. Although it will take time to validate the city as Ubar, the discovery is a monumental archeological triumph.
Author
Archaeology; Cities; Remote Sensing; Radar Imagery; Thematic Mapping

20020080963 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Multi-Wavelength Thermal Infrared and Reflectance Scene Simulation Model
Ballard, J. R., Jr., Army Engineer Research and Development Center, USA; Smith, J. A., NASA Goddard Space Flight Center,

USA; [2002]; 3p; In English; 2002 International Geoscience and Remote Sensing Symposium, 23-28 Jun. 2002, Toronto, Canada Contract(s)/Grant(s): NRA-99-OES-01; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Several theoretical calculations are presented and our approach discussed for simulating overall composite scene thermal infrared exitance and canopy bidirectional reflectance of a forest canopy. Calculations are performed for selected wavelength bands of the DOE Multispectral Thermal Imagery and comparisons with atmospherically corrected MTI imagery are underway. NASA EO-1 Hyperion observations also are available and the favorable comparison of our reflective model results with these data are reported elsewhere.

Author

Canopies (Vegetation); Infrared Radiation; Thermal Simulation; Terrestrial Radiation; Bidirectional Reflectance

20020080979 Environmental Protection Agency, National Exposure Researc Lab., Las Vegas, NV USA

Imaging Spectroscopy for Determining Rangeland Stressors to Western Watersheds: Pollution Prevention and New Technology

Williams, D.; Kepner, W.; Apr. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-107278; EPA/600/R-01/004; NERL-LV-ESD-01-004; No Copyright; Avail: National Technical Information Service (NTIS)

The Environmental Protection Agency is developing rangeland ecological indicators in twelve western states using advanced remote sensing techniques. Fine spectral resolution (hyperspectral) sensors, or imaging spectrometers, can detect the subtle spectral features that make vegetation and soil discrimination possible. This study will use hyperspectral remote sensing data, such as NASA's Airborne Visible-Infra-Red Imaging Spectrometer (AVIRIS), a system capable of 5 to 20 meter spatial resolution. Airborne and satellite remote sensing will provide vegetation mapping at the species level, soil types and characteristics, and landscape information such as erosional features. Vegetation community structure, spatial distribution, and health can then be determined and combined with climatic data to classify rangeland condition and identify disturbed regions.

NTIS

Watersheds; Imaging Spectrometers; Ecology; Rangelands; Environmental Monitoring; Spectroscopy

20020080989 NASA Goddard Space Flight Center, Greenbelt, MD USA

Combined Use of Satellite and Surface Observations to Infer the Imaginary Part of Refractive Index of Saharan Dust

Sinyuk, Alexander, NASA Goddard Space Flight Center, USA; Torres, Omar, NASA Goddard Space Flight Center, USA; Dubovik, Oleg, NASA Goddard Space Flight Center, USA; [2002]; 5p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We present a method for retrieval of the imaginary part of refractive index of desert dust aerosol in the near UV part of spectrum. The method uses Total Ozone Mapping Spectrometer (TOMS) measurements of the top of the atmosphere radiances at 331 and 360 run and aerosol optical depth provided by the Aerosol Robotic Network (AERONET). Obtained values of imaginary part of refractive index retrieved for Saharan dust aerosol at 360 nm are significantly lower than previously reported values. The average retrieved values vary between 0.0054 and 0.0066 for different geographical locations. Our findings are in good agreement with the results of several recent investigations.

Author

Refractivity; Satellite Observation; Dust; Total Ozone Mapping Spectrometer; Aerosols; Robotics

20020080996 NASA Goddard Space Flight Center, Greenbelt, MD USA

Galactic Noise and Passive Microwave Remote Sensing from Space At L-Band

LeVine, David M., NASA Goddard Space Flight Center, USA; Abraham, Saji, NASA Goddard Space Flight Center, USA; [2002]; 26p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The spectral window at L-band (1.4 GHz) is important for passive remote sensing of soil moisture and ocean salinity from space, parameters that are needed to understand the hydrologic cycle and ocean circulation. At this frequency, radiation from extraterrestrial (mostly galactic) sources is strong and, unlike the constant cosmic background, this radiation is spatially variable. This paper presents a modern radiometric map of the celestial sky at L-band and a solution for the problem of determining what portion of the sky is seen by a radiometer in orbit. The data for the radiometric map is derived from recent radio astronomy surveys and is presented as equivalent brightness temperature suitable for remote sensing applications. Examples using orbits and antennas

representative of those contemplated for remote sensing of soil moisture and sea surface salinity from space are presented to illustrate the signal levels to be expected. Near the galactic plane, the contribution can exceed several Kelvin.
Author
Remote Sensing; Ultrahigh Frequencies; Radiation Sources; Microwave Imagery; Radiometers; Hydrological Cycle; Ocean Currents

20020081025 NASA Goddard Space Flight Center, Greenbelt, MD USA
Integrated NASA Lidar System Strategy for Space-Based Remote Sensing
Singh, Upendra N., NASA Langley Research Center, USA; Heaps, William S., NASA Goddard Space Flight Center, USA; [2002]; 4p; In English; International Laser Radar Conference, Quebec City, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Recent peer reviews of' NASA's space-based lidar missions and of the technology readiness of lasers appropriate for space-based lidars indicated a critical need for an integrated research and development strategy to move laser transmitter technology from low technical readiness levels to the higher levels required for space missions. This paper presents a multi-Center efforts leading to formulation of an integrated NASA strategy to provide the technology and maturity of systems necessary to make Lidar/Laser systems viable for space-based study and monitoring of the earth's atmosphere.
Author
Earth Atmosphere; Laser Applications; Remote Sensing; Optical Radar

20020081026 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Multiple Resource Inventory of Delaware Using an Airborne Profiling Laser
Nelson, Ross, NASA Goddard Space Flight Center, USA; Short, Austin, Forest Service, USA; Valenti, Michael A., Forest Service, USA; Keller, Cherry, Fish and Wildlife Service, USA; Sep. 20, 2002; 33p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An airborne profiling laser is used to monitor multiple resources related to landscape structure, both natural and man-made, across regions encompassing hundreds of thousands of hectares. A small, lightweight, inexpensive airborne profiling laser is used to inventory Delaware forests, to estimate impervious surface area statewide, and to locate potentially Suitable Delmarva Fox Squirrel (Scrotum niger cinereus) habitat. Merchantable volume estimates are within 14% of US Forest Service estimates at the county level and within 4% statewide. Total above-ground dry biomass estimates are within 19% of USES estimates at the county level and within 16% statewide. Mature forest stands suitable for reintroduction of the Delmarva Fox Squirrel, an endangered species historically endemic to the eastern shores of Delaware, Maryland, and Virginia, are identified and mapped along the laser transacts. Intersection lengths with various types of impervious surface (roofs, concrete/asphalt) and open water are tallied to estimate percent and areal coverage statewide, by stratum and county. Laser estimates of open water are within 7% of photointerpreted GIS estimates at the county level and within 3% of the GIS at the state level.
Author
Biomass; Delmarva Peninsula (De-Md-Va); Endangered Species; Estimates; Forests; Inventories; Lasers; Squirrels; Topography

20020081285 NASA Goddard Space Flight Center, Greenbelt, MD USA
Combining Radar and Optical Data for Forest Disturbance Studies
Ranson, K. Jon, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Disturbance is an important factor in determining the carbon balance and succession of forests. Until the early 1990's researchers have focused on using optical or thermal sensors to detect and map forest disturbances from wild fires, logging or insect outbreaks. As part of a NASA Siberian mapping project, a study evaluated the capability of three different radar sensors (ERS, JERS and Radarsat) and an optical sensor (LANDSAT 7) to detect fire scars, logging and insect damage in the boreal forest. This paper describes the data sets and techniques used to evaluate the use of remote sensing to detect disturbance in central Siberian forests. Using images from each sensor individually and combined an assessment of the utility of using these sensors was developed. Transformed Divergence analysis and maximum likelihood classification revealed that LANDSAT data was the single best data type for this purpose. However, the combined use of the three radar and optical sensors did improve the results of discriminating these disturbances.
Author
Forests; Carbon; Remote Sensing; Satellite Imagery; Divergence; Maximum Likelihood Estimates; Environmental Monitoring

20020081318 NASA Goddard Space Flight Center, Greenbelt, MD USA

Tides and Modern Geodesy

Ray, Richard D., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Weikko A. Heiskanen Symposium in GEODES, 30 Sep. - 5 Oct. 2002, OH, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In modem high-precision geodesy, and especially in modem space geodesy, every measurement that one makes contains tidal signals. Generally these signals are considered noise and must somehow be eliminated. The stringent requirements of the latest space geodetic missions place severe demands on tidal models. On the other hand, these missions provide the strongest data for improving tidal models. In particular, TOPEX/POSEIDON altimetry and LAGEOS laser ranging have improved models to such an extent that new geophysical information about the ocean and the solid Earth are coming to light. Presumably GRACE intersatellite ranging data will also add to this information. This paper discusses several of these new geophysical results, with special emphasis given to the dissipation of tidal energy. Strong constraints have recently been placed on the partitioning of energy dissipation among the ocean, atmosphere, and solid earth and between the deep and shallow ocean. The dissipation in deep water is associated with internal tides and has potentially important implications for understanding the ocean's thermohaline circulation. Author

Geodesy; Tides; Ocean Dynamics; Ocean Models; Energy Dissipation

20020081347 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Wavelength Optimization Study on Visible and Infrared Propagation Systems in Coastal Environments

Reid, J. S., NASA Goddard Space Flight Center, USA; Tsay, Si-Chee, NASA Goddard Space Flight Center, USA; Moision, W. K., NASA Goddard Space Flight Center, USA; Gasso, S., NASA Goddard Space Flight Center, USA; Cook, J. R., NASA Goddard Space Flight Center, USA; Westphal, D. L., NASA Goddard Space Flight Center, USA; Paulus, R. A., NASA Goddard Space Flight Center, USA; Bucholtz, A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; SPIE Conference on Optics in Atmospheric Propagation and Adaptive Systems V, 23-27 Sep. 2002, Crete, Greece; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Electro-optical (EO) systems employed for communications, surveillance and weapons systems are commonly assessed in the North American and European continents. However, the atmospheric propagation environment in these regions is often dissimilar to most other parts of the world. In particular, atmospheric dust, industrial pollution, and smoke frequently reduce visibility to less than 5 km in Asia and South America significantly hampering EO system performance. Because atmospheric aerosol species vary considerably in size and chemistry, optimal wavelengths for EO systems vary from region to region. In this paper we examine the extinction effects from aerosol particles and water vapor on a regional basis. Theoretical studies are coupled with visibility and satellite climatologies to make an assessment for the coastal regions of the world. While longer wavelengths permit higher transmission by particles in regions significantly hampered by fine mode particles (such as industrial pollution and smoke), this advantage is commonly offset by high extinction values from water vapor. This offsetting effect is particularly strong in industrial and developing countries in the tropics and sub-tropics such as Southeast Asia and South America. Conversely, the advantage of low water vapor concentrations in longer wavelengths is offset by high mass-extinction efficiencies of atmospheric dust in this portion of the spectrum.

Author

Coasts; Electro-Optics; Equatorial Atmosphere; Extinction; Infrared Radiation

20020082886 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. fuer Hochfrequenztechnik und Radarsysteme, Oberpfaffenhofen, Germany

Airborne Polarimetric SAR Tomography ***Flugzeuggetragene polarimetrische SAR-Tomographie***

Reigber, Andreas, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; 2002; ISSN 1434-8454; 158p; In English; Original contains color illustrations

Report No.(s): DLR-FB-2002-02; Copyright; Avail: Issuing Activity

In SAR tomography a real three-dimensional imaging of a scene is achieved by the formation of an additional synthetic aperture in elevation. In this work, this new technique is presented in theory and experiment. In a theoretical part, first a general three-dimensional description of tomographic SAR, based on physical wave propagation, is presented. by using a precise modelling of the tomographic signal, a highly optimised processing method for the special case of multibaseline SAR tomography, is derived from this general solution. Further on, a novel method for the suppression sidelobes, resulting from an uneven distribution of the flight tracks is developed. In the following, the worldwide first polarimetric tomographic processing of SAR data of an airborne sensor is presented. A detailed data analysis proves the extended information content of tomographic SAR compared to conventional SAR. Interesting insights about the backscattering behaviour of forested areas are derived by vertical

scattering profiles, extracted from the tomographic image. Finally an outlook on possible future configurations for airborne and spaceborne tomographic SAR imaging is given.
Author
Tomography; Synthetic Aperture Radar; Airborne Equipment; Imaging Techniques; Astronomical Polarimetry; Three Dimensional Models

20020082944 South Dakota School of Mines and Technology, Rapid City, SD USA
The Use of Remote Sensing for Monitoring, Prediction, and Management of Hydrologic, Agricultural, and Ecological Processes in the Northern Great Plains ***Annual Report, 1 Sep. 2001 - 31 Aug. 2002***
Farwell, Sherry O., South Dakota School of Mines and Technology, USA; Oct. 07, 2002; 15p; In English
Contract(s)/Grant(s): NCC5-588; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The NASA-EPSCoR program in South Dakota is focused on the enhancement of NASA-related research in earth system science and corresponding infrastructure development to support this theme. Hence, the program has adopted a strategy that keys on research projects that: a) establish quantitative links between geospatial information technologies and fundamental climatic and ecosystem processes in the Northern Great Plains (NGP) and b) develop and use coupled modeling tools, which can be initialized by data from combined satellite and surface measurements, to provide reliable predictions and management guidance for hydrologic, agricultural, and ecological systems of the NGP. Building a partnership network that includes both internal and external team members is recognized as an essential element of the SD NASA-EPSCoR program. Hence, promoting and tracking such linkages along with their relevant programmatic consequences are used as one metric to assess the program's progress and success. This annual report first summarizes general activities and accomplishments, and then provides progress narratives for the two separate, yet related research projects that are essential components of the SD NASA-EPSCoR program.
Derived from text
Agriculture; Climatology; Ecosystems; Remote Sensing

20020082981 Battelle Memorial Inst., Columbus, OH USA
Diagnostic Tools for Integrated In Situ Air Sparging Pilot Tests
Johnson, Richard L.; Johnson, Paul C.; Amerson-Treat, Illa; Tim, Bruce; Leeson, Andrea; Dec. 01, 2001; 25p; In English
Contract(s)/Grant(s): F08637-95-C-6036; Proj-2103
Report No.(s): AD-A405906; AFRL-ML-TY-TP-2000-4579; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Pilot tests are an important tool for improving our conceptual understanding of in situ air sparging (IAS) behavior at a site. Unfortunately, prediction of long term performance based on pilot tests has proved to be difficult. Nevertheless pilot tests have proven useful as a means of identifying 'red flags' prior to installation of lull-scale systems. In that context, IAS pilot tests are most useful when designed to: (a) look for indicators of infeasibility, (b) characterize the air distribution to the extent practicable, and (c) identify any safety hazards to be addresses in the lull-scale design. Prior to conducting the pilot test activities outlined in the paper the following tasks should be completed: (1) Define the target treatment zone (2) Propose a conceptual model for the air distribution in the treatment zone (3) Determine if 15 ft well spacings are cost prohibitive, and if so, determine the minimum injection well spacing that is not cost prohibitive. (4) Propose the depth, location, and construction specifics of a pilot test well. (5) Determine the expected range of operating pressures for the injection well. If based on the previous site activities IAS is chosen as the remediation technology for the site, it is recommended that the series of pilot test activities described in the report be conducted. If in the preliminary assessment it was determined that the well spacings of 15 feet are cost effective, the first six activities described in the report should be conducted. If a greater well spacing is required, additional site-specific activities should be conducted. These are also described in the report.
DTIC
Secondary Injection; Hydrogeology

20020083014 Woods Hole Oceanographic Inst., MA USA
Data Management for MG&G: Tools for Archiving, Analysis and Visualization ***Final Report, 15 Dec. 2000-14 Dec 2001***
Smith, Deborah K.; Dec. 2001; 2p; In English
Contract(s)/Grant(s): N00014-01-1-0327
Report No.(s): AD-A405770; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
On May 14-16, 2001 a workshop on Data Management for Marine Geology and Geophysics: Tools for Archiving, Analysis, and Visualization was held in La Jolla, CA. The workshop 5 objective was to bring together researchers, data collectors, data users, engineers, and computer scientists to assess the state of existing data management efforts in the marine geology and geophysics

(MG&G) community, share experiences in developing data management projects, and help determine the direction of future efforts in data management.
DTIC
Data Management; Ocean Bottom; Aerosols

20020083251 Army Engineer Research and Development Center, Vicksburg, MS USA
Assessing Water Quality Functions of Wetlands
Ashby, Steven L.; Jul. 2002; 11p; In English
Report No.(s): AD-A405983; ERDC-WQTN-AM-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This technical note provides an overview of the current understanding of water quality functions of wetlands and describes methods useful for assessing water quality functions. This technical note is specifically oriented to provide direct assistance in the assessment of water quality functions of wetlands. There is an abundance of literature on the nature and function of wetlands for additional information. Both qualitative and quantitative assessment methods are discussed and the need for good hydrology information is emphasized for quantitative assessment methods. Two case studies are summarized in a generic format to offer ideas on methods to assess water quality functions.
DTIC
Wetlands; Water Quality; Hydrology

20020083259 NASA Goddard Space Flight Center, Greenbelt, MD USA
Relationship Between Surface Reflectance in the Visible and Mid-IR used in MODIS Aerosol Algorithm-Theory
Kaufman, Yoram J., NASA Goddard Space Flight Center, USA; Gobron, Nadine, Institute for Environment and Sustainability, Italy; Pinty, Bernard, Institute for Environment and Sustainability, Italy; Widlowski, Jean-Luc, Institute for Environment and Sustainability, Italy; Verstraete, Michel M., Institute for Environment and Sustainability, Italy; [2002]; 5p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Data from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument that flies in polar orbit on the Terra platform, are used to derive the aerosol optical thickness and properties over land and ocean. The relationships between visible reflectance (at blue, rho(sub blue), and red, rho(sub red)) and mid-infrared (at 2.1 microns, rho(sub 2.1)) are used in the MODIS aerosol retrieval algorithm to derive global distribution of aerosols over the land. These relations have been established from a series of measurements indicating that rho(sub blue) is approximately 0.5 rho(sub red) is approximately 0.25 rho(sub 2.1). Here we use a model to describe the transfer of radiation through a vegetation canopy composed of randomly oriented leaves to assess the theoretical foundations for these relationships. Calculations for a wide range of leaf area indices and vegetation fractions show that rho(sub blue) is consistently about 1/4 of rho(sub 2.1) as used by MODIS for the whole range of analyzed cases, except for very dark soils, such as those found in burn scars. For its part, the ratio rho(sub red)/rho(sub 2.1) varies from less than the empirically derived value of 1/2 for dense and dark vegetation, to more than 1/2 for bright mixture of soil and vegetation. This is in agreement with measurements over uniform dense vegetation, but not with measurements over mixed dark scenes. In the later case the discrepancy is probably mitigated by shadows due to uneven canopy and terrain on a large scale. It is concluded that the value of this ratio should ideally be made dependent on the land cover type in the operational processing of MODIS data, especially over dense forests.
Author
Aerosols; Algorithms; Imaging Spectrometers; Imaging Techniques; Optical Thickness; Spectral Reflectance; Spectroradiometers; Vegetation

20020083307 NASA Goddard Space Flight Center, Greenbelt, MD USA
L1 and L2 Observatories for Earth Science Vision in the Post-2010 Era
Wiscombe, Warren, NASA Goddard Space Flight Center, USA; Herman, Jay, NASA Goddard Space Flight Center, USA; Valero, Francisco, Scripps Institution of Oceanography, USA; [2002]; 1p; In English; International Geoscience and Remote Sensing Symposium Conference (IGARSS), 24-28 Jun.2002, Toronto, Canada; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA's Post-2010 Earth Science Vision is partly built around a new paradigm called the Sensor Web, involving a collaborating set of sensors ranging from deep space, at the L1 and L2 (Lagrange) points, down to the ocean and land surfaces. L1 and L2 observatories, roughly 1.5 million km from Earth towards and away from the Sun, respectively, provide unique vantage points. from L1, the entire sunlit face of the Earth is visible, and from L2, the entire night side. In tandem, they can observe the entire Earth simultaneously, with much less stitching than now needed to patch together the five operational geostationary images. This makes new kinds of science possible, especially science requiring synoptic (simultaneous) observations over the whole

globe. Triana, the pioneer of these kinds of observatories, is currently waiting for a launch opportunity. We will describe the novel features of the Triana mission, and of the L1 and L2 vantage points, with examples of the kinds of science that can be done from these points and examples of the way in which Earth observation from such great distances is pushing instrument technology. Author

Satellite Observation; Satellite Networks; Artificial Satellites; Lagrangian Equilibrium Points

20020083317 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Afternoon Constellation: A Formation of Earth Observing Systems for the Atmosphere and Hydrosphere

Schoeberl, Mark R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; International Geoscience and Remote Sensing Symposium Conference (IGARSS), 24-28 Jun. 2002, Toronto, Canada; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Two of the large EOS observatories, Aqua (formerly EOS-PM) and Aura (formerly EOS-CHEM) will fly is nearly the same inclination with 1:30 PM -15 min ascending node equatorial crossing times. Between Aura and Aqua a series of smaller satellites will be stationed: Cloudsat, CALYPSO (formerly PICASSO-CENA), and PARASOL. This constellation of low earth orbit satellites will provide an unprecedented opportunity to make near simultaneous atmospheric cloud and aerosol observations. This paper will provide details of the science opportunity and describe the sensor types for the afternoon constellation. This constellation by accretion provides a prototype for the Earth Science Vision sensor web and represent the building books for a future web structure.
Author

Satellite Constellations; Meteorological Satellites; Low Earth Orbits; Satellite Observation

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

20020080902 NASA Goddard Space Flight Center, Greenbelt, MD USA

SMEX-Lite Modular Solar Array Architecture

Lyons, John W., NASA Goddard Space Flight Center, USA; [2002]; 5p; In English; Intersociety Energy Conversion Engineering Conference, 29 Jul. - 1 Aug. 2002, Washington, DC, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The NASA Small Explorer (SMEX) missions have typically had three years between mission definition and launch. This short schedule has posed significant challenges with respect to solar array design and procurement. Typically, the solar panel geometry is frozen prior to going out with a procurement. However, with the SMEX schedule, it has been virtually impossible to freeze the geometry in time to avoid scheduling problems with integrating the solar panels to the spacecraft. A modular solar array architecture was developed to alleviate this problem. This approach involves procuring sufficient modules for multiple missions and assembling the modules onto a solar array framework that is unique to each mission. The modular approach removes the solar array from the critical path of the SMEX integration and testing schedule. It also reduces the cost per unit area of the solar arrays and facilitates the inclusion of experiments involving new solar cell or panel technologies in the SMEX missions.
Author

NASA Programs; Solar Arrays; Solar Cells; Space Missions; Modules

20020080951 Sage Advance Corp., Eugene, OR USA

Solar Water Heater

Spinoff 1993; 1993, pp. 78; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

As a Jet Propulsion Laboratory (JPL) scientist Dr. Eldon Haines studied the solar energy source and solar water heating. He concluded he could build a superior solar water heating system using the geyser pumping principle. He resigned from JPL to develop his system and later form Sage Advance Corporation to market the technology. Haines' Copper Cricket residential system has no moving parts, is immune to freeze damage, needs no roof-mounted tanks, and features low maintenance. It provides 50-90 percent of average hot water requirements. A larger system, the Copper Dragon, has been developed for commercial installations.
Author

Solar Energy; Solar Heating; Water Heating; Residential Energy

20020081257 NASA Glenn Research Center, Cleveland, OH USA

The Evaluation and Implementation of a Water Containment System to Support Aerospace Flywheel Testing

Trase, Larry M., NASA Glenn Research Center, USA; July 2002; 10p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA

Contract(s)/Grant(s): RTOP 755-1A-09

Report No.(s): NASA/TM-2002-211722; E-13473; IECEC-2002-20023; NAS 1.15:211722; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

High-energy flywheel systems for aerospace power storage and attitude control applications are being developed because of the potential for increasing the energy density and reducing operational costs. A significant challenge facing the development of the test hardware is containment of the rotating elements in the event of a failure during the development and qualification stages of testing. This containment is critical in order to ensure the safety of the test personnel and the facility. A containment system utilizing water as the containment media is presented. Water containment was found to be a low cost, flexible, and highly effective containment system. Ballistic test results and analytical results are discussed along with a description of a flywheel test facility that was designed and built utilizing the water containment system at the NASA Glenn Research Center at Lewis Field in Cleveland, Ohio.

Author

Flywheels; Test Facilities; Containment

20020081276 NASA Glenn Research Center, Cleveland, OH USA

Redesign of Glenn Research Center D1 Flywheel Module

Jansen, Ralph H., Toledo Univ., USA; Wagner, Robert C., Toledo Univ., USA; Duffy, Kirsten P., Toledo Univ., USA; Hervol, David S., Analex Corp., USA; Sterozuk, Ronald J., Analex Corp., USA; Dever, Timothy P., QSS Group, Inc., USA; Anzalone, Salvatore M., Science Applications International Corp., USA; Trudell, Jeffrey J., NASA Glenn Research Center, USA; Konno, Kevin E., NASA Glenn Research Center, USA; Kenny, Andrew, Texas A&M Univ., USA; August 2002; 10p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): RTOP 755-1A-09

Report No.(s): NASA/TM-2002-211788; E-13483; IECEC-2002-20075; NAS 1.15:211788; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Glenn Research Center has completed the redesign of the D1 flywheel module. The redesign includes a new rotor with a composite rim, motor/generator, touchdown bearings, sensors, and a magnetic actuator. The purpose of the relatively low cost module upgrade is to enable it to continuously operate throughout its speed range of 0 to 60,000 RPM. The module will be used as part of a combined attitude control and bus regulation experiment.

Author

Flywheels; Reaction Wheels; Counter-Rotating Wheels; Electric Motors; Electromechanical Devices; Rotor Dynamics

20020081339 NASA Glenn Research Center, Cleveland, OH USA

Flywheel Magnetic Suspension Developments

Palazzolo, Alan, Texas A&M Univ., USA; Kenny, Andrew, Texas A&M Univ., USA; Lei, Shuliang, Texas A&M Univ., USA; Kim, Yeonkyu, Texas A&M Univ., USA; Sun, Guangyoung, Texas A&M Univ., USA; Chon, ChonHee, Texas A&M Univ., USA; Tucker, Randy, Texas A&M Univ., USA; Preuss, Jason, Texas A&M Univ., USA; Li, Ming, Texas A&M Univ., USA; Mimihan, Thomas, Texas A&M Univ., USA; September 2002; 14p; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations

Contract(s)/Grant(s): NRA-00-OSS-05; NRA-GRC-99-02; RTOP 757-A1-00

Report No.(s): NASA/TM-2002-211886; NAS 1.15:211886; E-13568; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper provides an overview of many areas of the flywheel magnetic suspension (MS) R&D being performed at the Texas A&M Vibration Control and Electromechanics Lab (TAMU-VCEL). This includes system response prediction, actuator optimization and redundancy, controller realizations and stages, sensor enhancements and backup bearing reliability.

Author

Flywheels; Magnetic Suspension; Energy Storage; Attitude Control; Rotor Dynamics; Systems Simulation

20020082938 NASA Glenn Research Center, Cleveland, OH USA

DC Bus Regulation With a Flywheel Energy Storage System

Kenny, Barbara H., NASA Glenn Research Center, USA; Kascak, Peter E., Toledo Univ., USA; October 2002; 14p; In English; Power Systems Conference, 29-31 Oct. 2002, Coral Springs, FL, USA; Sponsored by Society of Automotive Engineers, Inc., USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 755-1A-09

Report No.(s): NASA/TM-2002-211897; NAS 1.15:211897; E-13579; Rept-02PSC-61; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes the DC bus regulation control algorithm for the NASA flywheel energy storage system during charge, charge reduction and discharge modes of operation. The algorithm was experimentally verified with results given in a previous paper. This paper presents the necessary models for simulation with detailed block diagrams of the controller algorithm. It is shown that the flywheel system and the controller can be modeled in three levels of detail depending on the type of analysis required. The three models are explained and then compared using simulation results.

Author

Flywheels; Energy Storage; Controllers; Algorithms

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ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20020080733 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Spatial Coherence of Interannual Temperature Variations in the Antarctic Peninsula

King, John C., National Environmental Research Council, UK; Comiso, Josefino C., NASA Goddard Space Flight Center, USA; [2002]; 19p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over 50 years of observations from climate stations on the west coast of the Antarctic Peninsula show that this is a region of extreme interannual variability in near-surface temperatures. The region has also experienced more rapid warming than any other part of the Southern Hemisphere. In this paper we use a new dataset of satellite-derived surface temperatures to define the extent of the region of extreme variability more clearly than was possible using the sparse station data. The region in which satellite surface temperatures correlate strongly with west Peninsula station temperatures is found to be quite small and is largely confined to the seas just west of the Peninsula, with a northward and eastward extension into the Scotia Sea and a southward extension onto the western slopes of Palmer Land. Correlation of Peninsula surface temperatures with surface temperatures over the rest of continental Antarctica is poor confirming that the west Peninsula is in a different climate regime. The analysis has been used to identify sites where ice core proxy records might be representative of variations on the west coast of the Peninsula. of the five existing core sites examined, only one is likely to provide a representative record for the west coast.

Author

Atmospheric Temperature; Annual Variations; Antarctic Regions; Satellite Observation

20020080735 NASA Goddard Space Flight Center, Greenbelt, MD USA

Atmospheric Measurements by the 2002 Geoscience Laser Altimeter System Mission

Spinhirne, James D., NASA Goddard Space Flight Center, USA; [2002]; 4p; In English; 21st ILRC Conference, 8-12 Jul. 2002, Quebec City, Quebec, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The NASA Earth Observing System (EOS) program is a multiple platform NASA initiative for the study of global change. As part of the EOS project, the Geoscience Laser Altimeter System (GLAS) was selected as a laser sensor filling complementary requirements for several earth science disciplines including atmospheric and surface applications. Late in 2002, the GaAs instrument is to be launched for a three to five year observational mission. For the atmosphere, the instrument is designed to full fill comprehensive requirements for profiling of radiatively significant cloud and aerosol. Algorithms have been developed to process the cloud and aerosol data and provide standard data products. After launch there will be a three-month project to analyze and understand the system performance and accuracy of the data products. As an EOS mission, the GaAs measurements and data products will be openly available to all investigators. An overview of the instrument, data products and evaluation plan is given. Derived from text

Earth Observing System (EOS); Earth Sciences; Geophysics; Laser Altimeters; Space Missions; Spacecraft Instruments

20020080738 NASA Goddard Space Flight Center, Greenbelt, MD USA

Conference Summary: First International Conference on Global Warming and the Next Ice Age

Wetzel, Peter J., NASA Goddard Space Flight Center, USA; Chylek, Petr, Dalhousie Univ., Canada; Lesins, Glen, Dalhousie Univ., Canada; Aug. 26, 2002; 22p; In English; First International Conference on Global Warming and the Next Ice Age, 19-24 Aug. 2001, Halifax, Nova Scotia, Canada; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The First International Conference on Global Warming and the Next Ice Age was convened in Halifax, Nova Scotia, August 19-24, 2001. The conference program began each day with a 30 minute live classical music performances of truly international quality before the beginning business. Ample time for panel discussions was also scheduled. The general public was invited to attend and participate in a special evening panel session on the last day of the conference. The unusual and somewhat provocative title of the conference was designed to attract diverse views on global climate change. This summary attempts to accurately reflect the tone and flavor of the lively discussions which resulted. Presentations ranged from factors forcing current climate to those in effect across the span of time from the Proterozoic ”snowball Earth” epoch to 50,000 years in the future. Although, as should be expected, attendees at the conference arrived with opinions on some of the controversial issues regarding climate change, and no-one openly admitted to a ’conversion’ from their initial point of view, the interdisciplinary nature of the formal presentations, poster discussions, panels, and abundant informal discourse helped to place the attendees’ personal perspectives into a broader, more diversified context.

Author

Global Warming; Conferences; Paleoclimatology; Climate Change; Climate

20020080739 NASA Goddard Space Flight Center, Greenbelt, MD USA

Biological Invasions: A Challenge In Ecological Forecasting

Schnase, J. L., NASA Goddard Space Flight Center, USA; Smith, J. A., NASA Goddard Space Flight Center, USA; Stohlgren, T. J., Geological Survey, USA; Graves, S., Alabama Univ., USA; Trees, C., NASA, USA; [2002]; 3p; In English; 2002 International and Remote Sensing Symposium, 24-28 Jun. 2002, Toronto, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The spread of invasive species is one of the most daunting environmental, economic, and human-health problems facing the USA and the World today. It is one of several grand challenge environmental problems being considered by NASA’s Earth Science Vision for 2025. The invasive species problem is complex and presents many challenges. Developing an invasive species predictive capability could significantly advance the science and technology of ecological forecasting.

Author

Ecology; Earth Sciences; Prediction Analysis Techniques; Research and Development; Forecasting

20020080750 National Inst. for Occupational Safety and Health, Cincinnati, OH USA

Work, Smoking, and Health: A NIOSH Scientific Workshop

2000; 124p

Report No.(s): PB2002-109206; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Tobacco use, with its associated morbidity and mortality, is unevenly distributed across the working population. Tobacco has a significant adverse effect on people who work and their families, both alone and in combination with workplace exposures. While at work, people may be exposed to personal or environmental tobacco smoke, to workplace toxins or stressors, or both. Tobacco smoke in the home can affect the children of smoking adults, and these children are also more likely to smoke themselves. Thus, factors that encourage or discourage smoking among workers can have a profound effect on the health of future generations. Prevention of health effects related to tobacco use remains one of the highest public health priorities. On June 15-16, 2000, 79 leaders from labor, industry, academia, government, and non-governmental agencies participated in a scientific workshop titled, ’Work, Smoking and Health’ in Washington, D.C. Speakers included individuals with national perspectives and extensive experience in public health, tobacco control, and occupational health. During the workshop, the various interrelationships among work, work exposures, tobacco use, and health were explored.

NTIS

Tobacco; Indoor Air Pollution

20020080751 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA

User’s Guide for the Emissions Modeling System for Hazardous Air Pollutants (EMS-HAP, Version 2.0)

Strum, M.; Mason, R.; Linderman, D.; Aug. 2002; 466p; In English

Report No.(s): PB2002-109207; EPA/454/B-02/001; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

The Emissions Modeling System for Hazardous Air Pollutants (EMS-HAP) Version 2.0 is a series of computer programs that process emission inventory data for toxic air pollutants for subsequent air quality modeling using either the Assessment System for Population Exposure Nationwide (ASPEN) dispersion model 1 or the Industrial Source Complex Short Term Version 3 (ISCST3) dispersion model. In addition, EMS-HAP allows you to project base-year emissions to a future year for use in these air quality models. EMS-HAP Version 2.0 replaces EMS-HAP Version 1.0, and this User's Guide supercedes the Version 1.0 User's Guide (EPA-454/R-00-018). The key differences in Version 2 are the added functionality to process emissions for the ISCST3 air quality model and added flexibility in estimating future-year emissions.
NTIS
Air Quality; Air Pollution; Pollution Monitoring; Emission

20020080761 Department of Energy, Washington, DC USA
Project W-420 Ventilation Stack Monitoring System Year 2000 Compliance Assessment Project Plan
Bussell, J. H.; Aug. 25, 1999; 10p; In English
Report No.(s): DE2002-797672; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This document contains a limited assessment of Year 2000 compliance for Project W-420. Additional information is provided as a road map to project documents and other references that may be used to verify Year 2000 compliance.
NTIS
Project Planning; Wastes

20020080773
Experience with Aerosol Generation During Rotary Mode Core Sampling in the Hanford Single Shell Waste Tanks
Schofield, J. S.; Aug. 31, 1999; 59p; In English
Report No.(s): DE2002-797749; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This document provides data on aerosol concentrations in tank head spaces, total mass of aerosols in the tank head space and mass of aerosols sent to the exhauster during Rotary Mode Core Sampling from November 1994 through April 1999.
NTIS
Aerosols; Particulates; Core Sampling; Storage Tanks; Radioactive Wastes

20020080780 NASA Goddard Space Flight Center, Greenbelt, MD USA
New Insights on Hydro-Climate Feedback Processes over the Tropical Ocean from TRMM
Lau, William K. M., NASA Goddard Space Flight Center, USA; Wu, H. T., Science Systems and Applications, Inc., USA; Li, Xiaofan, National Oceanic and Atmospheric Administraion, USA; Sui, C. H., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; International TRMM Conference, 22-26 Jul. 2002, Honolulu, HI, USA; No Copyright; Avail: Issuing Activity; Abstract Only
In this paper, we study hydro-climate feedback processes over the tropical oceans, by examining the relationships among large scale circulation and Tropical Rainfall Measuring Mission Microwave Imager-Sea Surface Temperature (TMI-SST), and a range of TRMM rain products including rain rate, cloud liquid water, precipitable water, cloud types and areal coverage, and precipitation efficiency. Results show that for a warm event (1998), the 28C threshold of convective precipitation is quite well defined over the tropical oceans. However, for a cold event (1999), the SST threshold is less well defined, especially over the central and eastern Pacific cold tongue, where stratiform rain occurs at much lower than 28 C. Precipitation rates and cloud liquid water are found to be more closely related to the large scale vertical motion than to the underlying SST. While total columnar water vapor is more strongly dependent on SST. For a large domain, over the eastern Pacific, we find that the areal extent of the cloudy region tends to shrink as the SST increases. Examination of the relationship between cloud liquid water and rain rate suggests that the residence time of cloud liquid water tends to be shorter, associated with higher precipitation efficiency in a warmer climate. It is hypothesized that the reduction in cloudy area may be influenced both by the shift in large scale cloud patterns in response to changes in large scale forcings, and possible increase in the cloud liquid water conversion to rain water in a warmer environment. Results of numerical experiments with the Goddard cloud resolving model to test the hypothesis will be discussed.
Author
Ocean Surface; Trmm Satellite; Tropical Regions; Hydroclimatology; Feedback; Precipitation (Meteorology)

20020080781 NASA Goddard Space Flight Center, Greenbelt, MD USA
Space-Time Controls on Carbon Sequestration Over Large-Scale Amazon Basin
Smith, Eric A., NASA Goddard Space Flight Center, USA; Cooper, Harry J., Florida State Univ., USA; Gu, Jiujing, Florida State Univ., USA; Grose, Andrew, Florida State Univ., USA; Norman, John, Wisconsin Univ., USA; daRocha, Humberto R., Sao Paulo

Univ., Brazil; [2002]; 1p; In English; 2nd International LBA Scientific Conference, 7-12 Jul. 2002, Manaus, Brazil; No Copyright; Avail: Issuing Activity; Abstract Only

A major research focus of the LBA Ecology Program is an assessment of the carbon budget and the carbon sequestering capacity of the large scale forest-pasture system that dominates the Amazonia landscape, and its time-space heterogeneity manifest in carbon fluxes across the large scale Amazon basin ecosystem. Quantification of these processes requires a combination of in situ measurements, remotely sensed measurements from space, and a realistically forced hydrometeorological model coupled to a carbon assimilation model, capable of simulating details within the surface energy and water budgets along with the principle modes of photosynthesis and respiration. Here we describe the results of an investigation concerning the space-time controls of carbon sources and sinks distributed over the large scale Amazon basin. The results are derived from a carbon-water-energy budget retrieval system for the large scale Amazon basin, which uses a coupled carbon assimilation-hydrometeorological model as an integrating system, forced by both in situ meteorological measurements and remotely sensed radiation fluxes and precipitation retrieval retrieved from a combination of GOES, SSM/I, TOMS, and TRMM satellite measurements. Brief discussion concerning validation of (a) retrieved surface radiation fluxes and precipitation based on 30-min averaged surface measurements taken at Ji-Parana in Rondonia and Manaus in Amazonas, and (b) modeled carbon fluxes based on tower CO2 flux measurements taken at Reserva Jaru, Manaus and Fazenda Nossa Senhora. The space-time controls on carbon sequestration are partitioned into sets of factors classified by: (1) above canopy meteorology, (2) incoming surface radiation, (3) precipitation interception, and (4) indigenous stomatal processes varied over the different land covers of pristine rainforest, partially, and fully logged rainforests, and pasture lands. These are the principle meteorological, thermodynamical, hydrological, and biophysical control paths which perturb net carbon fluxes and sequestration, produce time-space switching of carbon sources and sinks, undergo modulation through atmospheric boundary layer feedbacks, and respond to any discontinuous intervention on the landscape itself such as produced by human intervention in converting rainforest to pasture or conducting selective/clearcut logging operations.

Author

Amazon Region (South America); Carbon; Ecology; Remote Sensing; River Basins; Hydrometeorology; Relativity

20020080800 NASA Goddard Space Flight Center, Greenbelt, MD USA

Geodetic Application of ROCSAT-3/COSMIC: Climate-Induced Time-Variable Gravity

Chao, Benjamin F., NASA Goddard Space Flight Center, USA; Cox, C., Raytheon Information Technology and Scientific Services, USA; [2002]; 1p; In English; COSMIC Radio Occultation Science Workshop, 21-23 Aug. 2002, Boulder, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The ROCSAT-3/COSMIC (Constellation Observing System for Meteorology, Ionosphere and Climate) mission consists of a constellation of 6 low-earth orbiting satellites. In conducting the atmospheric limb sounding using the GPS radio occultation technique (which is the main objective of the mission), the satellite orbits are precisely determined at any given moment by GPS ”high-low” satellite-to-satellite tracking. These precise orbit determination (POD) data contain useful information about the Earth’s gravitational field and its time variations, for both geophysical and climate-related research. Our previous simulations showed that the use of these orbit data can yield an order of magnitude improvement over the state-of-the-art global gravity model EGM96 out to degree and order 20 (spatial resolution of 1000 km), depending on the mission design and orbit adjustment scenario. In this paper, the temporal variation signals of low-degree harmonics are the subject matter. These signals can be obtained from POD at the 800 km operational altitude (where the non-gravitational forces is weaker and can be better modeled and removed) during the lifetime of the mission. The time-varying gravity is becoming an important data source for studying climate-related global changes, especially in anticipating the use of the time-variable gravity data from the GRACE mission which was recently launched into orbit. Although not as precise as what GRACE promises to achieve, with much denser spatial and temporal coverages provided by 6 satellites and hence greatly reduced aliasing errors COSMIC represents independent and complementary observations for the new time-variable gravity research. We will present simulation results based on the present mission scenario.

Author

Constellations; Geodesy; Radio Occultation; Climate; Earth Gravitation; Earth Ionosphere

20020080883 Health Effects Inst., Cambridge, MA USA

Research Directions to Improve Estimates of Human Exposure and Risk from Diesel Exhaust

Apr. 2002; 252p; In English

Report No.(s): PB2002-108746; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Contents include the following: Part I: Report of the HEI Diesel Epidemiology Working Group; Part II: Investigators’ Reports; Cancer Risk from Diesel Emissions Exposure in Central and Eastern Europe: A Feasibility Study; Cancer Risk from Diesel Exhaust Exposure in the Canadian Railroad Industry: A Feasibility Study; Quantitative Assessment of Lung Cancer Risk

from Diesel Exhaust Exposure in the US Trucking Industry: A Feasibility Study; Measurement of Diesel Aerosol Exposure: A Feasibility Study; Measuring Diesel Emissions Exposure in Underground Mines: A Feasibility Study.
NTIS
Diesel Fuels; Exhaust Gases; Air Pollution; Exhaust Emission; Exposure; Occupational Diseases

20020080896 National Inst. for Occupational Safety and Health, Cincinnati, OH USA
Evaluation of Side Exhaust and Prototype and Production Emission Control Devices to Prevent Carbon Monoxide Poisonings from Generator Exhaust on Houseboats
Watkins, D. W.; Clark, B. L.; Earnest, G. S.; Beamer, B.; Dunn, K.; May 2002; 34p
Report No.(s): PB2003-100046; EPHB-171-29A; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Researchers from the National Institute for Occupational Safety and Health (NIOSH) conducted an evaluation of carbon monoxide emissions and control from gasoline-powered generators on houseboats. This evaluation is part of a series of studies conducted by NIOSH investigators during the past several years to identify and recommend effective engineering controls to reduce the carbon monoxide (CO) hazard and eliminate CO poisonings on houseboats. Emission and dispersion characteristics of side-exhausted generators and the performance of several emission control devices (ECDs) that were manufactured by Enviromarine LLC, were studied. Recently developed prototype and production ECDs were retrofitted onto gasoline-powered generators used on houseboats to reduce the hazard of carbon monoxide (CO) poisonings from the exhaust. The prototype ECD had previously been evaluated by NIOSH when it was new and had been used on a houseboat generator for approximately 3,000 hours since the previous testing. The production ECD had several modifications from the prototype and had not been previously evaluated or used.
NTIS
Carbon Monoxide Poisoning; Boats; Evaluation; Exhaust Gases; Emission; Electric Power Supplies; Electric Generators

20020080897 Environmental Protection Agency, Emission Factor and Inventory Group, Research Triangle Park, NC USA
Air CHIEF, Version 9.0 (on CD-ROM)
Jul. 2002; In English; The software is on CD-ROM disc. Documentation is on the disc. Files are compressed
Report No.(s): PB2002-500086; EPA/454/C-01/003; No Copyright; Avail: National Technical Information Service (NTIS)

The ClearingHouse for Inventories and Emission Factors (Air CHIEF) CD-ROM gives the public and private sector users access to air emission data specific to estimating the types and quantities of pollutants that may be emitted from a wide variety of sources. Updated annually, Air CHIEF offers on one disc literally thousands of pages contained in some of EPA's most widely used and requested documents. Included are the US EPA Emission Factor and Inventory Group's most popular emission estimation tools. Included on the CD-ROM are: Compilation of Air Pollutant Emission Factors (AP-42), Fifth Edition, Volume 1, Stationary Point and Area. This contains information on over 200 stationary source categories. It includes brief descriptions of processes used, potential sources of air emissions from the processes and in many cases common methods used to control these air emissions. Methodologies for estimating the quantity of air pollutant emissions are presented in the form of Emission Factors; Sources (including Supplements A, B, C and D). These charaterizes the source categories for which emissions of a toxic substance have been identified. These volumes include general descriptions of the emitting processes, identifying potential release points and emission factors; Compilation of Air Pollutant Emission Factors (AP-42), Fifth Edition, Volume 2, Mobile Sources; AP-42 Background Files; Locating and Estimating Document Series; Emission Inventory Improvement Program Documents; Source Classification Codes (SCC)/Area and Mobile Source (AMS) Codes; NIOSH Registry of Toxic Effects of Chemicals Synonym List. Also included on Air CHIEF are the installable copies of these software programs: Chemdat 8 Factor Information REtrieval (FIRE); PC BEIS PMCALC; and Water 8.
NTIS
Computer Programs; Air Pollution; Pollution Monitoring; CD-ROM

20020080938 Western Water International, Inc., Forestville, MD USA
Water Filters
Spinoff 1993; 1993, pp. 79; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The Aquaspace H2OME Guardian Water Filter, available through Western Water International, Inc., reduces lead in water supplies. The filter is mounted on the faucet and the filter cartridge is placed in the "dead space" between sink and wall. This filter is one of several new filtration devices using the Aquaspace compound filter media, which combines company developed and

NASA technology. Aquaspace filters are used in industrial, commercial, residential, and recreational environments as well as by developing nations where water is highly contaminated.
Author
Filtration; Water Treatment; Potable Water; Contaminants

20020080953 Terra Firma Environmental, Baytown, TX USA
Natural Air Purifier
Spinoff 1993; 1993, pp. 68; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

NASA environmental research has led to a plant-based air filtering system. Dr. B.C. Wolverton, a former NASA engineer who developed a biological filtering system for space life support, served as a consultant to Terra Firma Environmental. The company is marketing the BioFilter, a natural air purifier that combines activated carbon and other filter media with living plants and microorganisms. The filter material traps and holds indoor pollutants; plant roots and microorganisms then convert the pollutants into food for the plant. Most non-flowering house plants will work. After pollutants have been removed, the cleansed air is returned to the room through slits in the planter. Terra Firma is currently developing a filter that will also disinfect the air.
Author
Air Purification; Pollution Control; Plants (Botany); Indoor Air Pollution

20020080969 Colorado Dept. of Public Health and Environment, Denver, CO USA
Impact of a 10 percent Ethanol Blended Fuel on the Exhaust Emissions for Tier 0 and Tier 1 Light Duty Gasoline Vehicles at 35 Degrees F
Ragazzi, R.; Nelson, K.; Mar. 26, 1999; 118p; In English
Report No.(s): PB2002-109110; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A study to evaluate the effects of oxygenated fuels on motor vehicle emissions at low ambient temperature was conducted by the Colorado Department of Public Health and Environment, Mobile Sources Section from April 1998 through December 1998. The purpose of the oxygenated fuel evaluation was to examine the effectiveness of oxygenated fuel as a CO reduction strategy on a cross section of late model motor vehicles. Questions were raised concerning the emission reduction potential of oxygenated fuels as a means to reduce CO in a 1996 report by the National Research Council entitled Toxicological and Performance Aspects of Oxygenated Motor Fuels. The council pointed out that very little data had been collected on the impact of oxygenated fuel on motor vehicle generated CO at low temperatures.
NTIS
Pollution Control; Automobiles; Automobile Fuels; Low Temperature Tests; Oxygenation; Carbon Monoxide

20020080973 Envair, Albany, CA USA
Analysis of Weekday/Weekend Differences in Ambient Particulate Nitrate Concentrations and Formation in Southern California *Final Report*
Blanchard, C. L.; Tanenbaum, S.; Mar. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM and in paper copy
Report No.(s): PB2002-109188; No Copyright; Avail: National Technical Information Service (NTIS)

One of the principal contributors to fine particulate matter (PM) concentrations in California's South Coast Air Basin (SoCAB), especially during the months of October through January, is particulate nitrate. to improve understanding of the effects of volatile organic compounds (VOC) and nitrogen oxide (NOx) emission reductions on particulate nitrate concentrations, we analyzed PM, ozone, and precursor data from monitoring locations in southern California (Los Angeles Area, Venture County, and Mojave Desert). The specific objectives of the project were to: Characterize weekday and weekend variations of ambient particulate nitrate and precursor concentrations; Develop observational evidence supporting or contradicting the hypothesis that lower weekend emissions of NOx lead to lower weekend concentrations of particulate nitrate; Complement modeling studies and provide information of use for further research on relations among particulate nitrate and its precursors, as well as on the possible side effects of nitrate control strategies on ozone formation.
NTIS
Air Pollution; Nitric Acid; Volatile Organic Compounds; Nitrates

20020080975 Environmental Protection Agency, Office of Research and Development, Research Triangle Park, NC USA
Assessment of Potential Health Risks of Gasoline Oxygenated with Methyl Tertiary Butyl Ether (MTBE)
Nov. 1993; 62p; In English
Report No.(s): PB2002-109177; EPA/600/R-93/206; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This assessment of potential inhalation health risks associated with MTBE in gasoline drew upon the results of recent studies first reported at the ”Conference on MTBE and Other Oxygenates” in July of 1993 as well as prior research. The focus of concerns at this time was on the winter oxygenated gasoline program, which required the use of gasoline containing 2.7%-weight oxygen in certain areas not in attainment of the National Ambient Air Quality Standard for carbon monoxide. This report described the current scientific information on MTBE with respect to: health effects; air quality and human exposure; and potential health risks (an integration of health effects and exposure information). Limited discussion was also devoted to benzene, formaldehyde, and other fuel-related toxic air emissions that may be altered by the use of MTBE in gasoline.
NTIS
Public Health; Health; Risk; Toxicity; Ambience; Carbon Monoxide

20020080976 Environmental Protection Agency, Washington, DC USA
Estimating Air Emissions from Petroleum UST Cleanups
Jun. 1989; 58p; In English
Report No.(s): PB2002-109172; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In our work to clean up contamination from leaking underground storage tanks (USTs), it is easy to become caught up in the immediate danger to our ground water supplies. While this hazard to ground water is real and must be addressed, it cannot be addressed with complete disregard to other parts of the environment. This manual is designed to address the issue of air emissions that result from petroleum UST cleanups. It will educate both those who are conducting UST corrective actions, and those who are regulating air emissions at the State and local levels. This manual will provide the means to make more informed and responsible decisions. This manual will serve as one tool to protect human health and the environment.
NTIS
Storage Tanks; Underground Storage; Petroleum Products; Air Pollution; Volatile Organic Compounds; Environmental Cleanup

20020080999 NASA Goddard Space Flight Center, Greenbelt, MD USA
Orbital Noise in the Earth System is a Common Cause of Climate and Greenhouse-Gas Fluctuation
Liu, H. S., NASA Goddard Space Flight Center, USA; Kolenkiewicz, R., NASA Goddard Space Flight Center, USA; Wade, C., Jr., NASA Goddard Space Flight Center, USA; [2002]; 9p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The mismatch between fossil isotopic data and climate models known as the cool-tropic paradox implies that either the data are flawed or we understand very little about the climate models of greenhouse warming. Here we question the validity of the climate models on the scientific background of orbital noise in the Earth system. Our study shows that the insolation pulsation induced by orbital noise is the common cause of climate change and atmospheric concentrations of carbon dioxide and methane. In addition, we find that the intensity of the insolation pulses is dependent on the latitude of the Earth. Thus, orbital noise is the key to understanding the troubling paradox in climate models.
Author
Celestial Mechanics; Background Noise; Climate Change; Climate Models; Earth Sciences; Atmospheric Composition; Orbital Resonances (Celestial Mechanics)

20020081019 NASA Goddard Space Flight Center, Greenbelt, MD USA
Global Surface Temperature Change and Uncertainties Since 1861
Shen, Samuel S. P., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; CAIMS (Canadian Applied and Industrial Mathematics Society), 8-10 Jun. 2002, Calgary, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

The objective of this talk is to analyze the warming trend and its uncertainties of the global and hemi-spheric surface temperatures. by the method of statistical optimal averaging scheme, the land surface air temperature and sea surface temperature observational data are used to compute the spatial average annual mean surface air temperature. The optimal averaging method is derived from the minimization of the mean square error between the true and estimated averages and uses the empirical orthogonal functions. The method can accurately estimate the errors of the spatial average due to observational gaps and random measurement errors. In addition, quantified are three independent uncertainty factors: urbanization, change of the in situ observational practices and sea surface temperature data corrections. Based on these uncertainties, the best linear fit to annual global surface temperature gives an increase of 0.61 +/- 0.16 C between 1861 and 2000. This lecture will also touch the topics

on the impact of global change on nature and environment. as well as the latest assessment methods for the attributions of global change.
Author
Global Warming; Atmospheric Temperature; Land Surface Temperature; Sea Surface Temperature; Mean Square Values; Uncertain Systems

20020081020 NASA Goddard Space Flight Center, Greenbelt, MD USA
Mesoscale Convective Systems During SCSMEX: Simulations with a Regional Climate Model and a Cloud-Resolving Model
Tao, W.-K., NASA Goddard Space Flight Center, USA; Wang, Y., NASA Goddard Space Flight Center, USA; Qian, J.-H., NASA Goddard Space Flight Center, USA; Shie, C.-L., NASA Goddard Space Flight Center, USA; Lau, W. K.-M., NASA Goddard Space Flight Center, USA; Kakar, R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; National Central University, 1-9 Jun. 2002, Chung-Li, Taiwan, Province of China; No Copyright; Avail: Issuing Activity; Abstract Only

The South China Sea Monsoon Experiment (SCSMEX) was conducted in May-June 1998. One of its major objectives is to better understand the key physical processes for the onset and evolution of the summer monsoon over Southeast Asia and southern China. Multiple observation platforms (e.g., upper-air soundings, Doppler radar, ships, wind profilers, radiometers, etc.) during SCSMEX provided a first attempt at investigating the detailed characteristics of convection and circulation changes associated with monsoons over the South China Sea region. SCSMEX also provided precipitation derived from atmospheric budgets and comparison to those obtained from the Tropical Rainfall Measuring Mission (TRMM). In this paper, a regional scale model (with grid size of 20 km) and Goddard Cumulus Ensemble (GCE) model (with 1 km grid size) are used to perform multi-day integration to understand the precipitation processes associated with the summer monsoon over Southeast Asia and southern China. The regional climate model is used to understand the soil-precipitation interaction and feedback associated with a flood event that occurred in and around China's Yantz River during SCSMEX Sensitivity tests on various land surface models, sea surface temperature (SST) variations, and cloud processes are performed to understand the precipitation processes associated with the onset of the monsoon over the S. China Sea during SCSMEX. These tests have indicated that the land surface model has a major impact on the circulation over the S. China Sea. Cloud processes can effect the precipitation pattern while SST variation can effect the precipitation amounts over both land and ocean. The exact location (region) of the flooding can be effected by the soil-rainfall feedback. The GCE-model results captured many observed precipitation characteristics because it used a fine grid size. For example, the model simulated rainfall temporal variation compared quite well to the sounding-estimated rainfall. The results show there are more latent heat fluxes prior to the onset of the monsoon. However, more rainfall was simulated after the onset of the monsoon. This modeling study indicates the latent heat fluxes (or evaporation) have more of an impact on precipitation processes and rainfall in the regional climate model simulations than in the cloud-resolving model simulations. Research is underway to determine if the difference in the grid sizes or the moist processes used in these two models is responsible for the differing influence of surface fluxes an precipitation processes.
Author
Atmospheric Models; Clouds (Meteorology); Monsoons; Sea Surface Temperature; Doppler Radar; Climate Models; Atmospheric Temperature

20020081022 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Radiative Impact of Smoke Aerosols on Clouds in Southeast Asia
Hsu, N. Christina, Maryland Univ. Baltimore County, USA; Herman, Jay R., NASA Goddard Space Flight Center, USA; Tsay, Si-Chee, NASA Goddard Space Flight Center, USA; [2002]; 9p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The impact of smoke aerosols generated from biomass burning activities in Southeast Asia on the total (direct and indirect) reflected solar radiation from clouds was investigated using satellite data. Narrowband measurements from UV to near-infrared wavelengths (from SeaWiFS and TOMS) were combined with broadband radiation measurements (from CERES). Using this information, we quantified how smoke aerosols change the cloud forcing spectrally and as a whole in the Southeast Asia region. In this region our results show that smoke is present over large areas of cloud-covered regions, and that the frequency of such occurrences is high in the boreal spring. Depending on the thickness of the smoke aerosol, the reflected solar radiation from clouds could he reduced by as much as 100 Watt/sq m, on average over the March 2000 data. We also found that the reduction in the reflectance of the clouds at 670 nm is large enough to lead to significant errors in cloud optical thickness retrievals from satellites such as AVHRR and MODIS.
Author
Aerosols; Biomass Burning; Optical Thickness; Reflectance; Reflected Waves; Smoke; Southeast Asia

20020081029 NASA Goddard Space Flight Center, Greenbelt, MD USA

Lidar Observations of Tropospheric Aerosols Over Northeastern South Africa During the ARREX and SAFARI-2000 Dry Season Experiments

Campbell, James R., Science Systems and Applications, Inc., USA; Welton, Ellsworth J., Maryland Univ. Baltimore County, USA; Spinhirne, James D., NASA Goddard Space Flight Center, USA; Ji, Qiang, Science Systems and Applications, Inc., USA; Tsay, Si-Chee, NASA Goddard Space Flight Center, USA; Piketh, Stuart J., Witwatersrand Univ., South Africa; Barenbrug, Marguerite, Witwatersrand Univ., South Africa; Holben, Brent, NASA Goddard Space Flight Center, USA; [2002]; 45p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the ARREX-1999 and SAFARI-2000 Dry Season experiments a micropulse lidar (523 nm) instrument was operated at the Skukuza Airport in northeastern South Africa. The Mar was collocated with a diverse array of passive radiometric equipment. For SAFARI-2000 the processed Mar data yields a daytime time-series of layer mean/derived aerosol optical properties, including extinction-to-backscatter ratios and vertical extinction cross-section profile. Combined with 523 run aerosol optical depth and spectral Angstrom exponent calculations from available CIMEL sun-photometer data and normalized broadband flux measurements the temporal evolution of the near surface aerosol layer optical properties is analyzed for climatological trends. For the densest smoke/haze events the extinction-to-backscatter ratio is found to be between 60-80/sr, and corresponding Angstrom exponent calculations near and above 1.75. The optical characteristics of an evolving smoke event from SAFARI-2000 are extensively detailed. The advecting smoke was embedded within two distinct stratified thermodynamic layers, causing the particulate mass to advect over the instrument array in an incoherent manner on the afternoon of its occurrence. Surface broadband flux forcing due to the smoke is calculated, as is the evolution in the vertical aerosol extinction profile as measured by the Han Finally, observations of persistent elevated aerosol during ARREX-1999 are presented and discussed. The lack of corroborating observations the following year makes these observation; both unique and noteworthy in the scope of regional aerosol transport over southern Africa.
Author

Optical Radar; Aerosols; Troposphere; Radiometers; Broadband; Climatology

20020081042 Raytheon Electronic Systems, Santa Barbara Remote Sensing, Goleta, CA USA

Advanced Thermal Emission Imaging Systems Definition and Development ***Quarterly Report, 1 Jul. - 30 Sep. 2002***

Blasius, Karl, Raytheon Electronic Systems, USA; Sep. 30, 2002; 10p; In English

Contract(s)/Grant(s): NASW-00037

Report No.(s): LB2L-0006; SF298; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Santa Barbara Remote Sensing (SBRS), Raytheon Company, is pleased to submit this quarterly progress report of the work performed in the third quarter of Year 2 of the Advanced THEMIS Project, July through September 2002. We review here progress in the proposed tasks. During July through September 2002 progress was made in two major tasks, Spectral Response Characterization and Flight Instrument Definition. Because of staffing problems and technical problems earlier in the program we have refocused the remaining time and budget on the key technical tasks. Current technical problems with a central piece of test equipment has lead us to request a 1 quarter extension to the period of performance. This request is being made through a separate letter independent of this report.
Author

Thermal Emission; Spectral Sensitivity; Photothermal Conversion; Imaging Techniques; Design Analysis; Product Development; Flight Instruments

20020081260 NASA Goddard Inst. for Space Studies, New York, NY USA

Trends of Measured Climate Forcing Agents

Hansen, James E., NASA Goddard Inst. for Space Studies, USA; Sato, Makiko, Columbia Univ., USA; [2002]; 6p; In English; Exxon Mobil Hosted Transportation Panel Meeting, 3 Apr. 2002, Fairfax, VA, USA; Orginial contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The growth rate of climate forcing by measured greenhouse gases peaked near 1980 at almost 5 W/sq m per century. This growth rate has since declined to approximately equal to 3 W/sq m per century, largely because of cooperative international actions. We argue that trends can be reduced to the level needed for the moderate ”alternative” climate scenario (approximately equal to 2 W/M2 per century for the next 50 years) by means of concerted actions that have other benefits, but the forcing reductions are not automatic ”co-benefits” of actions that slow CO2 emissions. Current trends of climate forcings by aerosols

remain very uncertain. Nevertheless, practical constraints on changes in emission levels suggest that global warming at a rate + 0.15 +/- 0.05 C per decade will occur over the next several decades.
Author
Climate Change; Global Warming; Greenhouse Effect; Exhaust Gases; Aerosols; Air Pollution

20020081317 NASA Goddard Space Flight Center, Greenbelt, MD USA
Visions of our Planet's Atmosphere, Land and Oceans: Spectacular Visualizations of our Blue Marble
Hasler, A. F., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; NASA/NOAA Electronic-Theater 2002, 31 Aug. - 26 Sep. 2002, South Africa; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA/NOAA Electronic Theater presents Earth science observations and visualizations in a historical perspective. Fly in from outer space to South Africa, Cape Town and Johannesburg using NASA Terra/MODIS data, LANDSAT data and 1 m IKONOS 'Spy Satellite' data. Zoom in to any place South Africa using Earth Viewer 3D from Keyhole Inc. and LANDSAT data at 30 m resolution. Go back to the early weather satellite images from the 1960s and see them contrasted with the latest US and international global satellite weather movies including hurricanes and 'tornadoes'. See the latest visualizations of spectacular images from NASA/NOAA remote sensing missions like Terra, GOES, TRMM, SeaWiFS, LANDSAT 7 including 1 - min GOES rapid scan image sequences of Nov 9th 2001 Midwest tornadic thunderstorms and have them explained.
Author
NASA Programs; High Definition Television; Television Transmission; Information Dissemination; Public Relations; Earth Observations (From Space)

20020081319 NASA Goddard Space Flight Center, Greenbelt, MD USA
Global Aerosol Remote Sensing from MODIS
Ichoku, Charles, NASA Goddard Space Flight Center, USA; Kaufman, Yoram J., NASA Goddard Space Flight Center, USA; Remer, Lorraine A., NASA Goddard Space Flight Center, USA; Chu, D. Allen, NASA Goddard Space Flight Center, USA; Mattoo, Shana, NASA Goddard Space Flight Center, USA; Tanre, Didier, Laboratoire d'Optique Atmospherique, France; Levy, Robert, NASA Goddard Space Flight Center, USA; Li, Rong-Rong, NASA Goddard Space Flight Center, USA; Martins, Jose V., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 34th COSPAR Scientific Assembly/2nd World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The physical characteristics, composition, abundance, spatial distribution and dynamics of global aerosols are still very poorly known, and new data from satellite sensors have long been awaited to improve current understanding and to give a boost to the effort in future climate predictions. The derivation of aerosol parameters from the MODerate resolution Imaging Spectro-radiometer (MODIS) sensors aboard the Earth Observing System (EOS) Terra and Aqua polar-orbiting satellites ushers in a new era in aerosol remote sensing from space. Terra and Aqua were launched on December 18, 1999 and May 4, 2002 respectively, with daytime equator crossing times of approximately 10:30 am and 1:30 pm respectively. Several aerosol parameters are retrieved at 10-km spatial resolution (level 2) from MODIS daytime data. The MODIS aerosol algorithm employs different approaches to retrieve parameters over land and ocean surfaces, because of the inherent differences in the solar spectral radiance interaction with these surfaces. The parameters retrieved include: aerosol optical thickness (AOT) at 0.47, 0.55 and 0.66 micron wavelengths over land, and at 0.47, 0.55, 0.66, 0.87, 1.2, 1.6, and 2.1 micron over ocean; Angstrom exponent over land and ocean; and effective radii, and the proportion of AOT contributed by the small mode aerosols over ocean. to ensure the quality of these parameters, a substantial part of the Terra-MODIS aerosol products were validated globally and regionally, based on cross correlation with corresponding parameters derived from ground-based measurements from AERONET (AErosol RObotic NETwork) sun photometers. Similar validation efforts are planned for the Aqua-MODIS aerosol products. The MODIS level 2 aerosol products are operationally aggregated to generate global daily, eight-day (weekly), and monthly products at one-degree spatial resolution (level 3). MODIS aerosol data are used for the detailed study of local, regional, and global aerosol concentration, distribution, and temporal dynamics, as well as for radiative forcing calculations. We show several examples of these results and comparisons with model output.
Author
Aerosols; Imaging Spectrometers; Atmospheric Circulation; Pollution Transport; Remote Sensing

20020081323 NASA Goddard Space Flight Center, Greenbelt, MD USA
International Heliophysical Year
Davila, J. M., NASA Goddard Space Flight Center, USA; Harrison, R., NASA Goddard Space Flight Center, USA; Poland, A., NASA Goddard Space Flight Center, USA; St.Cyr, O. C., NASA Goddard Space Flight Center, USA; Thompson, B. J., NASA

Goddard Space Flight Center, USA; [2002]; 1p; In English; 34th COSPAR Scientific Assembly/2nd World Space Congress, 9-18 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

In 1957 a program of international research, inspired by the International Polar Years of 1882-83 and 1932-33, was organized as the International Geophysical Year (IGY) to study global phenomena of the Earth and geospace. The IGY involved about 60,000 scientists from 66 nations, working at thousands of stations, from pole to pole to obtain simultaneous, global observations on Earth and in space. There had never been anything like it before. The fiftieth anniversary of the International Geophysical Year will occur in 2007. We propose to organize an international program of scientific collaboration for this time period called the International Heliophysical Year (IHY). Like it predecessors, the IHY will focus on fundamental global questions of Earth science. Author

Earth Sciences; Solar Radiation; International Cooperation

20020081332 NASA Goddard Space Flight Center, Greenbelt, MD USA

Aura Science and Validation

Hilsenrath, E., NASA Goddard Space Flight Center, USA; Schoeberl, M., NASA Goddard Space Flight Center, USA; Douglass, A., NASA Goddard Space Flight Center, USA; Anderson, J., Harvard Univ., USA; [2002]; 1p; In English; 34th COSPAR Scientific Assembly/2nd World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The EOS-Aura Mission is designed to answer three basic questions concerning the Earth's atmosphere: 1) Is ozone recovering as predicted, 2) is air quality getting worse, and 3) how is climate changing? Aura's four instruments work synergistically and are dedicated to answering these questions. These questions relate to NASA Earth Science Enterprise's overall strategic questions, which seek to understand the consequences of climate change for human civilization and determine if these changes can be predicted. NASA supports an ongoing research and analysis program, which is conducted independently and in support of satellite missions. The research program conducts several on-going field campaigns employing aircraft, balloons, and ground based systems. These campaigns have focused on exploring processes in the tropics, high latitudes, and continental outflow to explain the chemistry and transport in the troposphere and stratosphere and how these regions interact. NASA is now studying how the Aura mission and requirements of the research and analysis program might be merged to achieve its strategic goals related to global atmospheric chemistry changes. In addition, NASA field campaign resources will be folded into Aura's validation requirements. Aura validation requires correlative measurements throughout the troposphere and stratosphere under a range of observing and geophysical conditions. Because of the recent launches of Envisat and other smaller international chemistry satellites, the NASA program plans to collaborate with European space agencies in developing a series of campaigns that will provide continuity between those satellites missions and Aura.

Author

Ozone; Climate Change; Satellite Observation; Meteorological Satellites; Air Quality

20020081345 NASA Goddard Space Flight Center, Greenbelt, MD USA

Study of Air Pollution from Space Using TOMS: Challenges and Promises for Future Missions

Bhartia, Pawan K., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 34th COSPAR Scientific Assembly/2nd World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

A series of TOMS instruments built by NASA has flown on US, Russian, and Japanese satellites in the last 24 years. These instruments are well known for producing spectacular maps of the ozone hole that forms over Antarctica each spring. However, it is less well known that these instruments also provided first evidence that space-based measurements in UV of sufficiently high precision and accuracy can provide valuable information to study global air quality. We will use the TOMS experience to highlight the promises and challenges of future space-based missions designed specifically for air quality studies.

Author

Total Ozone Mapping Spectrometer; Air Quality; Air Pollution; Ultraviolet Spectroscopy

20020081351 NASA Goddard Space Flight Center, Greenbelt, MD USA

Chemistry-Transport Modeling of the Satellite Observed Distribution of Tropical Tropospheric Ozone

Peters, Wouter, Utrecht Univ., Netherlands; Krol, Maarten, Utrecht Univ., Netherlands; Dentener, Frank, Joint Research Centre of the European Communities, Italy; Thompson, Anne M., NASA Goddard Space Flight Center, USA; Leloeveld, Jos, Max-Planck-Inst. fuer Chemie, Germany; [2002]; 19p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have compared the 14-year record of satellite derived tropical tropospheric ozone columns (TTOC) from the NIMBUS-7 Total Ozone Mapping Spectrometer (TOMS) to TTOC calculated by a chemistry-transport model (CTM). An objective measure of error, based on the zonal distribution of TTOC in the tropics, is applied to perform this comparison systematically. In addition, the sensitivity of the model to several key processes in the tropics is quantified to select directions for future improvements. The comparisons indicate a widespread, systematic (20%) discrepancy over the tropical Atlantic Ocean, which maximizes during austral Spring. Although independent evidence from ozonesondes shows that some of the disagreement is due to satellite over-estimate of TTOC, the Atlantic mismatch is largely due to a misrepresentation of seasonally recurring processes in the model. Only minor differences between the model and observations over the Pacific occur, mostly due to interannual variability not captured by the model. Although chemical processes determine the TTOC extent, dynamical processes dominate the TTOC distribution, as the use of actual meteorology pertaining to the year of observations always leads to a better agreement with TTOC observations than using a random year or a climatology. The modeled TTOC is remarkably insensitive to many model parameters due to efficient feedbacks in the ozone budget. Nevertheless, the simulations would profit from an improved biomass burning calendar, as well as from an increase in NOX abundances in free tropospheric biomass burning plumes. The model showed the largest response to lightning NOX emissions, but systematic improvements could not be found. The use of multi-year satellite derived tropospheric data to systematically test and improve a CTM is a promising new addition to existing methods of model validation, and is a first step to integrating tropospheric satellite observations into global ozone modeling studies. Conversely,the CTM may suggest improvements to evolving satellite retrievals for tropospheric ozone.
Author
Ozone; Atmospheric Circulation; Atmospheric Chemistry; Pollution Transport; Atmospheric Models; Tropical Regions

20020082879 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. fuer Antriebstechnik, Cologne, Germany
Application-Oriented Methods to Determine CO, HC and Soot from Aircraft Engines ***Anwendungsorientierte Verfahren zur Bestimmung von CO, HC und Russ aus Luftfahrttriebwerken***
Doepelheuer, Andreas, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; June 2002; ISSN 1434-8454; 146p; In German; Original contains color illustrations
Report No.(s): DLR-FB-2002-10; Copyright; Avail: Issuing Activity

Applicable calculation procedures for aircraft emissions are needed to estimate the potential influence of aviation on the environment and the climate. Such methods are developed in this work for carbon monoxide, for the sum of unburned hydrocarbons and for soot. Because the discussed climate- and health-related effects of soot do not solely depend on the mass fraction, the number and the size of the soot particles are included in the investigations as well. All calculation procedures are based on measured results by making use of variable reference values The developed calculation procedures very well reflect all available measurements. The capability of the methods is demonstrated by several examples. For this purpose the amount of emissions of individual aircraft engines and of flight missions are determined in detail. Finally, using a global airframe database, the calculation procedures are applied to the world aviation as a whole.Applicable calculation procedures for aircraft emissions are needed to estimate the potential influence of aviation on the environment and the climate. Such methods are developed in this work for carbon monoxide, for the sum of unburned hydrocarbons and for soot. Because the discussed climate- and health-related effects of soot do not solely depend on the mass fraction, the number and the size of the soot particles are included in the investigations as well. All calculation procedures are based on measured results by making use of variable reference values. The developed calculation procedures very well reflect all available measurements. The capability of the methods is demonstrated by several examples. For this purpose the amount of emissions of individual aircraft engines and of flight missions are determined in detail. Finally, using a global airframe database, the calculation procedures are applied to the world aviation as a whole.
Author
Computation; Emission; Carbon Monoxide; Soot

20020082958 NASA Goddard Space Flight Center, Greenbelt, MD USA
Comparison of a 2D Photochemical Model to Data Using Statistical Trend Analysis
Stolarski, Richard S., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Stony Brook University, 4 Sep. 2002, Stony Brook, NY, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We have analyzed our 23-year merged ozone data set for variability and trends with a statistical time-series model. to assist in that analysis, we have analyzed the Goddard ED photochemical model for the same time period with the same time-series model. Multiple runs of the photochemical model allow us to separate the effects of various terms on ozone, such as solar cycle and volcanic eruptions. We use this to help us separate those signals from each other in the data. We also used a smoothed version of the photochemical model's prediction of global ozone change in place of a simple linear trend. We find a number of interesting results. This particular photochemical model is more sensitive to chlorine perturbations than the atmosphere appears to be. It is

less sensitive to solar cycle. It predicts an effect from the Pinatubo eruption that is nearly symmetric in the two hemispheres, but the data appears to have not responded to Pinatubo in the southern mid-latitudes. These results and their uncertainties will be discussed.
Author
Mathematical Models; Ozone Depletion; Statistical Analysis; Pollution Transport

20020082962 NASA Goddard Space Flight Center, Greenbelt, MD USA
NASA's Seasonal-to-Interannual Prediction Project: In Partnership With the NCCS
1999 NCCS Highlights; July 2002, pp. 12-19; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Researchers with NASA's Season-to-Interannual Prediction Project (NSIPP) refer to different types of memory when running models on NCCS computers: the computer memory required for their models and the memory of the atmosphere or the ocean. Because of the atmosphere's chaotic nature, its memory is short. For weather predictions, the initial information taken from atmospheric observations has a limited useful life. Currently, there is no way to take observations, initialize an atmosphere model, integrate ahead in time, and make an accurate weather forecast beyond about 2 weeks. After that, the system becomes chaotic. What conditions could be used to make predictions beyond 2 weeks? If not conditions in the atmosphere, then the memory must be found somewhere else. That place is in the oceans. Although most changes in the atmosphere vary on a short timescale, the weather being a prime example, some important large atmospheric climate variations occur over much longer timescales-month s, years, or decades. NSIPP is interested specifically in those phenomena that occur over timescales of several months to a few years, and the El Nino Southern Oscillation (ENSO) is the most significant of these.
Author
Atmospheric Models; Weather Forecasting; Memory (Computers)

20020082964 NASA Goddard Space Flight Center, Greenbelt, MD USA
Climate Prediction Sees Future Despite Chaos: Researchers Outside NASA use NCCS Resources for Studies
1999 NCCS Highlights; July 2002, pp. 36-41; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The air on this mostly sunny January day is crisp and the wind is blustery. The morning's National Weather Service 6-hour forecast had accurately predicted these conditions for the Baltimore-Washington area and the 2-3 day extended outlook was almost perfect. The previous week, the National Center for Environmental Prediction's (NCEP) 6-10 day temperature and precipitation outlook for the general trends for the' region was correct as well. However, no forecast could have predicted specific details about this day. It is 28.5 F in the sunshine bright enough for dark sunglasses, and windy enough to blow off a hat. Such details are impossible to foresee with any accuracy and are outside the scope of routine weather prediction. Equally difficult is accurately forecasting weather beyond about 2 weeks.
Derived from text
Atmospheric Temperature; Weather Forecasting; Predictions; Blowing

20020082966 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Torque of the Planet: NASA Researcher Uses NCCS Computers to Probe Atmosphere-Land-Ocean Coupling
1999 NCCS Highlights; July 2002, pp. 64-69; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The study of Earth science is like a giant puzzle, says Braulio Sanchez. "The more you know about the individual pieces, the easier it is to fit them together." A researcher with Goddard's Space Geodesy Branch, Sanchez has been using NCCS supercomputer and mass storage resources to show how the angular momenta of the atmosphere, the oceans, and the solid Earth are dynamically coupled. Sanchez has calculated the magnitude of atmospheric torque on the planet and has determined some of the possible effects that torque has on Earth's rotation.
Derived from text
Angular Momentum; Earth Rotation; Torque

20020082971 NASA Goddard Space Flight Center, Greenbelt, MD USA
TOVS Pathfinder Path A: A Boon for Climatologists
1999 NCCS Highlights; July 2002, pp. 42-47; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Is it cooler than normal or warmer? Are we having an El Nino or La Nina? Haw intense is it, and how is it affecting the atmosphere? These are sorts of questions that climate studies hope to answer. Reaching further into the past than the short memory of the atmosphere and projecting far into the past than the future, climate studies examine trends and changes that take place over decades. Looking at this length of time is necessary to monitor and understand climate variability and to determine if significant trends exist - global warming seasons of increased flooding, a coming drought. For climatologists, these, studies must have good data sets. Ideally, data would be collected continuously over a period of decades without any major changes to the instrumentation us for collection, which would introduce incongruities and make trends hard to follow. Also, the data should be in the form of time and space-averaged measurements or estimates convenient for climate studies.
Derived from text
Climate; Global Warming; Time Measurement; Satellite Sounding; Weather Forecasting

20020083025 Envirogen, Inc., Lawrenceville, NJ USA
Multiple Co-Substrates for Biostimulation of TCE Degradation ***Final Report, 18 Mar. 1998-22 Dec. 2000***
Steffan, Robert J.; Dec. 22, 2000; 218p; In English
Contract(s)/Grant(s): F33615-98-C-5850
Report No.(s): AD-A405794; AFRL-ML-TY-TR-2001-0013; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
The objective of this Phase II SBIR project was to test and demonstrate the feasibility of using multiple co-substrates to stimulate in situ biodegradation of volatile organochloride compounds (VOCs) including trichloroethylene (TCE), cis- 1,2 dichloroethylene (DCE) and vinyl chloride (VC). The project also evaluated the use of novel substrate delivery and groundwater capture systems for use during in situ biostimulation applications with gaseous cosubstrates. The work involved a field-scale demonstration of propane and oxygen injection to stimulate microbial degradation of VOCs in an aquifer underlying the Lakehurst, NJ Naval Air Engineering Station (NAES).
DTIC
Water Pollution; Biodegradation; Chlorides; Trichloroethylene; Feasibility

20020083049 NASA Goddard Space Flight Center, Greenbelt, MD USA
MPL-net at ARM Sites
Spinhirne, J. D., NASA Goddard Space Flight Center, USA; Welton, E. J., NASA Goddard Space Flight Center, USA; Campbell, J. R., NASA Goddard Space Flight Center, USA; Berkoff, T. A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; ARM Program Science Meeting, 8-12 Apr. 2002, Saint Petersburg, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The NASA MPL-net project goal is consistent data products of the vertical distribution of clouds and aerosol from globally distributed lidar observation sites. The four ARM micro pulse lidars are a basis of the network to consist of over twelve sites. The science objective is ground truth for global satellite retrievals and accurate vertical distribution information in combination with surface radiation measurements for aerosol and cloud models. The project involves improvement in instruments and data processing and cooperation with ARM and other partners.
Author
Aerosols; Atmospheric Models; Optical Radar; Vertical Distribution

20020083051 NASA Goddard Space Flight Center, Greenbelt, MD USA
Variability in Ozone in the Tropical Upper Troposphere-Lower Stratosphere from the 1998-2000 SHADOZ (Southern Hemisphere Additional Ozonesondes) Data
Thompson, A. M., NASA Goddard Space Flight Center, USA; Witte, J. C., NASA Goddard Space Flight Center, USA; McPeters, R. D., NASA Goddard Space Flight Center, USA; Schmidlin, F. J., NASA Wallops Flight Facility, USA; Oltmans, S. J., National Oceanic and Atmospheric Administration, USA; Kirchhoff, V. W. J. H., Instituto Nacional de Pesquisas Espacias, Brazil; Coetzee, G. J. R., South African Weather Service, South Africa; Posny, F., Reunion Univ., France; Kawakami, S., National Space Development Agency, Japan; Ogawa, T., National Space Development Agency, Japan; [2002]; 1p; In English; World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The first view of lower stratospheric and upper tropospheric structure from sondes is provided by a 3-year, 10-site record from the Southern Hemisphere ADditional OZonesondes (SHADOZ) network: <http://code9l6.gsfc.nasa.ov/Data_service s/shadoz>. Observations covering 1998-2000 were made over Ascension Island; Nairobi, Kenya; Irene, South Africa; Reunion Island; Watukosek, Java; Fiji; Tahiti; American Samoa; San Cristobal, Galapagos; Natal, Brazil. Taking the UT/LS (upper troposphere-lower stratosphere) as the region between 12 and 17 km, we examine ozone variability in this region on a week-to-week and seasonal basis. The tropopause is lower in September-October-November than in March-April-May, when ozone is a minimum

at most SHADOZ stations. A zonal wave-one pattern (referring to ozone mixing ratios greater over the Atlantic and adjacent continents than over the Pacific and eastern Indian Ocean), persists all year. The wave, predominantly in the troposphere and with variable magnitude, appears to be due to general circulation - with subsidence over the Atlantic and frequent deep convection over the Pacific and Indian Ocean. The variability of deep convection most prominent at Java, Fiji, Samoa and Natal - is explored in time-vs-altitude ozone curtains. Stratospheric incursions into the troposphere are most prominent in soundings at Irene and Reunion Island.
Author
Troposphere; Stratosphere; Variability; Ozone; Tropopause

20020083062 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Distribution of Ozone in the Early Stages of Polar Vortex Development
Kawa, S. R., NASA Goddard Space Flight Center, USA; Newman, P. A., NASA Goddard Space Flight Center, USA; Schoeberl, M. R., NASA Goddard Space Flight Center, USA; Bevilacqua, R., Naval Research Lab., USA; [2002]; 1p; In English; Workshop on Arctic Ozone Loss, 4-6 Mar. 2002, Potsdam, Germany; No Copyright; Avail: Issuing Activity; Abstract Only

Previous analysis has shown that the distribution of O3 at high northern latitudes in the lower-to-middle stratosphere at the beginning of the winter season, 1999-2000 has a characteristic distribution, which is consistent between in situ and satellite measurements [Kawa et al., The Interaction Between Dynamics and Chemistry of Ozone in the Set-up Phase of the Northern Hemisphere Polar Vortex, submitted manuscript, 2001]. Initial O3 profiles in the vortex are similar to each other and are quite different from outside the vortex at the same latitude and also from a zonal mean climatology. In the vortex, O3 is nearly constant from 500 to above 800 K with a value at 3 ppmv +/- approx.10%. Values outside the vortex are up to a factor of 2 higher and increase significantly with potential temperature. The seasonal time series of POAM data shows that relatively low O3 mixing ratios, which characterize the vortex in late fall, are already present at high latitudes at the end of summer in September before the vortex circulation sets up. This suggests a possible feedback role between O3 chemistry and the formation of the vortex, which is dominated by the seasonal radiation balance. Here we show that these characteristic O3 distributions are consistent from year to year and between the hemispheres. We will attempt to determine whether variations in fall vortex O3 are related in any way to O3 abundances and vortex structure later during winter and into spring.
Author
Ozone; Time Series Analysis; Atmospheric Radiation; Vortices

20020083155 NASA Goddard Space Flight Center, Greenbelt, MD USA
SHADOZ (Southern Hemisphere ADditional Ozonesondes}: What Have We Learned About Tropical Tropospheric Ozone from the First Three Years (1998-2000) Data
Thompson, Anne M., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Texas A&M University Conference, 27 Feb. - 2 Mar. 2002, College Station, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The first climatological overview of total, stratospheric and tropospheric ozone in the southern hemisphere tropical and subtropics is based on ozone sounding data from 10 sites comprising the Southern Hemisphere Additional OZonesondes (SHADOZ) network. The period covered is 1998-2000. Observations were made over: Ascension Island; Nairobi, Kenya; Irene, South Africa; Reunion Island; Watukosek, Java; Fiji; Tahiti; American Samoa; San Cristobal, Galapagos; Natal, Brazil. Campaign data were collected on an Trans-Atlantic oceanographic cruise and during SAFARI-2000 in Zambia. The ozone data, with simultaneous temperature profiles to approximately 7 hPa and relative humidity to approximately 200 hPa, reside at: <http://code9l6.gsfc.nasa.ov/ Data - services/shadoz>. SHADOZ ozone time-series and profiles give a perspective on tropical total, stratospheric and tropospheric ozone in 1998-2000. Prominent features are highly variable tropospheric ozone, a zonal wave-one pattern in total (and tropospheric) column ozone, and signatures of the Quasi-Biennial Oscillation (QBO) in stratospheric ozone. Total, stratospheric and tropospheric column ozone amounts peak between August and November and are lowest between March and May. Tropospheric ozone variability over the Indian and Pacific Ocean displays influences of the Indian Ocean Dipole, and convective mixing. Pollution transport from Africa, South American and the Maritime Continent is a seasonal feature. Tropospheric ozone seasonality over the Atlantic Basin shows effects of regional subsidence and recirculation as well as biomass burning. Dynamical and chemical influences appear to be of comparable magnitude though model studies are needed to quantify this.
Author
Southern Hemisphere; Ozone; Troposphere; Climatology; Stratosphere; Quasi-Biennial Oscillation; Data Acquisition

20020083161 NASA Goddard Space Flight Center, Greenbelt, MD USA

Cross Calibration of TOMS, SBUV/2 and SCIAMACHY Radiances from Ground Observations

Hilsenrath, Ernest, NASA Goddard Space Flight Center, USA; Bhartia, P. K., NASA Goddard Space Flight Center, USA; Bojkov, B., Science Systems and Applications, Inc., USA; Kowaleski, M., Science Systems and Applications, Inc., USA; Labow, G., Science Systems and Applications, Inc., USA; Ahmad, Z., Science and Data Systems, Inc., USA; [2002]; 1p; In English; International Geoscience and Remote Sensing Symposium Conference (IGARSS), 24-28 Jun. 2002, Toronto, Canada; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We have shown that validation of radiances is a very effective means for correcting absolute accuracy and long term drifts of backscatter type satellite measurements. This method by-passes the algorithms used for both satellite and ground based measurements which are normally used to validate and correct the satellite data. A new method for satellite validation is planned which will compliment measurements from the existing ground-based networks. This method will employ very accurate comparisons between ground based zenith sky radiances and satellite nadir radiances. These comparisons will rely heavily on the experience derived from the Shuttle SBUV (SSBUV) program which provided a reference standard of radiance measurements for SBUV/2, TOMS, and GOME. This new measurement program, called 'Skyrad', employs two well established capabilities at the Goddard Space Flight Center, 1) the SSBUV calibration facilities and 2) the radiative transfer codes used for the TOMS and SBUV/2 algorithms and their subsequent refinements. Radiative transfer calculations show that ground based zenith sky and satellite nadir backscatter ultraviolet comparisons can be made very accurately under certain viewing conditions. The Skyrad instruments (SSBUV, Brewer spectrophotometers, and possibly others) will be calibrated and maintained to a precision of a few tenths of a percent. Skyrad data will then enable long term calibration of upcoming satellite instruments such as QuickTOMS, SBUV/2s and SCIAMACHY with a high degree of precision. This technique can be further employed to monitor the performance of future instruments such as GOMEZ, OMI, and OMPS. Additional information is included in the original extended abstract. Author

Calibrating; Cross Correlation; Radiance; Satellite Observation; Ground Stations; Ultraviolet Spectrometers

20020083308 NASA Goddard Space Flight Center, Greenbelt, MD USA

Climate Change and Expected Impacts on the Global Water Cycle

Rind, David, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Graduate Student Summer Program (GSSP), 11 Jun. 2002, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

How the elements of the global hydrologic cycle may respond to climate change is reviewed, first from a discussion of the physical sensitivity of these elements to changes in temperature, and then from a comparison of observations of hydrologic changes over the past 100 million years. Observations of current changes in the hydrologic cycle are then compared with projected future changes given the prospect of global warming. It is shown that some of the projections come close to matching the estimated hydrologic changes that occurred long ago when the earth was very warm.
Author

Hydrological Cycle; Climate Change; Paleoclimatology

20020083310 NASA Goddard Space Flight Center, Greenbelt, MD USA

Science Objectives of EOS-Aura's Ozone Monitoring Instrument (OMI)

Levelt, P. F., Royal Netherlands Meteorological Inst., Netherlands; Veefkind, J. P., Royal Netherlands Meteorological Inst., Netherlands; Stammes, P., Royal Netherlands Meteorological Inst., Netherlands; Hilsenrath, E., NASA Goddard Space Flight Center, USA; Bhartia, P. K., NASA Goddard Space Flight Center, USA; Chance, K. V., Smithsonian Astrophysical Observatory, USA; Leppelmeier, G. W., Finnish Meteorological Inst., Finland; Maelkki, A., Finnish Meteorological Inst., Finland; [2002]; 1p; In English; International Geoscience and Remote Sensing Symposium (IGARSS 2002), 24-28 Jun. 2002, Toronto, Canada; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: Issuing Activity; Abstract Only

OMI is a UV/VIS nadir solar backscatter spectrograph, which provides near global coverage in one day with a spatial resolution of 13 x 24 sq km. OMI is a new instrument, with a heritage from the European satellite instruments GOME, GOMOS and SCIAMACHY. OMI's unique capabilities for measuring important trace gases with a small footprint and daily global coverage, in conjunction with the other Aura instruments, will make a major contribution to our understanding of stratospheric and tropospheric chemistry and climate change. OMI will measure solar irradiance and Earth radiances in the wavelength range of 270 to 500 nm with spectral resolution of about 0.5 nm and a spectral sampling of about 2-3 per FWHM. From these observations, total columns of O3, NO2, BrO and SO2 will be derived from the back-scattered solar radiance using differential absorption spectroscopy (DOAS). The TOMS total ozone record will also be continued by employing the well established TOMS algorithm. Because of the high accuracy and spatial resolution of the measurements, a good estimate of tropospheric amounts of ozone and NO2 are expected. Ozone profiles will be derived using the optimal estimation method. The spectral aerosol optical

depth will be determined from measurements between 340 and 500 nm. This will provide information on aerosol concentration, aerosol size distribution and aerosol type. This wavelength range makes it possible to retrieve aerosol information over both land and sea. OMI observations will also allow retrievals of cloud coverage and cloud heights. From these products, the UV-B flux at the surface can then be derived with high spatial resolution.
Author
Ultraviolet Spectra; Visible Spectrum; Absorption Spectroscopy; Ultraviolet Spectroscopy; Spectrographs; Irradiance; Ozonometry; Satellite-Borne Instruments

20020083334 Corps of Engineers, Washington, DC USA
Engineering and Design: In-Situ Air Sparging
Sep. 15, 1997; 160p; In English
Report No.(s): AD-A405737; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
In-situ air sparging (IAS) is a rapidly emerging remediation technology for treatment of contaminants in saturated zone soils and groundwater. Injection below the water table of air, pure oxygen, or other oases may result in removal of contaminants by volatilization or bioremediation. Less commonly, IAS can be used to immobilize contaminants through chemical changes such as precipitation. This Engineer Manual (EM) provides guidance for evaluation of the feasibility and applicability of IAS for remediation of contaminated groundwater and soil and, as a secondary objective, describes design and operational considerations for IAS systems. The document is primarily intended to set USACE technical policy on the use of the technology and to help prevent its application in inappropriate settings.
DTIC
Soil Pollution; Contaminants; Saturation; Precipitation (Chemistry)

46
GEOPHYSICS

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see 47 Meteorology and Climatology; and 93 Space Radiation.

20020080730 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Intercomparison of 2-D Models Within a Common Framework
Weisenstein, Debra K., Atmospheric and Environmental Research, Inc., USA; Ko, Malcolm K. W., Atmospheric and Environmental Research, Inc., USA; Scott, Courtney J., Atmospheric and Environmental Research, Inc., USA; Jackman, Charles H., NASA Goddard Space Flight Center, USA; Fleming, Eric L., NASA Goddard Space Flight Center, USA; Considine, David B., NASA Goddard Space Flight Center, USA; Kinnison, Douglas E., Lawrence Livermore National Lab., USA; Connell, Peter S., Lawrence Livermore National Lab., USA; Rotman, Douglas A., Lawrence Livermore National Lab., USA; [2002]; 58p; In English
Contract(s)/Grant(s): W-7405-eng-48; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A model intercomparison among the Atmospheric and Environmental Research (AER) 2-D model, the Goddard Space Flight Center (GSFC) 2-D model, and the Lawrence Livermore National Laboratory 2-D model allows us to separate differences due to model transport from those due to the model's chemical formulation. This is accomplished by constructing two hybrid models incorporating the transport parameters of the GSFC and LLNL models within the AER model framework. by comparing the results from the native models (AER and e.g. GSFC) with those from the hybrid model (e.g. AER chemistry with GSFC transport), differences due to chemistry and transport can be identified. For the analysis, we examined an inert tracer whose emission pattern is based on emission from a High Speed Civil Transport (HSCT) fleet; distributions of trace species in the 2015 atmosphere; and the response of stratospheric ozone to an HSCT fleet. Differences in NO(y) in the upper stratosphere are found between models with identical transport, implying different model representations of atmospheric chemical processes. The response of O3 concentration to HSCT aircraft emissions differs in the models from both transport-dominated differences in the HSCT-induced perturbations of H2O and NO(y) as well as from differences in the model represent at ions of O3 chemical processes. The model formulations of cold polar processes are found to be the most significant factor in creating large differences in the calculated ozone perturbations
Author
Atmospheric Composition; Atmospheric Models; Two Dimensional Models; Chemical Reactions; Trace Elements; Atmospheric Chemistry

20020080784 NASA Goddard Space Flight Center, Greenbelt, MD USA

Stratospheric Analysis and Forecasting in the Northern Winter of 1999/2000: The NASA DAO's GEOS-3 System

Pawson, Steven, NASA Goddard Space Flight Center, USA; Lamich, David, General Sciences Corp., USA; Ledvina, Andrea, General Sciences Corp., USA; Lucchesi, Robert, General Sciences Corp., USA; Owens, Tommy, General Sciences Corp., USA; Newman, Paul A., NASA Goddard Space Flight Center, USA; Jun. 19, 2002; 89p; In English; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

An evaluation is presented of the performance in the northern winter 1999/2000 of the GEOS-3 troposphere-stratosphere data assimilation system (DAS). The impacts of the two main input data types are assessed: upper-air soundings (sondes) provide wind and temperature information and satellite-based (Tiros Operational Vertical Sounders: TOVS) give estimates of the thermal structure. It is shown that in the low stratosphere (300-70hPa) the analyses are generally slightly warmer than the sonde data, but colder than the TOVS data; this relationship reverses between 70 and 10 hPa. There are geographical biases, related to the spatial and temporal coverage of the observation types and to the statistical weights assigned to them in the DAS. Forecasts show a tendency to reduce zonal asymmetries in the atmospheric flow and to suppress stratospheric temperature minima. In the DAS, the analysis increments compensate for this, but it leads to important biases in the multi-day forecasts. The analysis increments are as large as the diabatic forcing in the lower polar stratosphere, indicating a substantial model bias. The results provide important insights into the roles of different data types and the circulation model in producing accurate analyses for studies of polar chemistry and physical processes.

Author

Forecasting; Stratosphere; Atmospheric Sounding; GEOS 3 Satellite; Heat Transfer; Temperature Distribution; Tiros Satellites

20020080815 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Comparison of the Age-Spectra from Data Assimilation Models

Schoeberl, Mark R., NASA Goddard Space Flight Center, USA; Douglass, Anne R., NASA Goddard Space Flight Center, USA; Zhu, Zheng-Xin, Science Systems and Applications, Inc., USA; Pawson, Steven, Maryland Univ. Baltimore County, USA; [2002]; 27p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We use kinematic and diabatic back trajectory calculations, driven by winds from a general circulation model (GCM) and two different data assimilation systems (DAS), to compute the age spectrum at three latitudes in the lower stratosphere. The age-spectra are compared to chemical transport model (CTM) calculations, and the mean ages from all of these studies are compared to observations. The age spectra computed using the GCM winds show a reasonably well-isolated tropics in good agreement with observations; however, the age spectra determined from the DAS differ from the GCM spectra. For the diabatic trajectory calculations, the age spectrum is too broad as a result of too much exchange between the tropics and mid-latitudes. The age spectrum determined using the kinematic trajectory calculation is less broad and lacks an age offset; both of these features are due to excessive vertical dispersion of parcels. The tropical and mid-latitude mean age difference between the diabatically and kinematically determined age-spectra is about one year, the former being older. The CTM calculation of the age spectrum using the DAS winds shows the same dispersive characteristics of the kinematic trajectory calculation. These results suggest that the current DAS products will not give realistic trace gas distributions for long integrations; they also help explain why the mean ages determined in a number of previous DAS driven CTM's are too young compared with observations. Finally, we note trajectory-generated age spectra show significant age anomalies correlated with the seasonal cycles, and these anomalies can be linked to year-to-year variations in the tropical heating rate. These anomalies are suppressed in the CTM spectra suggesting that the CTM transport is too diffusive.

Author

Age Factor; Computation; Trajectories; Trace Elements; Trace Contaminants; Kinematics; Heat Transfer

20020080843 NASA Goddard Space Flight Center, Greenbelt, MD USA

Profiling Tropospheric Winds with the Goddard Lidar Observatory for Winds (GLOW)

Gentry, Bruce M., NASA Goddard Space Flight Center, USA; Chen, Huailin, Science Systems and Applications, Inc., USA; [2002]; 4p; In English; 21st ILRC, 8-12 Jul. 2002, Quebec City, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Goddard Lidar Observatory for Winds (GLOW) is a mobile direct detection Doppler lidar system designed to measure wind profiles from the surface into the lower stratosphere. Recently, the GLOW lidar has participated in several field deployments measuring tropospheric winds in a variety of conditions including both daytime and night operation. More than 50 hours of line-of-sight wind profit data were obtained in September, 2000 during a three week intercomparison experiment at the Ground Winds facility in North Glen, NH. Typical clear air lidar wind profiles extended to altitudes of 20 km with a 1 km vertical resolution and 1 minute averaging. An additional 40 hours of lidar profiles of wind speed and direction were obtained during HARGLO-2,

an intercomparison experiment held at Wallops Flight Facility, VA in November, 2001. A description of the mobile system is presented along with the examples of validated lidar wind profiles obtained during these experiments.
Author
Troposphere; Wind Measurement; Wind Profiles; Wind Velocity

20020080877 NASA Goddard Space Flight Center, Greenbelt, MD USA
Wavelet Approximation in Data Assimilation
Tangborn, Andrew, NASA Goddard Space Flight Center, USA; [2002]; 34p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Estimation of the state of the atmosphere with the Kalman filter remains a distant goal because of high computational cost of evolving the error covariance for both linear and nonlinear systems. Wavelet approximation is presented here as a possible solution that efficiently compresses both global and local covariance information. We demonstrate the compression characteristics on the the error correlation field from a global two-dimensional chemical constituent assimilation, and implement an adaptive wavelet approximation scheme on the assimilation of the one-dimensional Burger's equation. In the former problem, we show that 99%, of the error correlation can be represented by just 3% of the wavelet coefficients, with good representation of localized features. In the Burger's equation assimilation, the discrete linearized equations (tangent linear model) and analysis covariance are projected onto a wavelet basis and truncated to just 6%, of the coefficients. A nearly optimal forecast is achieved and we show that errors due to truncation of the dynamics are no greater than the errors due to covariance truncation.
Author
Wavelet Analysis; Approximation; Data Management; Error Analysis; Linear Systems; Nonlinear Systems

20020080933 NASA Goddard Space Flight Center, Greenbelt, MD USA
Evaluation of Transport in the Lower Tropical Stratosphere in a Global Chemistry and Transport Model
Douglass, Anne R., NASA Goddard Space Flight Center, USA; Schoeberl, Mark R., NASA Goddard Space Flight Center, USA; Rood, Richard B., NASA Goddard Space Flight Center, USA; Pawson, Steven, Maryland Univ. Baltimore County, USA; [2002]; 35p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Off-line models of the evolution of stratospheric constituents use meteorological information from a general circulation model (GCM) or from a data assimilation system (DAS). Here we focus on transport in the tropics and between the tropics and middle latitudes. Constituent fields from two simulations are compared with each other and with observations. One simulation uses winds from a GCM and the second uses winds from a DAS that has the same GCM at its core. Comparisons of results from the two simulations with observations from satellite, aircraft, and sondes are used to judge the realism of the tropical transport. Faithful comparisons between simulated fields and observations for O3, CH4, and the age-of-air are found for the simulation using the GCM fields. The same comparisons for the simulation using DAS fields show rapid upward tropical transport and excessive mixing between the tropics and middle latitudes. The unrealistic transport found in the DAS fields may be due to the failure of the GCM used in the assimilation system to represent the quasi-biennial oscillation. The assimilation system accounts for differences between the observations and the GCM by requiring implicit forcing to produce consistency between the GCM and observations. These comparisons suggest that the physical consistency of the GCM fields is more important to transport characteristics in the lower tropical stratosphere than the elimination bias with respect to meteorological observations that is accomplished by the DAS. The comparisons presented here show that GCM fields are more appropriate for long-term calculations to assess the impact of changes in stratospheric composition because the balance between photochemical and transport terms is likely to be represented correctly.
Author
Atmospheric Composition; Atmospheric General Circulation Models; Meteorological Parameters; Simulation; Stratosphere

20020081270 Raytheon Technical Services Co., Lanham, MD USA
Ionospheric Electron/Ion Densities Temperatures on CD-ROM and WWW ***Final Report***
Bilitza, Dieter, Raytheon Technical Services Co., USA; Papitashvili, Natasha, Raytheon Technical Services Co., USA; Schar, Bill, L-3 Communications Analytics Corp., USA; Grebowsky, Joseph, NASA Goddard Space Flight Center, USA; Aug. 31, 2002; 29p; In English
Contract(s)/Grant(s): NAG5-8264
Report No.(s): RTSC-3453; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As part of this project a large volume of ionospheric satellite insitu data from the sixties, seventies and early eighties were made accessible online in ASCII format for public use. This includes 14 data sets from the BE-B, Alouette 2, DME-A, AE-B, ISIS-1, ISIS-2, OGO-6, DE-2, AEROS-A, AE-C, AE-D, AE-E, and Hinotori satellites. The original data existed in various

machine-specific, highly compressed, binary encoding on 7-, or 9-track magnetic tapes. The data were decoded and converted to a common ASCII data format, solar and magnetic indices were added, and some quality control measures were taken. The original intent of producing CD-ROMs with these data was overtaken by the rapid development of the Internet. Most users now prefer to obtain the data directly online and greatly value WWW-interfaces to browse, plot and subset the data. Accordingly the data were made available online on the anonymous ftp site of NASA's National Space Science Data Center (NSSDC) at ftp://nssdcftp.gsfc.nasa.gov/spacecraft data/ and on NSSDC's ATMOWeb (http://nssdc.gsfc.nasa.gov/atmoweb/), a WWW-interface for plotting, subsetting, and downloading the data. Several new features were implemented into ATMOWeb as part of this project including a filtering and scatter plot capability. The availability of this new database and WWW system was announced through several electronic mailer (AGU, CEDAR, IRI, etc) and through talks and posters during scientific meetings. Derived from text

Ion Density (Concentration); CD-ROM; World Wide Web; Ionospheric Temperature; Artificial Satellites; Earth Ionosphere; Data Processing

20020081277 NASA Goddard Space Flight Center, Greenbelt, MD USA

Evaluation of Refractivity Profiles from CHAMP and SAC-C GPS Radio Occultation

Poli, Paul, NASA Goddard Space Flight Center, USA; Joiner, Joanna, NASA Goddard Space Flight Center, USA; delaTorreJuarez, Manuel, Jet Propulsion Lab., California Inst. of Tech., USA; Hoff, Raymond M., Joint Center for Earth Systems Technology, USA; [2002]; 1p; In English; 1st International Workshop on Occultations for Probing Atmosphere and Climate, 16-20 Sep. 2002, Graz, Austria; No Copyright; Avail: Issuing Activity; Abstract Only

The CHAMP and SAC-C missions are the first missions to carry a second-generation 'Blackjack' GPS receiver. One of the new features of this receiver is its ability to sense the lower troposphere closer to the surface than the proof-of-concept GPS/MET 1995 experiment. Since their launch, CHAMP and SAC-C have collected thousands of GPS radio occultations, representing a wealth of measurements available for data assimilation in Numerical Weather Prediction (NWP) models. In order to evaluate the refractivity data derived by JPL from raw radio occultation measurements, we use Data Assimilation Office (DAO) 6-hour forecasts as an independent state of the atmosphere. We compare CHAMP and SAC-C refractivity (processed by JPL) with refractivity calculated from the DAO global fields of temperature, water vapor content and humidity. We will show statistics of the differences as well as Probability Density Functions (PDFs) of the differences. Depending upon availability of AIRS data, we plan to show individual profile comparisons between GPS radio occultation and AIRS retrievals.

Author

Refractivity; Radio Occultation; Global Positioning System; Numerical Weather Forecasting; Atmospheric Models

20020081296 NASA Goddard Space Flight Center, Greenbelt, MD USA

Tidal Models In A New Era of Satellite Gravimetry

Ray, Richard D., NASA Goddard Space Flight Center, USA; Rowlings, David D., NASA Goddard Space Flight Center, USA; Edbert, G. D., Oregon State Univ., USA; [2002]; 12p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The high precision gravity measurements to be made by recently launched (and recently approved) satellites place new demands on models of Earth, atmospheric, and oceanic tides. The latter is the most problematic. The ocean tides induce variations in the Earth's geoid by amounts that far exceed the new satellite sensitivities, and tidal models must be used to correct for this. Two methods are used here to determine the standard errors in current ocean tide models. At long wavelengths these errors exceed the sensitivity of the GRACE mission. Tidal errors will not prevent the new satellite missions from improving our knowledge of the geopotential by orders of magnitude, but the errors may well contaminate GRACE estimates of temporal variations in gravity. Solar tides are especially problematic because of their long alias periods. The satellite data may be used to improve tidal models once a sufficiently long time series is obtained. Improvements in the long-wavelength components of lunar tides are especially promising.

Author

Gravimetry; Lunar Tides; Mathematical Models; Space Missions; Satellite-to-Satellite Tracking

20020081346 NASA Goddard Space Flight Center, Greenbelt, MD USA

Overview of the Upper Atmosphere Research Satellite: Observations from 1991 to 2002

Jackman, Charles H., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 34th COSPAR Scientific Assembly/2nd World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Upper Atmosphere Research Satellite (UARS) was launched in September 1991 by the Space Shuttle Discovery. Seven of the original ten instruments aboard the UARS are functional and six instruments regularly take measurements. The UARS is in a stable observing configuration, in spite of experiencing several anomalies which have impacted the data tape storage and power available. Power sharing and ”real-time” operations using the Tracking and Data Relay Satellites have reduced the data collection over the past five years. Although the UARS measurements have not been continuous, the UARS instruments HALOE, SUSIM, SOLSTICE, HRDI, WINDII, and PEM have provided important observations over an entire solar cycle. The UARS HALOE instrument measures ozone and other constituents important in understanding ozone variations. The UARS SUSIM and SOLSTICE instruments observe ultraviolet light between 120 and 420 nm, which influence middle atmospheric constituent fluctuations. The UARS HRDI and WINDII instruments measure winds in the stratosphere, mesosphere, and thermosphere, which move constituents among the various atmospheric regions. The UARS PEM instrument provides observations of input precipitating charged particles, including both electrons and protons. This paper will provide an overview about the UARS mission and its relevant atmospheric measurements.

Author

Upper Atmosphere Research Satellite (UARS); Satellite Observation; Satellite-Borne Instruments; Ozone; Halogen Occultation Experiment; Earth Atmosphere

20020081348 NASA Goddard Space Flight Center, Greenbelt, MD USA

Ozone Depletion from Nearby Supernovae

Gehrels, Neil, NASA Goddard Space Flight Center, USA; Laird, Claude M., Kansas Univ., USA; Jackman, Charles H., NASA Goddard Space Flight Center, USA; Cannizzo, John K., NASA Goddard Space Flight Center, USA; Mattson, Barbara J., NASA Goddard Space Flight Center, USA; Chen, Wan, Sprint, USA; [2002]; 19p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Estimates made in the 1970’s indicated that a supernova occurring within tens of parsecs of Earth could have significant effects on the ozone layer. Since that time improved tools for detailed modeling of atmospheric chemistry have been developed to calculate ozone depletion, and advances have been made also in theoretical modeling of supernovae and of the resultant gamma ray spectra. In addition, one now has better knowledge of the occurrence rate of supernovae in the galaxy, and of the spatial distribution of progenitors to core-collapse supernovae. We report here the results of two-dimensional atmospheric model calculations that take as input the spectral energy distribution of a supernova, adopting various distances from Earth and various latitude impact angles. In separate simulations we calculate the ozone depletion due to both gamma rays and cosmic rays. We find that for the combined ozone depletion from these effects roughly to double the ’biologically active’ UV flux received at the surface of the Earth, the supernova must occur at approximately or less than 8 parsecs.

Author

Ozone Depletion; Supernovae; Gamma Ray Spectra; Atmospheric Chemistry; Mathematical Models; Molecular Dynamics; Photochemical Reactions; Earth Atmosphere

20020082883 Colorado Univ., Boulder, CO USA

Ice Shelves and Landfast Ice on the Antarctic Perimeter: Revised Scope of Work

Scambos, Ted, Colorado Univ., USA; Oct. 14, 2002; 23p; In English

Contract(s)/Grant(s): NAG5-11308; CU-1534620; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ice shelves respond quickly and profoundly to a warming climate. Within a decade after mean summertime temperature reaches approx. O C and persistent melt pending is observed, a rapid retreat and disintegration occurs. This link was documented for ice shelves in the Antarctic Peninsula region (the Larsen ’A’, ’B’ and Wilkins Ice shelves) by the results of a previous grant under ADRO-1. Modeling of ice flow and the effects of meltwater indicated that melt pending accelerates shelf breakup by increasing fracture penetration. SAR data supplemented an AVHRR- and SSM/I-based image analysis of extent and surface characteristic changes. This funded grant is a revised, scaled-down version of an earlier proposal under the ADRO-2 NRA. The overall objective remains the same: we propose to build on the previous study by examining other ice shelves of the Antarctic and incorporate an examination of the climate-related characteristics of landfast ice. The study now considers just a few shelf and fast ice areas for study, and is funded for two years. The study regions are the northeastern Ross Ice Shelf, the Larsen ’B’ and ’C’ shelves, fast ice and floating shelf ice in the Pine Island Glacier area, and fast ice along the Wilkes Land coast. Further, rather than investigating a host of shelf and fast ice processes, we will home in on developing a series of characteristics associated with climate change over shelf and fast ice areas. Melt pending and break-up are the end stages of a response to a warming climate that may begin with increased melt event frequency (which changes both albedo and emissivity temporarily), changing firn backscatter

(due to percolation features), and possibly increased rifting of the shelf surface. Fast ice may show some of these same processes on a seasonal timescale, providing insight into shelf evolution.
Author
Advanced Very High Resolution Radiometer; Ross Ice Shelf; Land Ice; Image Analysis; Geological Faults

20020082968 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Earth Gravitational Model 1996: The NCCS: Resource for Development, Resource for the Future
1999 NCCS Highlights; July 2002, pp. 78-83; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

For centuries, men have attempted to understand the climate system through observations obtained from Earth's surface. These observations yielded preliminary understanding of the ocean currents, tides, and prevailing winds using visual observation and simple mechanical tools as their instruments. Today's sensitive, downward-looking radar systems, called altimeters, onboard satellites can measure globally the precise height of the ocean surface. This surface is largely that of the equipotential gravity surface, called the geoid - the level surface to which the oceans would conform if there were no forces acting on them apart from gravity, as well as having a significant 1-2- meter-level signal arising from the motion of the ocean's currents.
Derived from text
Earth Gravitation; Models; Visual Observation; Climate

20020082972 NASA Goddard Space Flight Center, Greenbelt, MD USA
Simulating the Dynamics of Earth's Core: Using NCCS Supercomputers Speeds Calculations
1999 NCCS Highlights; July 2002, pp. 84-89; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

If one wanted to study Earth's core directly, one would have to drill through about 1,800 miles of solid rock to reach liquid core-keeping the tunnel from collapsing under pressures that are more than 1 million atmospheres and then sink an instrument package to the bottom that could operate at 8,000 F with 10,000 tons of force crushing every square inch of its surface. Even then, several of these tunnels would probably be needed to obtain enough data. Faced with difficult or impossible tasks such as these, scientists use other available sources of information - such as seismology, mineralogy, geomagnetism, geodesy, and, above all, physical principles - to derive a model of the core and, study it by running computer simulations. One NASA researcher is doing just that on NCCS computers. Physicist and applied mathematician Weijia Kuang, of the Space Geodesy Branch, and his collaborators at Goddard have what he calls the,"second - ever" working, usable, self-consistent, fully dynamic, three-dimensional geodynamic model (see "The Geodynamic Theory"). Kuang runs his model simulations on the supercomputers at the NCCS. He and Jeremy Bloxham, of Harvard University, developed the original version, written in FORTRAN 77, in 1996.
Derived from text
Computerized Simulation; Dynamic Models; Geodynamics; Geomagnetism; Seismology; Three Dimensional Models

20020083256 Colorado Univ., Dept. of Physics, Boulder, CO USA
Feasibility of the Use of 3D Models to Improve Regional Locations in W. China, Central Asia, and Parts of the Middle East ***Final Report, 12 Dec. 1999-11 Aug. 2002***
Ritzwoller, Michael H.; Shapiro, Nikolai M.; Levshin, Anatoli L.; Bergman, Eric A.; Engdahl, Eric R.; Sep. 09, 2002; 61p; In English
Contract(s)/Grant(s): DTRA01-00-C-0026
Report No.(s): AD-A405941; 30-10613-1532378; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We have assembled a data set of nearly 1000 events across Eurasia and N. Africa whose locations and origin times are known with high accuracy. These events which occur in 23 event clusters, the groomed P and Pn arrival time data observed at regional distances, and about 1000 empirical phase path anomalies create a Ground Truth (GT) data base to be used to assess the quality of 3-D (three-dimensional) models and their applicability to regional locations. We assessed several seismic models of the crust and upper mantle, concentrating on the 1-D (one-dimensional) model AK135 and the 3-D model CUB2.0, in two ways: (1) the fit of model predicated travel times to the empirical path anomalies and (2) the ability to locate the GT events. The 3-D Vp model converted from CUB2.0 Vs model using the thermoelastic properties of an assumed mantle composition fits regional P and Pn travel times remarkably well. Our findings underscore the importance of GT data bases in assessing 3-D models, and show that global 3-D Vs models provide a sound basis on which to build improvements in regional location capabilities.
DTIC
Seismic Waves; Three Dimensional Models; Asia; Computerized Simulation

20020083299 Steedman (R. Scott), Reading, UK
Earthquake Engineering Support, Phase 5 ***Final Report***
Steedman, R. S.; Aug. 2002; 99p; In English
Contract(s)/Grant(s): N68171-01-M-5037
Report No.(s): AD-A406126; RSS/J0101R04-REV-0; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This report summarizes the findings of an experimental study supported by the U.S. Army Centrifuge Research Center and Engineer Earthquake Engineering Research Program (EQEN) into the behavior of saturated sands under high initial effective confining stresses subjected to strong ground shaking. The research was conducted using the Army Centrifuge at the U.S. Army Engineering Research and Development Center (ERDC), located in Vicksburg, MS. A large dataset of the response of saturated sand to dynamic shaking under level ground' conditions has been compiled and a series of verification models have been conducted. Several techniques were used to investigate the response of deep soil sites (in excess of 70 m) including surcharges, lowered water table and higher acceleration (gravities). The most effective approach was to test specimens at higher gravity, as the interpretation of data from specimens tested using a heavy surcharge on the ground surface, or a deep water table has proved difficult. Many deep samples showed a limit to the excess pore pressure generated during shaking at a level much less than 100% of the initial vertical effective stress. A range of explanations has been proposed, including container effects, saturation, compression of the soil, redistribution of pore pressure and dynamic response of the surcharge. The verification tests eliminated container effects, and parallel research by others has shown that there are several reasons for pore pressure generation at depth to be limited. However, as postulated in earlier stages of this research, there is no absolute limit: in a fully saturated specimen of broadly uniform permeability, liquefaction was observed within a few cycles of strong shaking throughout (to an equivalent field depth of around 65 m). A second key finding indicates that dense layers overlying loose layers may still be readily liquefied as a consequence of the high excess pore pressures generated below.
DTIC
Earthquakes; Surface Water; Stress Analysis; Soil Mechanics

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20020080729 NASA Goddard Space Flight Center, Greenbelt, MD USA
Tropical Cumulus Convection and Upward Propagating Waves in Middle Atmospheric GCMs
Horinouchi, T., Kyoto Univ., Japan; Pawson, S., NASA Goddard Space Flight Center, USA; Shibata, K., Meteorological Research Inst., Japan; Langematz, U., Freie Univ., Germany; Manzini, E., Max-Planck-Inst. fuer Meteorologie, Germany; Giorgetta, M. A., Max-Planck-Inst. fuer Meteorologie, Germany; Sassi, F., National Center for Atmospheric Research, USA; Wilson, R. J., Princeton Univ., USA; Hamilton, K. P., Princeton Univ., USA; deGranpre, J., York Univ., Canada; [2002]; 62p; In English; Original contains color illustrations
Contract(s)/Grant(s): JSPS-13740278; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

It is recognized that the resolved tropical wave spectrum can vary considerably between general circulation models (GCMs) and that these differences can have an important impact on the simulated climate. A comprehensive comparison of the waves is presented for the December-January-February period using high-frequency (three-hourly) data archives from eight GCMs and one simple model participating in the GCM Reality Intercomparison Project for SPARC (GRIPS). Quantitative measures of the structure and causes of the wavenumber-frequency structure of resolved waves and their impacts on the climate are given. Space-time spectral analysis reveals that the wave spectrum throughout the middle atmosphere is linked to variability of convective precipitation, which is determined by the parameterized convection. The variability of the precipitation spectrum differs by more than an order of magnitude between the models, with additional changes in the spectral distribution (especially the frequency). These differences can be explained primarily by the choice of different, cumulus par amet erizations: quasi-equilibrium mass-flux schemes tend to produce small variability, while the moist-convective adjustment scheme is most active. Comparison with observational estimates of precipitation variability suggests that the model values are scattered around the truth. This result indicates that a significant portion of the forcing of the equatorial quasi-biennial oscillation (QBO) is provided by waves with scales that are not resolved in present-day GCMs, since only the moist convective adjustment scheme (which has the largest transient variability) can force a QBO in models that have no parameterization of non-stationary gravity waves. Parameterized cumulus convection also impacts the nonmigrating tides in the equatorial region. In most of the models, momentum transport by diurnal nonmigrating tides in the mesosphere is larger than that by Kelvin waves, being more significant than has been thought. It is shown that the equatorial semi-annual oscillation in the models examined is driven mainly by gravity waves

with periods shorter than three days, with at least some contribution from parameterized gravity waves; the contribution from the ultra-fast zonal wavenumber-1 Kelvin waves is negligible.
Author
Atmospheric General Circulation Models; Middle Atmosphere; Quasi-Biennial Oscillation; Tropical Regions; Cumulus Clouds; Convection; Parameterization

20020080736 NASA Goddard Space Flight Center, Greenbelt, MD USA
Cloud Physics Lidar Optical Measurements During the SAFARI-2000 Field Campaign
Hlavka, Dennis L., Science Systems and Applications, Inc., USA; McGill, Matt, NASA Goddard Space Flight Center, USA; Hart, William D., Science Systems and Applications, Inc., USA; Spinhirne, James D., NASA Goddard Space Flight Center, USA; [2002]; 3p; In English; IGARRS 2002 Symposium, 24-28 Jun. 2002, Toronto, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In this presentation, we will show new optical data processing results from the Cloud Physics War during SAFARI-2000. Retrieved products include aerosol and cloud layer location and identification, layer optical depths, vertical extinction profiles, and extinction-to-backscatter (S) ratios for 532 and 1064 nm. The retrievals will focus on the persistent and smoky planetary boundary layer and occasional elevated aerosol layers found in southern Africa during August and September 2000.
Author
Cloud Physics; Optical Properties; Optical Radar; Optical Measurement; Algorithms

20020080741 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Structure of A Pacific Narrow Cold Frontal Rainband
Jorgensen, David P., National Severe Storms Lab., USA; Pu, Zhaoxia, Maryland Univ. Baltimore County, USA; Persson, Ola, National Oceanic and Atmospheric Administration, USA; Tao, Wei-Kuo, NASA Goddard Space Flight Center, USA; Jul. 26, 2002; 59p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A NOAA P-3 instrumented aircraft observed an intense, fast-moving narrow cold frontal Farmhand as it approached the Pacific Northwest coast on 19 February 2001 during the Pacific Coastal Jets Experiment. Pseudo-dual-Doppler analyses performed on the airborne Doppler radar data while the frontal system was well offshore indicated that a narrow ribbon of very high radar reflectively convective cores characterized the Farmhand at low levels with echo tops to approximately 4-5 km. The NCFR exhibited gaps in its narrow ribbon of high reflectively, probably as a result of hydrodynamic instability all no its advancing cold pool leading edge. In contrast to some earlier studies of cold frontal rainbands, density current theory described well the motion of the overall front. The character of the updraft structure associated with the heavy rainfall at its leading edge varied across the gap region. The vertical shear of the cross-frontal low-level ambient flow exerted a strong influence on the updraft character, consistent with theoretical arguments developed for squall lines describing the balance of vorticity at the leading edge. In short regions south of the gaps the vertical wind shear was strongest with the updrafts and rain shafts more intense, narrower, and more erect or even downshear tilted. North of the gaps the wind shear weakened with less intense Dihedrals which tilted upshear with a broader band of rainfall. Simulations using a nonhydrostatic mesoscale nested grid model are used to investigate the gap regions, particularly the balance of cold pool induced to pre-frontal ambient shears at the leading edge. Observations confirm the model results that the updraft character depends on the balance of vorticity at the leading edge. Downshear-tilted updrafts imply that convection south of the gap regions would weaken with time relative to the frontal segments north of the gaps since inflow air would be affected by passage through the heavy rain region before ascent, suggesting a mechanism for gap filling.
Author
Rain; Mesoscale Phenomena; Doppler Radar; Precipitation (Meteorology); NOAA Satellites; Cold Fronts

20020080785 G and A Technical Software, Inc., Newport News, VA USA
Characterization of Polar Mesospheric Clouds Using Infrared Measurements from HALOE ***Monthly Report, 1-31 Aug. 2000***
Hervig, Mark E., G and A Technical Software, Inc., USA; Jun. 09, 2002; 1p; In English
Contract(s)/Grant(s): NASW-02013
Report No.(s): GATS-090602; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Measurements from the Halogen Occultation Experiment (HALOE) revealed the infrared signature of polar mesospheric clouds (PMCs), for the first time, HALOE PMC observations at eight wavelengths (2.45 - 10 microns) show remarkable agreement with model PMC spectra based on ice particle extinction, and thus provide the first confirmation that water ice is the primary component of PMCs. Because PMCs respond to changes in temperature and water vapor, they are considered an indicator of global climate change. We propose to further the understanding of PMCs using a decade of infrared measurements form

HALOE. This effort will characterize PMC spectral properties, extinction profiles, and size distributions. Using this information, HALOE measurements will be used to make simultaneous retrievals of H2O3, and temperature, in the presence of PMCs. The simultaneous retrievals of particle properties, H2O3, and temperature will be used with HALOE NO data to provide a significant step forward in the knowledge of PMC characteristics and formation conditions. We will challenge fundamental theories of PMC formation, and investigate changes in PMC properties and related conditions over the length of the HALOE measurement record. HALOE has been operating without flaw since it was launched on October 11, 1991. Consequently, ten southern and ten northern PMC seasons have been observed thus far, providing a wealth of data for the study of PMC and related parameters.
Author
Climate Change; Halogen Occultation Experiment; Infrared Radiation; Infrared Signatures; Size Distribution; Water Vapor

20020080797 NASA Goddard Space Flight Center, Greenbelt, MD USA
Estimation of Rainfall Sampling Uncertainty: A Comparison of Two Diverse Approaches
Steiner, Matthias, Princeton Univ., USA; Zhang, Yu, Princeton Univ., USA; Baeck, Mary Lynn, Princeton Univ., USA; Wood, Eric F., Princeton Univ., USA; Smith, James A., Princeton Univ., USA; Bell, Thomas L., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; TRMM International Science Conference, 22-26 Jul. 2002, Honolulu, HI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The spatial and temporal intermittence of rainfall causes the averages of satellite observations of rain rate to differ from the ”true” average rain rate over any given area and time period, even if the satellite observations are perfectly accurate. The difference of satellite averages based on occasional observation by satellite systems and the continuous-time average of rain rate is referred to as sampling error. In this study, rms sampling error estimates are obtained for average rain rates over boxes 100 km, 200 km, and 500 km on a side, for averaging periods of 1 day, 5 days, and 30 days. The study uses a multi-year, merged radar data product provided by Weather Services International Corp. at a resolution of 2 km in space and 15 min in time, over an area of the central U.S. extending from 35N to 45N in latitude and 100W to 80W in longitude. The intervals between satellite observations are assumed to be equal, and similar In size to what present and future satellite systems are able to provide (from 1 h to 12 h). The sampling error estimates are obtained using a resampling method called ”resampling by shifts,” and are compared to sampling error estimates proposed by Bell based on earlier work by Laughlin. The resampling estimates are found to scale with areal size and time period as the theory predicts. The dependence on average rain rate and time interval between observations is also similar to what the simple theory suggests.
Author
Rain; Trmm Satellite; Meteorological Services; Satellite Observation

20020080804 NASA Goddard Space Flight Center, Greenbelt, MD USA
Intercomparison of Model Simulations of the Impact of 1997/98 El Nino on South American Summer Monsoon
Zhou, Jiayu, NASA Goddard Space Flight Center, USA; Lau, K.-M., NASA Goddard Space Flight Center, USA; March 2002; 44p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The simulations of climatology and response of the South American summer monsoon (SASM) to the 1997/98 El Nino are investigated using six atmospheric general circulation models. Results show all models simulate the large-scale features of the SASM reasonably well. However, both stationary and seasonal components of the surface pressure are overestimated, resulting in an excessively strong SASM in the model climatology. The low-level northwesterly jet over eastern foothills of the Andes is not well resolved because of the coarse resolution of the models. Large rainfall simulation biases are found in association with the Andes and the Atlantic ITCZ, indicating model problems in handling steep mountains and parameterization of convective processes. The simulation of the 1997/98 El Nino impact on SASM is examined based on an ensemble of ten two-year (September 1996 - August 1998) integration. Results show that most models can simulate the large-scale tropospheric warming response over the tropical central Pacific, including the dynamic response of Rossby wave propagation of the Pacific-South America (PSA) pattern that influences remote areas. Deficiencies are found in simulating the regional impacts over South America. Model simulation fails to capture the southeastward expansion of anomalously warm tropospheric air. As a result, the upper tropospheric anomalous high over the subtropical Andes is less pronounced, and the enhancement of subtropical westerly jet is displaced 5deg-10deg equatorward compared to the observed. Over the Amazon basin, the shift of Walker cell induced by El Nino is not well represented, showing anomalous easterlies in both upper and lower troposphere.
Author
Atmospheric General Circulation Models; Climatology; El Nino; Simulation; Dynamic Response

20020080807 NASA Goddard Space Flight Center, Greenbelt, MD USA

Structure of the Highly Sheared Tropical Storm Chantal During CAMEX -4

Heymsfield, Gerald M., NASA Goddard Space Flight Center, USA; Halverson, J., Maryland Univ., USA; Black, M., National Oceanic and Atmospheric Administration, USA; Marks, F., National Oceanic and Atmospheric Administration, USA; Zipser, E., Utah Univ., USA; Tian, L., Maryland Univ., USA; Belcher, L., Science Systems and Applications, Inc., USA; Bui, P., NASA Ames Research Center, USA; Im, E., Jet Propulsion Lab., California Inst. of Tech., USA; [2002]; 2p; In English; AMS 25th Conference on Hurricanes and Tropical Meteorology, 29 Apr. - 3 May 2002, San Diego, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

On 20 August 2001 during the Convection and Moisture Experiment 4 (CAMEX-4) and NOAA Hurricane Field Program (HFP2001), the NASA high-altitude ER-2 and medium-altitude DC-8, and lower-altitude NOAA P3 aircraft conducted a coordinated Quantitative Precipitation Estimation (QPE) mission focused on convection in Tropical Storm Chantal. This storm first became a depression on 14 August, a tropical storm on 17 August, and it maintained maximum winds of about 65-70 mph during 19-20 August with minimum pressures ranging from 1008 mb on 19 August to 1001 mb late on 20 August. The storm was westward moving and was forecasted to intensify and landfall near the Yucatan-Belize border late on 20 August. Chanter failed to intensify and instead exhibited a highly sheared structure with an open low-level circulation and intense convection well to the northeast of this circulation center. The NASA ER-2 and DC-8 aircraft were closely coordinated with the NOAA P3 (NOAA-42). The NASA aircraft collected remote sensing and in situ data sets, while the P3 collected lower level in situ and radar data; both the DC-8 and P3 released 7 and 24 dropsondes, respectively. These aircraft measurements provided a unique opportunity to examine the structure of a sheared system and why it did not develop as forecasted a few days earlier. This paper will describe a preliminary study of the precipitation and wind structure provided by the NASA aircraft within the context of the NOAA P3 measurements.

Author

Tropical Storms; Radar Data; In Situ Measurement; Hurricanes; Dropsondes; Belize

20020080817 NASA Goddard Space Flight Center, Greenbelt, MD USA

Observing System Simulation Experiments to Define Lidar Wind Requirements

Atlas, Robert, NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; Earth Science Technology Conference, 11-13 Jun. 2002, Pasadena, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Since the advent of meteorological satellites in the 1960's, numerous experiments have been conducted in order to evaluate the impact of these and other data on atmospheric analysis and prediction. Such studies have included both OSE'S and OSSE's. The OSE's were conducted to evaluate the impact of specific observations or classes of observations on analyses and forecasts. Such experiments have been performed for selected types of conventional data and for various satellite data sets as they became available. (See for example the 1989 ECMWF/EUMETSAT workshop proceedings on "The use of satellite data in operational numerical weather prediction" and the references contained therein.) The OSSE's were conducted to evaluate the potential for future observing systems to improve Numerical Weather Prediction (NWP) and to plan for the Global Weather Experiment and more recently for EOS ([1], [2], [3]). In addition, OSSE's have been run to evaluate trade-offs in the design of observing systems and observing networks ([4], [5]), and to test new methodology for data assimilation ([6]).

Author

Wind (Meteorology); Optical Radar; Meteorological Radar; Global Atmospheric Research Program; Numerical Weather Forecasting

20020080837 NASA Goddard Space Flight Center, Greenbelt, MD USA

Retrieval of Atmospheric and Surface Parameters from AIRS/AMSU/HSB Data Under Cloudy Conditions

Susskind, Joel, NASA Goddard Space Flight Center, USA; Barnet, Chris, NASA Goddard Space Flight Center, USA; Blaisdell, John, Science Applications International Corp., USA; [2002]; 23p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

New state of the art methodology is described to analyze AIRS/AMSU/HSB data in the presence of multiple cloud formations. The methodology forms the basis for the AIRS Science Team algorithm which will be used to analyze AIRS/AMSU/HSB data on EOS Aqua. The cloud clearing methodology requires no knowledge of the spectral properties of the clouds. The basic retrieval methodology is general and extracts the maximum information from the radiances, consistent with the channel noise covariance matrix. The retrieval methodology minimizes the dependence of the solution on the first guess field and the first guess error characteristics. Results are shown for AIRS Science Team simulation studies with multiple cloud formations. These simulation studies imply that clear column radiances can be reconstructed under partial cloud cover with an accuracy comparable to single spot channel noise in the temperature and water vapor sounding regions, temperature soundings can be

produced under partial cloud cover with RMS errors on the order of, or better than, 1deg K in 1 km thick layers from the surface to 700 mb, 1 km layers from 700 mb to 300 mb, 3 km layers from 300 mb to 30 mb, and 5 km layers from 30 mb to 1 mb, and moisture profiles can be obtained with an accuracy better than 20% absolute errors in 1 km layers from the surface to nearly 200 mb.
Author
Meteorological Parameters; Atmospheric Temperature; Algorithms; Atmospheric Sounding

20020080840 NASA Goddard Space Flight Center, Greenbelt, MD USA
Detection of Urban-Induced Rainfall Anomalies in Houston, Texas: A New Perspective from Space
Shepherd, J. Marshall, NASA Goddard Space Flight Center, USA; Burian, Steven J., Arkansas Univ., USA; Sep. 16, 2002; 20p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Urban heat islands (UHIs) are caused by the heat-retaining properties of surfaces usually found in urban cities like asphalt and concrete. The UHI can typically be observed on the evening TV weather map as warmer temperatures over the downtown of major cities and cooler temperatures in the suburbs and surrounding rural areas. The UHI has now become a widely acknowledged, observed, and researched phenomenon because of its broad environmental and societal implications. Interest in the UHI will intensify in the future as existing urban areas expand and rural areas urbanize. by the year 2025, more than 60% of the world's population will live in cities, with higher percentages expected in developed nations. The urban growth rate in the USA, for example, is estimated to be 12.5%, and the recent 2000 Census found that more than 80% of the population currently lives in urban areas. Furthermore, the U.S. population is not only growing but is tending to concentrate more in urban areas within the environmentally sensitive coastal zones. Urban growth creates unique and often contentious issues for policymakers related to land use zoning, transportation planning, agricultural production, housing and development, pollution, and natural resources protection. Urban expansion and its associated UHIs also have measurable impacts on weather and climate processes. The UHI has been documented to affect local and regional temperature, wind patterns, and air quality.
Derived from text
Air Quality; Anomalies; Climate; Earth Resources; Rain

20020080844 NASA Goddard Space Flight Center, Greenbelt, MD USA
Simulation of High-Latitude Hydrological Processes in the Torne-Kalix Basin: PILPS Phase 2(e), 3, Equivalent Model Representation and Sensitivity Experiments
Bowling, Laura C., Washington Univ., USA; Lettenmaier, Dennis P., Washington Univ., USA; Nijssen, Bart, Washington Univ., USA; Polcher, Jan, Laboratoire de Meteorologie Dynamique du CNRS, France; Koster, Randal D., NASA Goddard Space Flight Center, USA; Lohmann, Dag, National Centers for Environmental Prediction, USA; [2002]; 38p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Project for Intercomparison of Land Surface Parameterization Schemes (PILPS) Phase 2(e) showed that in cold regions the annual runoff production in Land Surface Schemes (LSSs) is closely related to the maximum snow accumulation, which in turn is controlled in large part by winter sublimation. to help further explain the relationship between snow cover, turbulent exchanges and runoff production, a simple equivalent model-(SEM) was devised to reproduce the seasonal and annual fluxes simulated by 13 LSSs that participated in PILPS Phase 2(e). The design of the SEM relates the annual partitioning of precipitation and energy in the LSSs to three primary parameters: snow albedo, effective aerodynamic resistance and evaporation efficiency. Isolation of each of the parameters showed that the annual runoff production was most sensitive to the aerodynamic resistance. The SEM was somewhat successful in reproducing the observed LSS response to a decrease in shortwave radiation and changes in wind speed forcings. SEM parameters derived from the reduced shortwave forcings suggested that increased winter stability suppressed turbulent heat fluxes over snow. Because winter sensible heat fluxes were largely negative, reductions in winter shortwave radiation imply an increase in annual average sensible heat.
Author
Hydrology; Turbulent Heat Transfer; Evaporation; Computerized Simulation; Polar Regions

20020080858 Millersville Univ., PA USA
Meteorological Software
Spinoff 1993; 1993, pp. 70; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

GEMPAK, a computer program developed by NASA's Goddard Space Center as a general purpose meteorological display package-(GSC- 13402), is used by Millersville University in its meteorology program. A data line feed stored in GEMPAK files

with data processed and displayed by means of text-based menu selection schemes allows students to analyze and interpret multiple products. The program also makes them aware of often difficult and varied meteorological analysis techniques.
Author
Computer Systems Programs; Meteorology; Software Engineering; Weather Forecasting

20020080862 NASA Goddard Space Flight Center, Greenbelt, MD USA
Study of the Variability in the Rain Drop Size Distribution Over a 2.3. km Path
Rincon, Rafael F., NASA Goddard Space Flight Center, USA; Lang, Roger, George Washington Univ., USA; Meneghini, Robert, NASA Goddard Space Flight Center, USA; Bidwell, Steven, NASA Goddard Space Flight Center, USA; Tokay, Ali, Maryland Univ. Baltimore County, USA; Mar. 22, 2002; 3p; In English; International Geoscience and Remote Sensing Symposium (IGARSS), USA
Contract(s)/Grant(s): NAG5-9550; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In an effort to study the drop size distribution (DSD) a state-of-the-art instrument arrangement was deployed on Wallops Island, VA. The instrumentation consisted of a 2.3-km multi-frequency microwave link, three impact disdrometers, and a network of optical and tipping bucket raingauges. A dual-frequency inversion technique was implemented with the fink measurements of attenuations at 25 GHz and 38 GHz to estimate the path-average DSD. Concurrently, an X-band, dual-polarization radar, located in the vicinity, collected polarization and reflectively measurements over the link path. The evaluation of the estimates and measurements generated some preliminary results.
Author
Raindrops; Particle Size Distribution; Drop Size; Precipitation Particle Measurement; Variability

20020080865 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Method to Retrieve Rainfall Rate Over Land from TRMM Microwave Imager Observations
Prabhakara, C., NASA Goddard Space Flight Center, USA; Iacovazzi, R., Jr., Science Systems and Applications, Inc., USA; Yoo, J.-M., Ewha Woman's Univ., Korea, Republic of; [2002]; 43p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over tropical land regions, rain rate maxima in mesoscale convective systems revealed by the Precipitation Radar (PR) flown on the Tropical Rainfall Measuring Mission (TRMM) satellite are found to correspond to thunderstorms, i.e., Cbs. These Cbs are reflected as minima in the 85 GHz brightness temperature, T85, observed by the TRMM Microwave Imager (TMI) radiometer. Because the magnitude of TMI observations do not discriminate satisfactorily convective and stratiform rain, we developed here a different TMI discrimination method. In this method, two types of Cbs, strong and weak, are inferred from the Laplacian of T85 at minima. Then, to retrieve rain rate, where T85 is less than 270 K, a weak (background) rain rate is deduced using T85 observations. Furthermore, over a circular area of 10 km radius centered at the location of each T85 minimum, an additional Cb component of rain rate is added to the background rain rate. This Cb component of rain rate is estimated with the help of (T19-T37) and T85 observations. Initially, our algorithm is calibrated with the PR rain rate measurements from 20 MCS rain events. After calibration, this method is applied to TMI data taken from several tropical land regions. With the help of the PR observations, we show that the spatial distribution and intensity of rain rate over land estimated from our algorithm are better than those given by the current TMI-Version-5 Algorithm. For this reason, our algorithm may be used to improve the current state of rain retrievals on land.
Author
Trmm Satellite; Precipitation (Meteorology); Meteorological Radar; Microwave Imagery; Rain

20020080868 NASA Goddard Space Flight Center, Greenbelt, MD USA
Confronting Models with Data: The GEWEX Cloud Systems Study
Randall, David, Colorado State Univ., USA; Curry, Judith, Colorado Univ., USA; Duynkerke, Peter, Royal Netherlands Meteorological Inst., Netherlands; Krueger, Steven, Utah Univ., USA; Moncrieff, Mitchell, National Center for Atmospheric Research, USA; Ryan, Brian, Commonwealth Scientific and Industrial Research Organization, Australia; Starr, David OC., NASA Goddard Space Flight Center, USA; Miller, Martin, European Centre for Medium-Range Weather Forecasts, UK; Rossow, William, NASA Goddard Inst. for Space Studies, USA; Tselioudis, George, NASA Goddard Inst. for Space Studies, USA; [2002]; 39p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The GEWEX Cloud System Study (GCSS; GEWEX is the Global Energy and Water Cycle Experiment) was organized to promote development of improved parameterizations of cloud systems for use in climate and numerical weather prediction models, with an emphasis on the climate applications. The strategy of GCSS is to use two distinct kinds of models to analyze and understand observations of the behavior of several different types of clouds systems. Cloud-system-resolving models (CSRMs)

have high enough spatial and temporal resolutions to represent individual cloud elements, but cover a wide enough range of space and time scales to permit statistical analysis of simulated cloud systems. Results from CSRMs are compared with detailed observations, representing specific cases based on field experiments, and also with statistical composites obtained from satellite and meteorological analyses. Single-column models (SCMs) are the surgically extracted column physics of atmospheric general circulation models. SCMs are used to test cloud parameterizations in an un-coupled mode, by comparison with field data and statistical composites. In the original GCSS strategy, data is collected in various field programs and provided to the CSRM Community, which uses the data to ”certify” the CSRMs as reliable tools for the simulation of particular cloud regimes, and then uses the CSRMs to develop parameterizations, which are provided to the GCM Community. We report here the results of a re-thinking of the scientific strategy of GCSS, which takes into account the practical issues that arise in confronting models with data. The main elements of the proposed new strategy are a more active role for the large-scale modeling community, and an explicit recognition of the importance of data integration.
Author
Atmospheric Models; Numerical Weather Forecasting; Clouds (Meteorology); Data Processing; Hydrological Cycle

20020080888 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Surface Energy Budget and Precipitation Efficiency for Convective Systems During TOGA, COARE, GATE, SCSMEX and ARM: Cloud-Resolving Model Simulations
Tao, W.-K., NASA Goddard Space Flight Center, USA; Shie, C.-L., NASA Goddard Space Flight Center, USA; Johnson, D, NASA Goddard Space Flight Center, USA; Simpson, J., NASA Goddard Space Flight Center, USA; Aug. 20, 2002; 33p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A two-dimensional version of the Goddard Cumulus Ensemble (GCE) Model is used to simulate convective systems that developed in various geographic locations. Observed large-scale advective tendencies for potential temperature, water vapor mixing ratio, and horizontal momentum derived from field campaigns are used as the main forcing. by examining the surface energy budgets, the model results show that the two largest terms are net condensation (heating/drying) and imposed large-scale forcing (cooling/moistening) for tropical oceanic cases. These two terms arc opposite in sign, however. The contributions by net radiation and latent heat flux to the net condensation vary in these tropical cases, however. For cloud systems that developed over the South China Sea and eastern Atlantic, net radiation (cooling) accounts for about 20% or more of the net condensation. However, short-wave heating and long-wave cooling are in balance with each other for cloud systems over the West Pacific region such that the net radiation is very small. This is due to the thick anvil clouds simulated in the cloud systems over the Pacific region. Large-scale cooling exceeds large-scale moistening in the Pacific and Atlantic cases. For cloud systems over the South China Sea, however, there is more large-scale moistening than cooling even though the cloud systems developed in a very moist environment. though For three cloud systems that developed over a mid-latitude continent, the net radiation and sensible and latent heat fluxes play a much more important role. This means the accurate measurement of surface fluxes and radiation is crucial for simulating these mid-latitude cases.
Author
Energy Budgets; Convection; Mixing Ratios; Water Vapor; Advection; Radiant Cooling; Radiant Heating

20020080930 Baron Services, Inc., Huntsville, AL USA
Storm Warning Service
Spinoff 1993; 1993, pp. 98; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

A Huntsville meteorologist of Baron Services, Inc. has formed a commercial weather advisory service. Weather information is based on data from Marshall Space Flight Center (MSFC) collected from antennas in Alabama and Tennessee. Bob Baron refines and enhances MSFC’s real time display software. Computer data is changed to audio data for radio transmission, received by clients through an antenna and decoded by computer for display. Using his service, clients can monitor the approach of significant storms and schedule operations accordingly. Utilities and emergency management officials are able to plot a storm’s path. A recent agreement with two other companies will promote continued development and marketing.
Author
Meteorological Services; Storms; Radio Transmission; Weather Forecasting

20020080964 NASA Goddard Space Flight Center, Greenbelt, MD USA
Sensitivities of Tropical Cyclones to Surface Friction and the Coriolis Parameter in a 2-D Cloud-Resolving Model
Chao, Winston C., NASA Goddard Space Flight Center, USA; Chen, Baode, Maryland Univ. Baltimore County, USA; Tao, Wei-Kuo, NASA Goddard Space Flight Center, USA; [2002]; 32p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The sensitivities to surface friction and the Coriolis parameter in tropical cyclogenesis are studied using an axisymmetric version of the Goddard cloud ensemble model. Our experiments demonstrate that tropical cyclogenesis can still occur without surface friction. However, the resulting tropical cyclone has very unrealistic structure. Surface friction plays an important role of giving the tropical cyclones their observed smaller size and diminished intensity. Sensitivity of the cyclogenesis process to surface friction. in terms of kinetic energy growth, has different signs in different phases of the tropical cyclone. Contrary to the notion of Ekman pumping efficiency, which implies a preference for the highest Coriolis parameter in the growth rate if all other parameters are unchanged, our experiments show no such preference.
Author
Cyclogenesis; Coriolis Effect; Two Dimensional Models; Tropical Storms; Atmospheric Models

20020080995 NASA Goddard Space Flight Center, Greenbelt, MD USA
North Atlantic Surface Winds Examined as the Source of Warm Advection into Europe in Winter
Otterman, J., NASA Goddard Space Flight Center, USA; Angell, J. K., National Oceanic and Atmospheric Administration, USA; Ardizzone, J., Science Applications International Corp., USA; Atlas, Robert, NASA Goddard Space Flight Center, USA; Schubert, S., NASA Goddard Space Flight Center, USA; Starr, D., NASA Goddard Space Flight Center, USA; Wu, M.-L., NASA Goddard Space Flight Center, USA; [2002]; 23p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

When from the southwest, North Atlantic ocean surface winds are known to bring warm and moist airmasses into central Europe in winter. by tracing backward trajectories from western Europe, we establish that these airmasses originate in the southwestern North Atlantic, in the very warm regions of the Gulf Stream. Over the eastern North Atlantic, Lt the gateway to Europe, the ocean-surface winds changed directions in the second half of the XXth century, those from the northwest and from the southeast becoming so infrequent, that the direction from the southwest became even more dominant. For the January-to-March period, the strength of south-westerlies in this region, as well as in the source region, shows in the years 1948-1995 a significant increase, above 0.2 m/sec/ decade. Based on the sensitivity of the surface temperature in Europe, slightly more than 1 C for a 1m/sec increase in the southwesterly wind, found in the previous studies, the trend in the warm advection accounts for a large part of the warming in Europe established for this period in several reports. However, for the most recent years, 1996-2001, the positive trend in the southwesterly advection appears to be is broken, which is consistent with unseasonally cold events reported in Europe in those winters. This study had, some bearing on evaluating the respective roles of the North Atlantic Oscillation and the Greenhouse Gas Global warming, GGG, in the strong winter warming observed for about half a century over the northern-latitude continents. Changes in the ocean-surface temperatures induced by GGG may have produced the dominant southwesterly direction of the North Atlantic winds. However, this implies a monotonically (apart from inherent interannual variability) increasing advection, and if the break in the trend which we observe after 1995 persists, this mechanism is counter-indicated. The 1948-1995 trend in the south-westerlies could then be considered to a large degree attributable to the North Atlantic Oscillation.
Author
Air Masses; Atmospheric Circulation; Atmospheric Heating; Atmospheric Temperature; Global Warming; Sea Surface Temperature

20020081012 NASA Goddard Space Flight Center, Greenbelt, MD USA
Comparing Satellite Rainfall Estimates with Rain-Gauge Data: Optimal Strategies Suggested by a Spectral Model
Bell, Thomas L., NASA Goddard Space Flight Center, USA; Kundu, Prasun K., Maryland Univ. Baltimore County, USA; [2002]; 17p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Validation of satellite remote-sensing methods for estimating rainfall against rain-gauge data is attractive because of the direct nature of the rain-gauge measurements. Comparisons of satellite estimates to rain-gauge data are difficult, however, because of the extreme variability of rain and the fact that satellites view large areas over a short time while rain gauges monitor small areas continuously. In this paper, a statistical model of rainfall variability developed for studies of sampling error in averages of satellite data is used to examine the impact of spatial and temporal averaging of satellite and gauge data on intercomparison results. The model parameters were derived from radar observations of rain, but the model appears to capture many of the characteristics of rain-gauge data as well. The model predicts that many months of data from areas containing a few gauges are required to validate satellite estimates over the areas, and that the areas should be of the order of several hundred km in diameter. Over gauge arrays of sufficiently high density, the optimal areas and averaging times are reduced. The possibility of using time-weighted averages of gauge data is explored.
Author
Remote Sensing; Satellite Observation; Meteorological Satellites; Rain Gages; Estimates; Mathematical Models

20020081015 NASA Goddard Space Flight Center, Greenbelt, MD USA

Advances in Understanding Global Water Cycle with Advent of Global Precipitation Measurement (GPM) Mission

Smith, Eric A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; International Geoscience and Remote Sensing Symposium, 24-28 Jun. 2002, Toronto, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

Within this decade the internationally organized Global Precipitation Measurement (GPM) Mission will take an important step in creating a global precipitation observing system from space. One perspective for understanding the nature of GPM is that it will be a hierarchical system of datastreams beginning with very high caliber combined dual frequency radar/passive microwave (PMW) rain-radiometer retrievals, to high caliber PMW rain-radiometer only retrievals, and then on to blends of the former datastreams with additional lower-caliber PMW-based and IR-based rain retrievals. Within the context of the now emerging global water & energy cycle (GWEC) programs of a number of research agencies throughout the world, GPM serves as a centerpiece space mission for improving our understanding of the global water cycle from a global measurement perspective. One of the salient problems within our current understanding of the global water and energy cycle is determining whether a change in the rate of the water cycle is accompanying changes in climate, e.g., climate warming. As there are a number of ways in which to define a rate-change of the global water cycle, it is not entirely clear as to what constitutes such a determination. This paper presents an overview of the GPM Mission and how its observations can be used within the framework of the oceanic and continental water budget equations to determine whether a given perturbation in precipitation is indicative of an actual rate change in the global water cycle, consistent with required responses in water storage and/or water flux transport processes, or whether it is the natural variability of a fixed rate cycle.

Author

Precipitation (Meteorology); Microwave Radiometers; Energy Technology; Climate

20020081016 NASA Goddard Space Flight Center, Greenbelt, MD USA

Parameterization of Shortwave Cloud Optical Properties for a Mixture of Ice Particle Habits for use in Atmospheric Models

Chou, Ming-Dah, NASA Goddard Space Flight Center, USA; Lee, Kyu-Tae, National Kangnung University, Korea, Republic of; Yang, Ping, Texas A&M Univ., USA; [2002]; 1p; In English; American Meteorological Society 11th Conference on Atmospheric Radiation, 3-7 Jun. 2002, Ogden, UT, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Based on the single-scattering optical properties pre-computed with an improved geometric optics method, the bulk absorption coefficient, single-scattering albedo, and asymmetry factor of ice particles have been parameterized as a function of the effective particle size of a mixture of ice habits, the ice water amount, and spectral band. The parameterization has been applied to computing fluxes for sample clouds with various particle size distributions and assumed mixtures of particle habits. It is found that flux calculations are not overly sensitive to the assumed particle habits if the definition of the effective particle size is consistent with the particle habits that the parameterization is based. Otherwise, the error in the flux calculations could reach a magnitude unacceptable for climate studies. Different from many previous studies, the parameterization requires only an effective particle size representing all ice habits in a cloud layer, but not the effective size of individual ice habits.

Author

Atmospheric Models; Ice Clouds; Optical Properties; Parameterization; Cloud Physics; Cloud Cover

20020081017 NASA Goddard Space Flight Center, Greenbelt, MD USA

Cloud Condensation Nuclei Measurements in Tropical Cyclones

Hudson, J. G., Nevada Univ., USA; Simpson, J., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AGU Spring 2002 Meeting, 28-31 May 2002, Washington, DC, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The first measurements of cloud condensation nuclei (CCN) within and around tropical cyclones were made with the Desert Research Institute (DRI) CCN spectrometer (Hudson 1909) from a NOAA P-3 Hurricane Hunter aircraft throughout the 2001 season. Two penetrations of the closed eye of Hurricane Erin off the northeast US coast on Sept. 10 showed concentrations consistently well in excess of 1000 per cubic cm at approximately 1.4% supersaturation. Simultaneous condensation nuclei (CN--total particle) concentrations were consistently well in excess of 2000 per cubic cm throughout these closed eye penetrations. These within eye measurements at 4 km altitude for exceeded CCN and CN measurements just outside of the storm at similar altitudes--300 and 600 per cubic cm respectively. These CCN and CN concentrations within this closed eye were far above concentrations in maritime air masses; they are characteristic of continental or polluted air masses. Although there was a possibility that Saharan duct may have gotten into this storm these sub tenth micrometer particles are much too small and much too numerous to be dust. Such high concentrations may have originated from European air pollution, which may have been

transported by similar airflow patterns to those that carry Saharan dust across the Atlantic. These high concentrations may be a manifestation of descending air that brings higher concentrations that are often characteristic of the upper troposphere (Clarke and Kapustin 2002). Later in the month measurements in Humberto showed highly variable CCN and CN concentrations that ranged from lots than 5 per cubic cm to more than 1000 per Cubic cm over km scale distances within and around the open eye of this tropical storm/hurricane. These very low concentrations suggest strong cloud scavenging.
Author
Tropical Storms; Cyclones; Condensation Nuclei; Hurricanes; Air Masses

20020081024 NASA Goddard Space Flight Center, Greenbelt, MD USA
Spatial Patterns of Variability in Antarctic Surface Temperature: Connections to the Southern Hemisphere Annular Mode and the Southern Oscillation
Kwok, Ron, Jet Propulsion Lab., California Inst. of Tech., USA; Comiso, Josefino C., NASA Goddard Space Flight Center, USA; [2002]; 17p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The 17-year (1982-1998) trend in surface temperature shows a general cooling over the Antarctic continent, warming of the sea ice zone, with moderate changes over the oceans. Warming of the peripheral seas is associated with negative trends in the regional sea ice extent. Effects of the Southern Hemisphere Annular Mode (SAM) and the extrapolar Southern Oscillation (SO) on surface temperature are quantified through regression analysis. Positive polarities of the SAM are associated with cold anomalies over most of Antarctica, with the most notable exception of the Antarctic Peninsula. Positive temperature anomalies and ice edge retreat in the Pacific sector are associated with El Nino episodes. Over the past two decades, the drift towards high polarity in the SAM and negative polarity in the SO indices couple to produce a spatial pattern with warmer temperatures in the Antarctic Peninsula and peripheral seas, and cooler temperatures over much of East Antarctica.
Author
Antarctic Regions; Sea Ice; Southern Hemisphere; Southern Oscillation; Surface Temperature; Trends; Variability

20020081028 NASA Goddard Space Flight Center, Greenbelt, MD USA
Impact of MIE-Resonances on the Atmospheric Absorption of Water Clouds
Wiscombe, W., NASA Goddard Space Flight Center, USA; Kinne, S., Maryland Univ. Baltimore County, USA; Nussenzveig, H., Instituto de Fisica, Brazil; [2002]; 1p; In English; American Meteorological Society 11th Conference on Atmospheric Radiation, 3-7 Jun. 2002, Ogden, UT, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Clouds strongly modulate radiative transfer processes in the Earth's atmosphere. Studies, which simulate bulk properties of clouds, such as absorption, require methods that accurately account for multiple scattering among individual cloud particles. Multiple scattering processes are well described by MIE-theory, if interacting particles have a spherical shape. This is a good assumption for water droplets. Thus, simulations for water clouds (especially for interactions with solar radiation) usually apply readily available MIE-codes. The presence of different drop-sizes, however, necessitates repetitive calculations for many sizes. The usual representation by a few sizes is likely to miss contributions from densely distributed, sharp resonances. Despite their usually narrow width, integrated over the entire size-spectrum of a cloud droplet distribution, the impact of missed resonances could add up. The consideration of these resonances tends to increase cloud extinction and cloud absorption. This mechanism for a larger (than by MIE-methods predicted) solar absorption has the potential to explain observational evidence of larger than predicted cloud absorption at solar wavelengths. The presentation will address the absorption impact of added resonances for typical properties of water clouds (e.g. drop size distributions, drop concentrations and cloud geometry). Special attention will be given to scenarios with observational evidence of law than simulated solar absorption; particularly if simultaneous measurements of cloud micro- and macrophysical properties are available.
Author
Atmospheric Attenuation; Cloud Physics; Drop Size; Mie Scattering; Radiative Transfer; Size Distribution; Drops (Liquids)

20020081030 NASA Goddard Space Flight Center, Greenbelt, MD USA
Vertical Profiles of Latent Heat Release Over the Global Tropics using TRMM Rainfall Products from December 1997 to November 2001
Tao, W.-K., NASA Goddard Space Flight Center, USA; Lang, S., NASA Goddard Space Flight Center, USA; Simpson, J., NASA Goddard Space Flight Center, USA; Meneghini, R., NASA Goddard Space Flight Center, USA; Halverson, J., NASA Goddard Space Flight Center, USA; Johnson, R., NASA Goddard Space Flight Center, USA; Adler, R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; National Central University, 1-9 Jun. 2002, Chung-Li, Taiwan, Province of China; No Copyright; Avail: Issuing Activity; Abstract Only

NASA Tropical Rainfall Measuring Mission (TRMM) precipitation radar (PR) derived rainfall information will be used to estimate the four-dimensional structure of global monthly latent heating and rainfall profiles over the global tropics from December 1997 to November 2000. Rainfall, latent heating and radar reflectivity structures between El Nino (DJF 1997-98) and La Nina (DJF 1998-99) will be examined and compared. The seasonal variation of heating over various geographic locations (i.e., oceanic vs continental, Indian ocean vs west Pacific, Africa vs S. America) will also be analyzed. In addition, the relationship between rainfall, latent heating (maximum heating level), radar reflectivity and SST is examined and will be presented in the meeting. The impact of random error and bias in stratiform percentage estimates from PR on latent heating profiles is studied and will also be presented in the meeting. The Goddard Cumulus Ensemble Model is being used to simulate various mesoscale convective systems that developed in different geographic locations. Specifically, the model estimated rainfall, radar reflectivity and latent heating profiles will be compared to observational data collected from TRMM field campaigns over the South China Sea in 1998 (SCSMEX), Brazil in 1999 (TRMM-LBA), and the central Pacific in 1999 (KWAJEX). Sounding diagnosed heating budgets and radar reflectivity from these experiments can provide the means to validate (heating product) as well as improve the GCE model.

Author

Latent Heat; Precipitation (Meteorology); Annual Variations; Atmospheric Models; Heat Transfer

20020081037 NASA Goddard Space Flight Center, Greenbelt, MD USA

Advances in Raman Lidar Measurements of Water Vapor

Whiteman, D. N., NASA Goddard Space Flight Center, USA; Evans, K., Maryland Univ. Baltimore County, USA; Demoz, B., Maryland Univ. Baltimore County, USA; DiGirolamo, P., Universita degli Studi della Basilicata, Italy; Mielke, B., Licel, Inc., Germany; Stein, B., Licel, Inc., Germany; Goldsmith, J. E. M., Sandia National Labs., USA; Tooman, T., Sandia National Labs., USA; Turner, D., Pacific Northwest National Lab., USA; [2002]; 4p; In English; 21st ILRC Conference, 8-12 Jul. 2002, Quebec City, Quebec, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Recent technology upgrades to the NASA/GSFC Scanning Raman Lidar have permitted significant improvements in the daytime and nighttime measurement of water vapor using Raman lidar. Numerical simulation has been used to study the temperature sensitivity of the narrow spectral band measurements presented here.

Author

Optical Radar; Radar Measurement; Water Vapor; Spectral Bands; Temperature Effects

20020081109 NASA Goddard Space Flight Center, Greenbelt, MD USA

New Concepts for Refinement of Cumulus Parameterization in GCM's the Arakawa-Schubert Framework

Sud, Y. C., NASA Goddard Space Flight Center, USA; Walker, G. K., NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; GCSS-ARM Workshop, 20-24 May 2002, Kananaskis, Albert, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Several state-of-the-art models including the one employed in this study use the Arakawa-Schubert framework for moist convection, and Sundqvist formulation of stratiform. clouds, for moist physics, in-cloud condensation, and precipitation. Despite a variety of cloud parameterization methodologies developed by several modelers including the authors, most of the parameterized cloud-models have similar deficiencies. These consist of: (a) not enough shallow clouds, (b) too many deep clouds; (c) several layers of clouds in a vertically demoralized model as opposed to only a few levels of observed clouds, and (d) higher than normal incidence of double ITCZ (Inter-tropical Convergence Zone). Even after several upgrades consisting of a sophisticated cloud-microphysics and sub-grid scale orographic precipitation into the Data Assimilation Office (DAO)'s atmospheric model (called GEOS-2 GCM) at two different resolutions, we found that the above deficiencies remained persistent. The two empirical solutions often used to counter the aforestated deficiencies consist of a) diffusion of moisture and heat within the lower troposphere to artificially force the shallow clouds; and b) arbitrarily invoke evaporation of in-cloud water for low-level clouds. Even though helpful, these implementations lack a strong physical rationale. Our research shows that two missing physical conditions can ameliorate the aforestated cloud-parameterization deficiencies. First, requiring an ascending cloud airmass to be saturated at its starting point will not only make the cloud instantly buoyant all through its ascent, but also provide the essential work function (buoyancy energy) that would promote more shallow clouds. Second, we argue that training clouds that are unstable to a finite vertical displacement, even if neutrally buoyant in their ambient environment, must continue to rise and entrain causing evaporation of in-cloud water. These concepts have not been invoked in any of the cloud parameterization schemes so far. We introduced them into the DAO-GEOS-2 GCM with McRAS (Microphysics of Clouds with Relaxed Arakawa-Schubert Scheme).

Author

Atmospheric Models; Cumulus Clouds; Parameterization; Atmospheric General Circulation Models; Precipitation (Meteorology); Cloud Physics

20020081118 NASA Goddard Space Flight Center, Greenbelt, MD USA

Summary of Cumulus Parameterization Workshop

Tao, Wei-Kuo, NASA Goddard Space Flight Center, USA; Starr, David OC., NASA Goddard Space Flight Center, USA; Hou, Arthur, NASA Goddard Space Flight Center, USA; Newman, Paul, NASA Goddard Space Flight Center, USA; Sud, Yogesh, NASA Goddard Space Flight Center, USA; [2002]; 31p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A workshop on cumulus parameterization took place at the NASA Goddard Space Flight Center from December 3-5, 2001. The major objectives of this workshop were (1) to review the problem of representation of moist processes in large-scale models (mesoscale models, Numerical Weather Prediction models and Atmospheric General Circulation Models), (2) to review the state-of-the-art in cumulus parameterization schemes, and (3) to discuss the need for future research and applications. There were a total of 31 presentations and about 100 participants from the USA, Japan, the UK, France and South Korea. The specific presentations and discussions during the workshop are summarized in this paper.

Author

Atmospheric General Circulation Models; Mesoscale Phenomena; Numerical Weather Forecasting; Atmospheric Models; Parameterization

20020081124 NASA Goddard Space Flight Center, Greenbelt, MD USA

Cloud Algorithm Design and Performance for the 2002 Geoscience Laser Altimeter System Mission

Spinhirne, J. D., NASA Goddard Space Flight Center, USA; Palm, S. P., NASA Goddard Space Flight Center, USA; Hart, W. D., NASA Goddard Space Flight Center, USA; Hlavka, D. L., NASA Goddard Space Flight Center, USA; Mahesh, A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AMS 11th Conference on Atmospheric Radiation, 3-7 Jun. 2002, Ogden, UT, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A satellite borne lidar instrument, the Geoscience Laser Altimeter System (GLAS), is to be launched in late 2002 and will provide continuous profiling of atmospheric clouds and aerosol on a global basis. Data processing algorithms have been developed to provide operational data products in near real time. Basic data products for cloud observations are the height of the top and bottom of single to multiple cloud layers and the lidar calibrated observed backscatter cross section up to the level of signal attenuation. In addition the optical depth and vertical profile of visible extinction cross section of many transmissive cloud layers and most haze layers are to be derived. The optical thickness is derivable in some cases from the attenuation of the molecular scattering below cloud base. In other cases an assumption of the scattering phase function is required. In both cases a estimated correction for multiple scattering is required. The data processing algorithms have been tested in part from aircraft measurements used to simulated satellite data. The GLAS lidar observations will be made from an orbit that will allow inter comparison with all other existing satellite cloud measurements.

Author

Clouds (Meteorology); Satellite Instruments; Laser Altimeters; Molecular Clouds; Algorithms

20020081125 NASA Goddard Space Flight Center, Greenbelt, MD USA

Single and Double ITCZ in Aqua-Planet Models with Globally and Temporally Uniform Sea Surface Temperature and Solar Insolation: An Interpretation

Chao, Winston C., NASA Goddard Space Flight Center, USA; Chen, Baode, Maryland Univ. Baltimore County, USA; [2002]; 2p; In English; 25th Conference on Hurricanes and Tropical Meteorology, 29 Apr. - 3 May 2002, San Diego, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Previous studies (Chao 2000, Chao and Chen 2001, Kirtman and Schneider 2000, Sumi 1992) have shown that, by means of one of several model design changes, the structure of the ITCZ in an aqua-planet model with globally uniform SST and solar angle (U-SST-SA) can change between a single ITCZ at the equator and a double ITCZ straddling the equator. These model design changes include switching to a different cumulus parameterization scheme (e.g., from relaxed Arakawa Schubert scheme (RAS) to moist convective adjustment scheme (MCA)), changes within the cumulus parameterization scheme, and changes in other aspects of the model, such as horizontal resolution. Sometimes only one component of the double ITCZ shows up; but still this is an ITCZ away from the equator, quite distinct from a single ITCZ over the equator. Since these model results were obtained by different investigators using different models which have yielded reasonable general circulation, they are considered as reliable. Chao and Chen (2001; hereafter CC01) have made an initial attempt to interpret these findings based on the concept of rotational ITCZ attractors that they introduced. The purpose of this paper is to offer a more complete interpretation.

Author

Convection; Sea Surface Temperature; Cumulus Clouds; Parameterization; Atmospheric Models; Insolation

20020081272 NASA Goddard Space Flight Center, Greenbelt, MD USA

Cirrus Parcel Model Comparison Phase 2

Lin, Ruei-Fong, Maryland Univ. Baltimore County, USA; Starr, David OC., NASA Goddard Space Flight Center, USA; DeMott, Paul J., Colorado State Univ., USA; Cotton, Richard, Meteorological Research Flight, UK; Jensen, Eric, NASA Ames Research Center, USA; Kaercher, Bernd, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Liu, Xiaohong, Michigan Univ., USA; [2002]; 4p; In English; 11th Conference on Cloud Physics, 3-7 Jun. 2002, Ogden, UT, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Cirrus Parcel Model Comparison (CPMC) project, a project of the GEWEX Cloud System Study Working Group on cirrus clouds (GCSS WG2), is an international effort to advance our knowledge of numerical simulations of cirrus cloud initiation. This project was done in two phases. In Phase 1 of CPMC, the critical components determining the predicted cloud microphysical properties were identified using parcel models in which the aerosol and ice crystal size distributions are explicitly resolved, the formulation of the homogeneous freezing of aqueous solution droplets, especially the gradient of nucleation rate with respect to solution concentration; aerosol growth modeling; and the mass accommodation coefficient of water vapor on ice surface (the deposition coefficient). In Phase 1, all simulations were conducted using a given background aerosol distribution. to complete the comparison study, participant model responses to a range of background aerosol distributions are investigated in Phase 2.
Author

Cloud Physics; Aerosols; Cirrus Clouds; Crystals; Deposition; Size Distribution

20020081274 NASA Goddard Space Flight Center, Greenbelt, MD USA

On Simulating the Mid-Western-US Drought of 1988 with a GCM

Sud, Y. C., NASA Goddard Space Flight Center, USA; Mocko, D. M., Science Systems and Applications, Inc., USA; Lau, William K.-M., NASA Goddard Space Flight Center, USA; Atlas, R., NASA Goddard Space Flight Center, USA; Aug. 23, 2002; 76p; In English; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The primary cause of the midwestern North American drought in the summer of 1988 has been identified to be the La Nina SST anomalies. Yet with the SST anomalies prescribed, this drought has not been simulated satisfactorily by any general circulation model. Seven simulation-experiments, each containing an ensemble of 4-sets of simulations, were conducted with the GEOS GCM for both 1987 and 1988. All simulations started from January 1 and continued through the end of August. In the first baseline case, Case 1, only the SST anomalies and some vegetation parameters were prescribed, while everything else (such as soil moisture, snow-cover, and clouds) was interactive. The GCM did produce some of the circulation features of a drought over North America, but they could only be identified on the planetary scales. The 1988 minus 1987 precipitation differences show that the GCM was successful in simulating reduced precipitation in the mid-west, but the accompanying circulation anomalies were not well simulated, leading one to infer that the GCM has simulated the drought for the wrong reason. to isolate the causes for this unremarkable circulation, analyzed winds and soil moisture were prescribed in Case 2 and Case 3 as continuous updates by direct replacement of the GCM-predicted fields. These cases show that a large number of simulation biases emanate from wind biases that are carried into the North American region from surroundings regions. Inclusion of soil moisture also helps to ameliorate the strong feedback, perhaps even stronger than that of the real atmosphere, between soil moisture and precipitation. Case 2 simulated one type of surface temperature anomaly pattern, whereas Case 3 with the prescribed soil moisture produced another.
Author

Anomalies; Atmospheric General Circulation Models; Atmospheric Moisture; Simulation

20020081315 NASA Goddard Space Flight Center, Greenbelt, MD USA

Midlatitude Cirrus Clouds Derived from Hurricane Nora: A Case Study with Implications for Ice Crystal Nucleation and Shape

Sassen, Kenneth, Utah Univ., USA; Arnott, W. Patrick, Desert Research Inst., USA; OCStarr, David, NASA Goddard Space Flight Center, USA; Mace, Gerald G., Utah Univ., USA; Wang, Zhien, Utah Univ., USA; Poellot, Michael R., North Dakota Univ., USA; March 2002; 40p; In English; Original contains color illustrations

Contract(s)/Grant(s): DE-FG02-ER-1059; DE-FG03-98ER-62571; NAG5-6458; NSF ATM-01-19502; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Hurricane Nora traveled up the Bala Peninsula coast in the unusually warm El Nino waters of September 1997, until rapidly decaying as it approached Southern California on 24 September. The anvil cirrus blowoff from the final surge of tropical convection became embedded in subtropical flow that advected the cirrus across the western US, where it was studied from the Facility for Atmospheric Remote Sensing (FARS) in Salt Lake City, Utah. A day later, the cirrus shield remnants were redirected southward by midlatitude circulations into the Southern Great Plains, providing a case study opportunity for the research aircraft

and ground-based remote sensors assembled at the Clouds and Radiation Testbed (CART) site in northern Oklahoma. Using these comprehensive resources and new remote sensing cloud retrieval algorithms, the microphysical and radiative cloud properties of this unusual cirrus event are uniquely characterized. Importantly, at both the FARS and CART sites the cirrus generated spectacular optical displays, which acted as a tracer for the hurricane cirrus, despite the limited lifetimes of individual ice crystals. Lidar polarization data indicate widespread regions of uniform ice plate orientations, and in situ particle masticator data show a preponderance of pristine, solid hexagonal plates and columns. It is suggested that these unusual aspects are the result of the mode of cirrus particle nucleation, presumably involving the lofting of sea-salt nuclei in thunderstorm updrafts into the upper troposphere. This created a reservoir of haze particles that continued to produce halide-saltcontaminated ice crystals during the extended period of cirrus cloud maintenance. The reference that marine microliters are embedded in the replicas of ice crystals collected over the CART site points to the longevity of marine effects. Various nucleation scenarios proposed for cirrus clouds based on this and other studies, and the implications for understanding cirrus radiative properties or a global scale, are discussed. Author

Atmospheric Models; Hurricanes; Cirrus Clouds; Ice; Nucleation; Crystal Growth

20020081316 NASA Goddard Space Flight Center, Greenbelt, MD USA

Correlations among the Optical Properties of Cirrus-Cloud Particles: Microphysical Interpretation

Reichardt, J., NASA Goddard Space Flight Center, USA; Reichardt, S., NASA Goddard Space Flight Center, USA; Hess, M., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; McGee, T. J., NASA Goddard Space Flight Center, USA; [2002]; ISSN 0148-0227; 20p; In English

Contract(s)/Grant(s): CEC-ENV4-CT95-0162; BMBF-01LO9504/5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cirrus measurements obtained with a ground-based polarization Raman lidar at 67.9 deg N in January 1997 reveal a strong positive correlation between the particle optical properties, specifically depolarization ratio delta(sub par) and extinction-to-backscatter (lidar) ratio S, for delta(sub par) less than approximately 40%, and an anti-correlation for delta(sub par) greater than approximately 40%. Over the length of the measurements the particle properties vary systematically. Initially, delta (sub par) approximately equals 60% and S approximately equals 10sr are observed. Then, with decreasing delta(sub par), S first increases to approximately 27sr (delta(sub par) approximately equals 40%) before decreasing to values around 10sr again (delta(sub par) approximately equals 20%). The analysis of lidar humidity and radiosonde temperature data shows that the measured optical properties stem from scattering by dry solid ice particles, while scattering by supercooled droplets, or by wetted or subliming ice particles can be excluded. For the microphysical interpretation of the lidar measurements, ray-tracing computations of particle scattering properties have been used. The comparison with the theoretical data suggests that the observed cirrus data can be interpreted in terms of size, shape, and, under the assumption that the lidar measurements of consecutive cloud segments can be mapped on the temporal development of a single cloud parcel moving along its trajectory, growth of the cirrus particles: Near the cloud top in the early stage of cirrus development, light scattering by nearly isometric particles that have the optical characteristics of hexagonal columns (short, column-like particles) is dominant. Over time the ice particles grow, and as the cloud base height extends to lower altitudes characterized by warmer temperatures they become morphologically diverse. For large S and depolarization values of approximately 40%, the scattering contributions of column- and plate-like particles are roughly the same. In the lower ranges of the cirrus clouds, light scattering is predominantly by plate-like ice particles. This interpretation assumes random orientation of the cirrus particles. Simulations with a simple model suggest, however, that the positive correlation between S and delta(sub par) which is observed for depolarization ratios less than 40% mainly at low cloud altitudes, can be alternatively explained by horizontal alignment of a fraction of the cirrus particle population.

Author

Cirrus Clouds; Cloud Physics; Particles; Optical Properties; Atmospheric Composition; Mathematical Models

20020081326 NASA Goddard Space Flight Center, Greenbelt, MD USA

Vertical Profiles of Latent Heat Release Over the Global Tropics using TRMM Rainfall Products from December 1997 to November 2001

Tao, W.-K., NASA Goddard Space Flight Center, USA; Lang, S., NASA Goddard Space Flight Center, USA; Simpson, J., NASA Goddard Space Flight Center, USA; Meneghini, R., NASA Goddard Space Flight Center, USA; Halverson, J., NASA Goddard Space Flight Center, USA; Johnson, R., NASA Goddard Space Flight Center, USA; Adler, R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English, 1-9 Jun. 2002, Taiwan, Province of China; No Copyright; Avail: Issuing Activity; Abstract Only

NASA Tropical Rainfall Measuring Mission (TRMM) precipitation radar (PR) derived rainfall information will be used to estimate the four-dimensional structure of global monthly latent heating and rainfall profiles over the global tropics from

December 1997 to November 2000. Rainfall, latent heating and radar reflectivity structures between El Nino (DJF 1997-98) and La Nina (DJF 1998-99) will be examined and compared. The seasonal variation of heating over various geographic locations (i.e., oceanic vs continental, Indian ocean vs west Pacific, Africa vs S. America) will also be analyzed. In addition, the relationship between rainfall, latent heating (maximum heating level), radar reflectivity and SST is examined and will be presented in the meeting. The impact of random error and bias in stratiform percentage estimates from PR on latent heating profiles is studied and will also be presented in the meeting. Additional information is included in the original extended abstract.
Author
Latent Heat; Meteorological Radar; Rain; Reflectance; Annual Variations

20020081330 NASA Goddard Space Flight Center, Greenbelt, MD USA
Sensitivities of Modeled Tropical Cyclones to Surface Friction and the Coriolis Parameter
Chao, Winston C., NASA Goddard Space Flight Center, USA; Chen, Baode, Maryland Univ. Baltimore County, USA; Tao, Wei-Kuo, NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; 25th American Meteorological Society Conference, 29 Apr. - 3 May 2002, San Diego, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In this investigation the sensitivities of a 2-D tropical cyclone (TC) model to surface frictional coefficient and the Coriolis parameter are studied and their implication is discussed. The model used is an axisymmetric version of the latest version of the Goddard cloud ensemble model. The model has stretched vertical grids with 33 levels varying from 30 m near the bottom to 1140 m near the top. The vertical domain is about 21 km. The horizontal domain covers a radius of 962 km (770 grids) with a grid size of 1.25 km. The time step is 10 seconds. An open lateral boundary condition is used. The sea surface temperature is specified at 29C. Unless specified otherwise, the Coriolis parameter is set at its value at 15 deg N. The Newtonian cooling is used with a time scale of 12 hours. The reference vertical temperature profile used in the Newtonian cooling is that of Jordan. The Newtonian cooling models not only the effect of radiative processes but also the effect of processes with scale larger than that of TC. Our experiments showed that if the Newtonian cooling is replaced by a radiation package, the simulated TC is much weaker. The initial condition has a temperature uniform in the radial direction and its vertical profile is that of Jordan. The initial winds are a weak Rankin vortex in the tangential winds superimposed on a resting atmosphere. The initial sea level pressure is set at 1015 hPa everywhere. Since there is no surface pressure perturbation, the initial condition is not in gradient balance. This initial condition is enough to lead to cyclogenesis, but the initial stage (say, the first 24 hrs) is not considered to resemble anything observed. The control experiment reaches quasi-equilibration after about 10 days with an eye wall extending from 15 to 25 km radius, reasonable comparing with the observations. The maximum surface wind of more than 70 m/s is located at about 18 km radius. The minimum sea level pressure on day 10 is about 886 hPa. Thus the overall simulation is considered successful and the model is considered adequate for our investigation.
Author
Cyclones; Atmospheric Models; Friction Factor; Coriolis Effect

20020081331 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Southern African Regional Science Initiative (SAFARI 2000). Dry-Season Campaign: An Overview
Swap, R. J., Virginia Univ., USA; Annegarn, H. J., Witwatersrand Univ., South Africa; Suttles, J. T., Raytheon Co., USA; Haywood, J., Meteorological Office, UK; Hely, C., Virginia Univ., USA; Hobbs, P. V., Washington Univ., USA; Holben, B. N., NASA Goddard Space Flight Center, USA; Ji, J., NASA Goddard Space Flight Center, USA; King, M. D., NASA Goddard Space Flight Center, USA; [2002]; 30p; In English
Contract(s)/Grant(s): NAG5-7956; NAG5-7939; NAG5-7266; NAG5-7862; NAG5-9357; RTOP 291-07-53; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Southern African Regional Science Initiative (SAFARI 2000) is an international science project investigating the southern African earth-atmosphere-human system. The experiment was conducted over a two-year period March 1999 - March 2001. The dry season field campaign (August-Steptember 2000) was the most intensive activity and involving over 200 scientists from 18 different nations. The main objectives of this campaign were to characterize and quantify the biogenic, pyrogenic and anthropogenic aerosol and trace gas emissions and their transport and transformations in the atmosphere and to validate the NASA Earth Observing System (EOS) satellite Terra within a scientific context. Five aircraft, namely two South African Weather Service aircraft, University of Washington CV-580, the UK Meteorological Office C-130 and the NASA ER-2, with different altitude capabilities, participated in the campaign. Additional airborne sampling of southern African air masses that had moved downwind of the subcontinent was conducted by the CSIRO over Australia. Multiple observations were taken in various sectors for a variety of synoptic conditions. Flight missions were designed to maximize synchronous over-flights of the NASA TERRA satellite

platform, above regional ground validation and science targets. Numerous smaller-scale ground validation activities took place throughout the region during the campaign period.
Author
Aerosols; Trace Contaminants; Pollution Transport; Atmospheric Composition; Africa; Air Pollution; Proving

20020082873 NASA Goddard Space Flight Center, Greenbelt, MD USA
Calibration Methodology for the Lightweight Rainfall Radiometer STAR Aircraft Sensor
Principe, Caleb, NASA Goddard Space Flight Center, USA; Ruf, Christopher, Michigan Univ., USA; [2002]; 1p; In English; MicroCal 2002, 9-11 Nov. 2002, Barcelona, Spain; No Copyright; Avail: Issuing Activity; Abstract Only

A proposed methodology for the in-flight calibration of a Synthetic Thinned Aperture Radiometer (STAR) airborne sensor with the potential application to a space flight version. The application of the spaceflight version of this instrument will address several pressing issues related to the Global Precipitation Measurement Mission (GPM). The X-Band Lightweight Rainfall Radiometer using STAR technology (LRR-X) is an aircraft sensor that is jointly developed by the NASA Goddard Space Flight Center and the University of Michigan. This paper will describe the theory of calibration as well as the hardware design specifications used by the method. The on-board hardware uses individual uncorrelated warm loads on each receiver as well as to a single noise diode providing a correlated noise source to each receiver. A procedure for maintaining onboard calibration with an optimum running average using correlated bursts of thermal noise interleaved with scene data will be exercised during the maiden flight of the LRR-X instrument during the spring of 2003. The final component of calibration of a synthetic aperture radiometer is the image reconstruction algorithm that uses the measured correlations to produce the temperature brightness (TB) images. An overview of system-level testing, both on the ground and in-flight, will be presented to validate the absolute accuracy of the image reconstruction algorithm.
Author
Calibrating; Airborne Equipment; Synthetic Apertures; Rain; Meteorological Instruments; Microwave Radiometers

20020082874 NASA Goddard Space Flight Center, Greenbelt, MD USA
Evaluation of Cirrus Cloud Simulations using ARM Data-Development of Case Study Data Set
Starr, David OC., NASA Goddard Space Flight Center, USA; Demoz, Belay, Maryland Univ. Baltimore County, USA; Wang, Yansen, Maryland Univ. Baltimore County, USA; Lin, Ruei-Fong, Maryland Univ. Baltimore County, USA; Lare, Andrew, Emergent Technologies Corp., USA; Mace, Jay, Utah Univ., USA; Poellot, Michael, North Dakota Univ., USA; Sassen, Kenneth, Utah Univ., USA; Brown, Philip, Meteorological Office, UK; [2002]; 1p; In English; ARM Program Science Team Meeting, 8-12 Apr. 2002, Saint Petersburg, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Cloud-resolving models (CRMs) are being increasingly used to develop parametric treatments of clouds and related processes for use in global climate models (GCMs). CRMs represent the integrated knowledge of the physical processes acting to determine cloud system lifecycle and are well matched to typical observational data in terms of physical parameters/measurables and scale-resolved physical processes. Thus, they are suitable for direct comparison to field observations for model validation and improvement. The goal of this project is to improve state-of-the-art CRMs used for studies of cirrus clouds and to establish a relative calibration with GCMs through comparisons among CRMs, single column model (SCM) versions of the GCMs, and observations. The objective is to compare and evaluate a variety of CRMs and SCMs, under the auspices of the GEWEX Cloud Systems Study (GCSS) Working Group on Cirrus Cloud Systems (WG2), using ARM data acquired at the Southern Great Plains (SGP) site. This poster will report on progress in developing a suitable WG2 case study data set based on the September 26, 1996 ARM IOP case - the Hurricane Nora outflow case. Progress is assessing cloud and other environmental conditions will be described. Results of preliminary simulations using a regional cloud system model (MM5) and a CRM will be discussed. Focal science questions for the model comparison are strongly based on results of the idealized GCSS WG2 cirrus cloud model comparison projects (Idealized Cirrus Cloud Model Comparison Project and Cirrus Parcel Model Comparison Project), which will also be briefly summarized.
Author
Cirrus Clouds; Atmospheric Models; Calibrating

20020082884 NASA Goddard Space Flight Center, Greenbelt, MD USA
Cloud Thickness from Offbeam Returns (THOR) Validation Campaign on NASA's P3B Over the ARM/SGP
Cahalan, R. F., NASA Goddard Space Flight Center, USA; Kolasinski, J., NASA Goddard Space Flight Center, USA; McGill, M., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Muscle 12 Lidar Conference, Munich, Germany; No Copyright; Avail: Issuing Activity; Abstract Only

Physical thickness of a cloud layer, sometimes multiple cloud layers, is a crucial controller of solar heating of the Earth-atmosphere system, which drives the convective processes that produce storm systems. Yet clouds of average optical thickness are opaque to conventional lidar, so their thickness is well estimated only by combining a lidar above and another below cloud, or a radar and lidar on the same side, dual facilities not widely available. Here we report initial observations of a new airborne multiple field of view lidar, capable of determining physical thickness of cloud layers from time signatures of off-beam returns from a I kHz micropulse lidar at 540 rim. For a single layer, the time delay of light returning from the outer diffuse halo of light surrounding the beam entry point, relative to the time delay at beam center, determines the cloud physical thickness. The delay combined with the pulse stretch gives the optical thickness. This halo method requires cloud optical thickness exceeding 2, and improves with cloud thickness, thus complimenting conventional lidar, which cannot penetrate thick clouds. Results are presented from March 25, 2002, when THOR flew a butterfly pattern over the ARM site at 8.3 km, above a thin ice cloud at 5 km, and a thick boundary-layer stratus deck with top at 1.3 km, as shown by THOR channel 1, and a base at about 0.3 km as shown by the ground-based MPL. Additional information is included in the original extended abstract.
Author
Cloud Cover; Optical Thickness; Optical Radar; Halos

20020082885 NASA Goddard Space Flight Center, Greenbelt, MD USA
GEWEX Cloud System Study (GCSS) Working Group on Cirrus Cloud Systems (WG2) ***Annual Report***
Starr, David, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Workshop on Representation of Cloud Systems in Large-Scale Models, 20-24 May 2002, Kananaskis, Alberta, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

Status, progress and plans will be given for current GCSS (GEWEX Cloud System Study) WG2 (Working Group on Cirrus Cloud Systems) projects, including: (a) the Idealized Cirrus Model Comparison Project, (b) the Cirrus Parcel Model Comparison Project (Phase 2), and (c) the developing Hurricane Nora extended outflow model case study project. Past results will be summarized and plans for the upcoming year described. Issues and strategies will be discussed. Prospects for developing improved cloud parameterizations derived from results of GCSS WG2 projects will be assessed. Plans for NASA's CRYSTAL-FACE (Cirrus Regional Study of Tropical Anvils and Layers - Florida Area Cirrus Experiment) potential opportunities for use of those data for WG2 model simulations (future projects) will be briefly described.
Author
Cirrus Clouds; Atmospheric Models

20020082963 NASA Goddard Space Flight Center, Greenbelt, MD USA
Low-Level Jets: The Data Assimilation Office and Reanalysis
1999 NCCS Highlights; July 2002, pp. 20-27; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Data assimilation brings together atmospheric observations and atmospheric models-what we can measure of the atmosphere with how we expect it to behave. NASA's Data Assimilation Office (DAO) sponsors research projects in data reanalysis, which take several years of observational data and analyze them with a fixed assimilation system, to create an improved data set for use in atmospheric studies. Using NCCS computers, one group of NASA researchers employs reanalysis to examine the role of summertime low-level jet (LLJ) winds in regional seasonal climate. Prevailing winds that blow strongly in a fixed direction within a vertically and horizontally confined region of the atmosphere are known as jets. Jets can dominate circulation and have an enormous impact on the weather in a region. Some jets are as famous as they are influential. The jet stream over North America, for instance, is the wind that blows eastward across the continent, bringing weather from the west coast and increasing the speed of airplanes flying to the east coast. The jet stream, while varying in intensity and location, is present in all seasons at the very high altitude of 200-300 millibars - more than 6 miles above Earth's surface.
Derived from text
Atmospheric Models; Data Processing; Lower Atmosphere; Jet Streams (Meteorology); Blowing

20020082970 NASA Goddard Space Flight Center, Greenbelt, MD USA
North American Observing Systems: An Interagency Group Runs Tests at the NCCS
1999 NCCS Highlights; July 2002, pp. 28-35; In English; Also announced as 20020082961; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Some 250,000 weather reports are collected by the National Weather Service (NWS) every day. Important measurements are taken by satellites, weather balloons, ground weather stations, airplanes, oceangoing ships, and tethered ocean buoys. Local or

global weather models rely on these reports to provide the raw data used as initial conditions for the models to produce a weather prediction.
Derived from text
Data Acquisition; Weather Forecasting; Atmospheric Models

20020082987 Naval Postgraduate School, Monterey, CA USA
Utility of Tactical Environmental Processor (TEP) as a Doppler At-Sea Weather Radar
Robinson, Sean D.; Jun. 2002; 84p; In English; Original contains color images
Report No.(s): AD-A405927; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Tactical Environmental Processor (TEP) is a through-the-sensor technique that converts radar returns from the AN/SPY-1 into environmental information known as spectral moments. TEP was installed aboard the USS Normandy (CG 60) in May 2000 to support a Limited Objective Experiment during Joint Task Force Exercise (JTFEX) 00-2. On 15 May, TEP observed severe weather associated with a line of passing thunderstorms. These weather events proved serious enough to suspend mid-cycle flight operations for the USS George Washington (CVN 73) during its simulated wartime scenario. TEP is a significant benefit to nowcast weather forecasting and supports at-sea METOC (meteorological/ oceanographic) and warfighters in two primary areas: improved situational awareness and optimization of sensors, weapons and tactics. Results from this case study demonstrate the importance of TEP as a Doppler at-sea weather radar in support of naval operations.
DTIC
Doppler Radar; Meteorological Radar; Weather Forecasting

20020083027 Naval Postgraduate School, Monterey, CA USA
An Assessment of NOGAPS Performance in the Prediction of Tropical Atlantic Circulation Formation
Dorics, Theodore G., III; Jun. 2002; 90p; In English; Original contains color images
Report No.(s): AD-A405807; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Navy requirement for 5-day tropical cyclone track guidance necessitates an assessment of the Navy Operational Global Atmospheric Prediction System (NOGAPS) in forecasting tropical cyclone formation. The Tropical Cyclone Vorticity Tracking Program is applied to NOGAPS analyses and forecasts through 120 h to identify and track circulations in the tropical Atlantic region from 25 July - 31 October 2001. Circulations over northern South America were not found to be related to Atlantic hurricane formation and the number of formations in the western Atlantic was insufficient for statistical analysis. Circulation formations over Africa tend to be forecast too early while those forming over the eastern Atlantic tend to be forecast late. About 70% of the NOGAPS forecasts and analyzed formations are within +/- 12 h regardless of forecast intervals, and about 12% of the formation forecasts are false alarms. Whereas the on-time formations tend to have small relative vorticity errors, the early (late) formation forecasts are at first too strong (weak), but then the model error growth dominates the expected timing error contribution. At the time the National Hurricane Center issues a tropical storm warning, the NOGAPS forecasts of relative vorticity, sea-level pressure, and circulation size generally have smaller amplitudes than the verifying analyzed values.
DTIC
Atmospheric Models; Forecasting; Hurricanes; Performance Prediction; Tropical Regions; Tropical Storms; Cyclones

20020083041 NASA Goddard Space Flight Center, Greenbelt, MD USA
Relationship of Global Precipitation Measurement (GPM) Mission to Global Change Research
Smith, Eric A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; International Astronautical Congress/Earth Observations Symposium of IAF, 10-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In late 2001, the Global Precipitation Measurement (GPM) mission was approved as a new start by the National Aeronautics and Space Administration (NASA). This new mission is motivated by a number of scientific questions that are posed over a range of space and time scales that generally fall within the discipline of the global water and energy cycle (GWEC). Recognizing that satellite rainfall datasets are now a foremost tool for understanding global climate variability out to decadal scales and beyond, for improving weather forecasting, and for producing better predictions of hydrometeorological processes including short-term hazardous flooding and seasonal fresh water resources assessment, a comprehensive and internationally sanctioned global measuring strategy has led to the GPM mission. The GPM mission plans to expand the scope of rainfall measurement through use of a multi-member satellite constellation that will be contributed by a number of world nations. This talk overviews the GPM scientific research program that has been fostered within NASA, then focuses on scientific progress that is being made in various research areas in the course of the mission formulation phase that are of interest to the global change scientific community. This latter part of the talk addresses research issues that have become central to the GPM science implementation plan concerning: (1) the rate of global water cycling through the atmosphere and surface and the relationship of precipitation variability to the sustained

rate of the water cycle; (2) the relationship between climate change and cloud macrophysical- microphysical processes; and (3) the general improvement in measuring precipitation at the fundamental microphysical level that will take place during the GPM era and an explanation of how these improvements are expected to come about.
Author
Climate Change; Precipitation (Meteorology); Periodic Variations; Hydrometeorology; Weather Forecasting; Climatology

20020083047 NASA Goddard Space Flight Center, Greenbelt, MD USA
CIMEL Measurements of Zenith Radiances at the ARM Site
Marshak, Alexander, Maryland Univ. Baltimore County, USA; Wiscombe, Warren, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 2002 ARM Program Science Team Meeting, 8-12 Apr. 2002, Saint Petersburg, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Starting from October 1, 2001, Cimel at the ARM Central Facility in Oklahoma has been switched to a new ”cloud mode.” This mode allows taking measurements of zenith radiance when the Sun in blocked by clouds. In this case, every 13 min. Cimel points straight up and takes 10 measurements with 9 sec. time interval. The new Cimel’s mode has four filters at 440, 670, 870 and 1020 nm. For cloudy conditions, the spectral contrast in surface albedo dominates over Rayleigh and aerosol effects; this makes normalized zenith radiances at 440 and 670 as well as for 870 and 1020 almost indistinguishable. We compare Cimel measurements with other ARM cart site instruments: Multi-Filter Rotating Shadowband Radiometer (MFRSR), Narrow Field of View (NFOV) sensor, and MicroWave Radiometer(MWR). Based on Cimel and MFRSR 670 and 870 nm channels, we build a normalized difference cloud index (NDCI) for radiances and fluxes, respectively. Radiance NDCI from Cimel and flux NDCI from MFRSR are compared between themselves as well as with cloud Liquid Water Path (LWP) retrieved from MWR. Based on our theoretical calculations and preliminary data analysis,there is a good correlation between NDCIs and LWP for cloudy sky above green vegetation. Based on this correlation, an algorithm to retrieve cloud optical depth from NDCI is proposed.
Author
Radiance; Zenith; Field of View; Aerosols; Microwaves

20020083154 Maryland Univ. Baltimore County, Goddard Earth Sciences and Technology Center, Catonsville, MD USA
MPL-Net Measurements of Aerosol and Cloud Vertical Distributions at Co-Located AERONET Sites
Welton, Ellsworth J., Maryland Univ. Baltimore County, USA; Campbell, James R., Maryland Univ. Baltimore County, USA; Berkoff, Timothy A., Maryland Univ. Baltimore County, USA; Spinhirne, James D., Maryland Univ. Baltimore County, USA; Tsay, Si-Chee, Maryland Univ. Baltimore County, USA; Holben, Brent, Maryland Univ. Baltimore County, USA; [2002]; 1p; In English; 2002 Spring AGU Meeting, 28-31 May 2002, Washington, DC, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In the early 1990s, the first small, eye-safe, and autonomous lidar system was developed, the Micropulse Lidar (MPL). The MPL acquires signal profiles of backscattered laser light from aerosols and clouds. The signals are analyzed to yield multiple layer heights, optical depths of each layer, average extinction-to-backscatter ratios for each layer, and profiles of extinction in each layer. In 2000, several MPL sites were organized into a coordinated network, called MPL-Net, by the Cloud and Aerosol Lidar Group at NASA Goddard Space Flight Center (GSFC) using funding provided by the NASA Earth Observing System. tn addition to the funding provided by NASA EOS, the NASA CERES Ground Validation Group supplied four MPL systems to the project, and the NASA TOMS group contributed their MPL for work at GSFC. The Atmospheric Radiation Measurement Program (ARM) also agreed to make their data available to the MPL-Net project for processing. In addition to the initial NASA and ARM operated sites, several other independent research groups have also expressed interest in joining the network using their own instruments. Finally, a limited amount of EOS funding was set aside to participate in various field experiments each year. The NASA Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) project also provides funds to deploy their MPL during ocean research cruises. All together, the MPL-Net project has participated in four major field experiments since 2000. Most MPL-Net sites and field experiment locations are also co-located with sunphotometers in the NASA Aerosol Robotic Network. (AERONET). Therefore, at these locations data is collected on both aerosol and cloud vertical structure as well as column optical depth and sky radiance. Real-time data products are now available from most MPL-Net sites. Our real-time products are generated at times of AERONET aerosol optical depth (AOD) measurements. The AERONET AOD is used as input to our processing routines, which calculate the aerosol layer top height and extinction profile, and our MPL calibration value. A variety of other data products are available or under development. We present an overview of the MPL-Net project and discuss data products useful to the AERONET community. Results from several sites and field experiments will be presented.
Author
Aerosols; Autonomy; Cloud Physics; Optical Radar; Robotics; Computer Networks; Vertical Distribution

20020083156 NASA Goddard Space Flight Center, Greenbelt, MD USA

Path-Integrated Attenuation from Airborne X-Band Radar and Passive Radiometer Measurements: Implication for Rainfall Measurements

Tian, Lin, NASA Goddard Space Flight Center, USA; Heymsfield, Gerry, NASA Goddard Space Flight Center, USA; Weinman, Jim, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 1st TRMM International Conference, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This study compares path-integrated attenuation (PIA), in precipitation over the ocean, derived from a single-frequency X-band radar, using the surface reference technique (SRT), with that deduced from a radiometer also operating at X band. The data were collected during TRMM field campaigns. The PIA derived from radar using the SRT does not involve any assumptions regarding the precipitation but it assumes that the cross-section of the surface is stable, that is, it is not significantly altered by factors such as surface roughness. The PIA deduced from the radiometer, however, involves assumptions regarding the temperature and emissivity of the surface and absorption and scattering by the intervening precipitation, which in turn depend upon the size, concentration and composition of the precipitation particles. The comparison of the PIA from the two instruments serves not only as a check between the radar and the radiometer but also may yield insights into the structure of the intervening precipitation. Such study can provide valuable information for TRMM in which both radar and radiometers are used for rain measurements. The radiometer PIA was first deduced from the brightness temperature using a simple one-layer radiative transfer model assuming no scattering, an isothermal atmosphere. The initial results show a general agreement between the PIAs deduced from the two instruments. Largo disagreement was found at high values of PIAs that may have been caused saturation of the X-band brightness temperature or by uncertainties in wind roughening of the sea surface that affects the SRT. Further results including the effects of scattering and a non-isothermal atmosphere will be shown at the conference.

Author

Airborne Radar; Radiometers; Rain; Attenuation; Ocean Surface; Superhigh Frequencies

20020083157 NASA Goddard Space Flight Center, Greenbelt, MD USA

High-Resolution Simulation of Hurricane Bonnie (1998): Storm Structure and Evolution

Braun, Scott A., NASA Goddard Space Flight Center, USA; Pu, Zhaoxia, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AMS 25th Conference on Hurricanes and Tropical Meteorology, 29 Apr. - 3 May 2002, San Diego, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A simulation of Hurricane Bonnie (1998) has been performed using multiple grid nesting to 2 km grid spacing. The simulation is initialized with large-scale analysis fields from the European Center for Medium Range Forecasts and with a bogus vortex inserted via four-dimensional variational data assimilation. The simulation, verified against radar observations from TRMM and aircraft observations from the NASA CAMEX-3 field experiment, reproduces well the storm intensity, the wavenumber 1 asymmetry of the precipitation field, the occurrence of deep convective towers within the eyewall, and the presence of broad stratiform precipitation regions. This study will explore the evolution of air parcels in these convective towers, from their beginnings in the boundary layer to their movement in upper level outflow. The role of these towers in storm intensification may also be examined.

Author

High Resolution; Computerized Simulation; Hurricanes; Storms (Meteorology); NASA Space Programs

20020083165 NASA Goddard Space Flight Center, Greenbelt, MD USA

Global Precipitation Analysis Using Satellite Observations

Adler, Robert F., NASA Goddard Space Flight Center, USA; Huffman, George, Science Systems and Applications, Inc., USA; Curtis, Scott, Maryland Univ. Baltimore County, USA; Bolvin, David, Science Systems and Applications, Inc., USA; Nelkin, Eric, Science Systems and Applications, Inc., USA; [2002]; 1p; In English; 40th Anniversary of Colorado State University Atmospheric Science Department, 8-10 Jul. 2002, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Global precipitation analysis covering the last few decades and the impact of the new TRMM (Tropical Rainfall Measuring Mission) observations are reviewed in the context of weather and climate applications. All the data sets discussed are the result of mergers of information from multiple satellites and gauges, where available. The focus of the talk is on TRMM-based 3 hr. analyses that use TRMM to calibrate polar-orbit microwave observations from SSM/I (and other satellites) and geosynchronous IR observations and merges the various calibrated observations into a final, 3 hr. resolution map. This TRMM standard product will be available for the entire TRMM period (January 1998-present) at the end of 2002. A real-time version of this merged product is being produced and is available at 0.25 deg latitude-longitude resolution over the latitude range from 50 deg N-50 deg S. Examples will be shown, including its use in monitoring flood conditions and in relating weather-scale patterns to climate-scale patterns. The 3-hourly analysis is placed in the context of two research products of the World Climate Research Program's

(WCRP/GEWEX) Global Precipitation Climatology Project (GPCP). The first is the 23 year, monthly, globally complete precipitation analysis that is used to explore global and regional variations and trends and is compared to the much shorter TRMM tropical data set. The GPCP data set shows no significant global trend in precipitation over the twenty years, unlike the positive trend in global surface temperatures over the past century. Regional trends are also analyzed. A trend pattern that is a combination of both El Nino and La Nina precipitation features is evident in the Goodyear data set. This pattern is related to an increase with time in the number of combined months of El Nino and La Nina during the 23 year period. Monthly anomalies of precipitation are related to ENSO variations with clear signals extending into middle and high latitudes of both hemispheres. Also shown is the GPCP daily, 1 deg latitude-longitude analysis, which is available from January 1997 to the present. Plans to incorporate the TRMM data and 3-hourly analysis into the GPCP products are outlined. The outcome should be an improved global analysis and climatology on monthly scales for the 23 year period and finer time scale analyses for more recent periods, including real-time 3-hourly (or finer) analyses over much of the globe.
Author
Precipitation (Meteorology); Satellite Observation; Microwaves; Infrared Instruments; Calibrating

20020083191 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Surface Climate and Snow-Weather Relationships of the Kuparuk Basin on Alaska's Arctic Slope
Olsson, Peter Q.; Hinzman, Larry D.; Sturm, Matthew; Liston, Glen E.; Kane, Douglas L.; Aug. 2002; 50p; In English
Report No.(s): AD-A406170; ERDC/CRREL-TR-02-10; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes temperature, wind, and snow-cover data for the Kuparuk River Basin in Arctic Alaska spanning the five-year period from 1994 - 1995. Comparison of results from five meteorological towers is presented to illustrate both the differences and similarities of the regional climate and weather along a 200 km transect. A picture emerges of the Arctic Slope as a region dominated by subfreezing temperatures for most of the annual cycle. The five sites showed a good deal of similarity in both seasonal variation and meteorological forcing on a time scale of a few days. While the Kuparuk Basin is typified by almost constant moderate winds, winds greater than 10 m(s-1) are fairly rare. The observed patterns of temperature and wind have important ramifications for the winter snow cover of the Kuparuk Basin, explaining why the snow cover forms first in the foothills and last near the coast. The surprisingly low wind speeds across the network in October and November help to explain the presence of thick but low-density layers observed in the basal snowpack. A pronounced warming event occurring each November capped this early snow with a melt crust or wind slab or both, protecting it from subsequent wind erosion.
DTIC
Snow; Meteorology; Arctic Regions; Climate; Weather

20020083217 NASA Goddard Space Flight Center, Greenbelt, MD USA
Advanced Passive Microwave Radiometer Technology for GPM Mission
Smith, Eric A., NASA Goddard Space Flight Center, USA; Im, Eastwood, Jet Propulsion Lab., California Inst. of Tech., USA; Kummerow, Christian, Colorado State Univ., USA; Principe, Caleb, NASA Goddard Space Flight Center, USA; Ruf, Christoper, Michigan Univ., USA; Wilheit, Thomas, Texas A&M Univ., USA; [2002]; 1p; In English; Earth Science Technology Conference 2002 (ESTC-2002), 11-13 Jun. 2002, Pasadena, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

An interferometer-type passive microwave radiometer based on MMIC receiver technology and a thinned array antenna design is being developed under the Instrument Incubator Program (TIP) on a project entitled the Lightweight Rainfall Radiometer (LRR). The prototype single channel aircraft instrument will be ready for first testing in 2nd quarter 2003, for deployment on the NASA DC-8 aircraft and in a ground configuration manner; this version measures at 10.7 GHz in a crosstrack imaging mode. The design for a two (2) frequency preliminary space flight model at 19 and 35 GHz (also in crosstrack imaging mode) has also been completed, in which the design features would enable it to fly in a bore-sighted configuration with a new dual-frequency space radar (DPR) under development at the Communications Research Laboratory (CRL) in Tokyo, Japan. The DPR will be flown as one of two primary instruments on the Global Precipitation Measurement (GPM) mission's core satellite in the 2007 time frame. The dual frequency space flight design of the ERR matches the APR frequencies and will be proposed as an ancillary instrument on the GPM core satellite to advance space-based precipitation measurement by enabling better microphysical characterization and coincident volume data gathering for exercising combined algorithm techniques which make use of both radar backscatter and radiometer attenuation information to constrain rainrate solutions within a physical algorithm context. This talk will discuss the design features, performance capabilities, applications plans, and conical/polarametric imaging possibilities for the LRR, as well as a brief summary of the project status and schedule.
Author
Interferometers; Microwave Radiometers; Antenna Arrays; Aircraft Instruments; Multispectral Radar

20020083257 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Evolution of Spaceborne Microwave Sounders for the U.S. Polar-Orbiting Weather Satellites

Shiue, James C., NASA Goddard Space Flight Center, USA; Krimschansky, Sergey, NASA Goddard Space Flight Center, USA; Patel, Probodh, Northrop Grumman Electronic Systems, USA; [2002]; 2p; In English; SPIE's Third International Asia-Pacific Symposium on Remote Sensing of the Atmosphere, Environment and Space Conference, 2002, Unknown; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Advanced Technology Microwave Sounder (ATMS) is the next generation space-borne microwave sounder. It is the latest and most advanced version of a series of satellite-based microwave sounders, currently under development by NASA for the future U.S. operational polar-orbiting weather satellite system, called the NPOESS (National Polar-orbiting Operational Environment Satellite System), slated to begin orbiting around the end of this decade. This paper will present a brief history of the evolution of the space-borne microwave sounders, from its early-day scientific experiments, through the operational sounder aboard today's polar orbiting weather satellites, and ending in the ATMS development. It will also describe the evolution of microwave radiometer technology that enabled the space-borne microwave radiometry, from its early versions with simple, nadir-viewing, fixed-horn antennas to the present-day scanning reflector antennas with broad-band MMIC Low Noise Amplifiers, plus on-board calibrations.

Author

Meteorological Satellites; Microwave Radiometers; Microwave Sounding

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

20020080806 NASA Goddard Space Flight Center, Greenbelt, MD USA

Freshening of the Labrador Sea Surface Waters in the 1990s: Another Great Salinity Anomaly

Hakkinen, Sirpa, NASA Goddard Space Flight Center, USA; Apr. 01, 2002; 16p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Both the observed and simulated time series of the Labrador Sea surface salinities show a major freshening event since the middles. It continues the series of decoder events of the 1970s and 1980s from which the freshening in the early 1970's was named as the Great Salinity Anomaly (GSA). These events are especially distinguishable in the late summer (August and September) time series. The observed data suggests that the 1990's freshening may equal the GSA in magnitude. This recent event is associated with a large reduction in the overturning rate between the early and latter part of the 1990s. Both the observations and model results indicate that the surface salinity conditions appear to be returning towards normal daring 1999 and 2000 in the coastal area, but offshore, the model predicts the freshening to linger on after peaking 1997.

Author

Time Series Analysis; Surface Water; Salinity; Ocean Surface

20020080808 NASA Goddard Space Flight Center, Greenbelt, MD USA

Decadal Changes in Global Ocean Annual Primary Production

Gregg, Watson, NASA Goddard Space Flight Center, USA; Conkright, Margarita E., National Oceanographic Data Center, USA; Behrenfeld, Michael J., NASA Goddard Space Flight Center, USA; Ginoux, Paul, NASA Goddard Space Flight Center, USA; Casey, Nancy W., Science Systems and Applications, Inc., USA; July 2002; 14p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Sea-viewing Wide Field-of-View Sensor (SeaWiFS) has produced the first multi-year time series of global ocean chlorophyll observations since the demise of the Coastal Zone Color Scanner (CZCS) in 1986. Global observations from 1997-present from SeaWiFS combined with observations from 1979-1986 from the CZCS should in principle provide an opportunity to observe decadal changes in global ocean annual primary production, since chlorophyll is the primary driver for estimates of primary production. However, incompatibilities between algorithms have so far precluded quantitative analysis. We have developed and applied compatible processing methods for the CZCS, using modern advances in atmospheric correction and consistent bio-optical algorithms to advance the CZCS archive to comparable quality with SeaWiFS. We applied blending methodologies, where in situ data observations are incorporated into the CZCS and SeaWiFS data records, to provide improvement of the residuals. These re-analyzed, blended data records provide maximum compatibility and permit, for the first time, a quantitative analysis of the changes in global ocean primary production in the early-to-mid 1980's and the present, using

synoptic satellite observations. An intercomparison of the global and regional primary production from these blended satellite observations is important to understand global climate change and the effects on ocean biota. Photosynthesis by chlorophyll-containing phytoplankton is responsible for biotic uptake of carbon in the oceans and potentially ultimately from the atmosphere. Global ocean annual primary decreased from the CZCS record to SeaWiFS, by nearly 6% from the early 1980s to the present. Annual primary production in the high latitudes was responsible for most of the decadal change. Conversely, primary production in the low latitudes generally increased, with the exception of the tropical Pacific. The differences and similarities of the two data records provide evidence of how the Earth's climate may be changing and how ocean biota respond. Furthermore, the results have implications for the ocean carbon cycle.
Author
Satellite Observation; Time Series Analysis; Periodic Variations; Chlorophylls; Oceans; Quantitative Analysis; Marine Environments

20020080814 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Optical Index of Phytoplankton Photoacclimation and Its Relation to Light-Saturated Photosynthesis in the Sea
Behrenfeld, Michael J., NASA Goddard Space Flight Center, USA; Boss, Emmanuel, Maine Univ., USA; Lyon, Paul E., Edgerton, Germeshausen and Grier, Inc., USA; Fennel, Katja, Oregon State Univ., USA; Hoge, Frank E., NASA Goddard Space Flight Center, USA; Apr. 19, 2002; 56p; In English; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In relation to understanding ocean biology at the global scale, one of NASA's primary foci has been measurements of near-surface concentrations of phytoplankton chlorophyll. Chlorophyll is an important light-absorbing pigment in phytoplankton. The absorbed light energy is used to fix carbon in the process of photosynthesis. Photosynthesis, in turn, is critical to the growth of phytoplankton and the function of entire marine ecosystems. Thus, the use of satellite surface chlorophyll data to estimate primary production in the ocean has been a key focus of much biological oceanography research. One of the major challenges in this research is to develop relationships that allow a given chlorophyll concentration (a standing stock) to be interpreted in terms of carbon fixation (a rate). This problem centers on the description of the light-saturated photosynthetic rate, Pbmax. In this paper, we describe how optical measurements of light attenuation provide information on particulate organic carbon (POC) concentrations. We then show how the ratio of POC to chlorophyll (Theta) provides critical information on variability in Pbmax. We then test this relationship between Theta and Pbmax using field data from a variety of open ocean ecosystems.
Author
Optical Measurement; Phytoplankton; Photosynthesis; Seas; Chlorophylls

20020080866 NASA Goddard Space Flight Center, Greenbelt, MD USA
On the Regulation of the Pacific Warm Pool Temperature
Chou, Ming-Dah, NASA Goddard Space Flight Center, USA; Chou, Sue-Hsien, NASA Goddard Space Flight Center, USA; Chan, Pui-King, Science Systems and Applications, Inc., USA; [2002]; 21p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the tropical western Pacific, regions of the highest sea surface temperature (SST) and the largest cloud cover are found to have the largest surface heating, primarily due to the weak evaporative cooling associated with weak winds. This situation is in variance with the suggestions that the temperature in the Pacific warm pool is regulated either by the reduced solar heating due to an enhanced cloudiness or by the enhanced evaporative cooling due to an elevated SST. It is clear that an enhanced surface heating in an enhanced convection region is not sustainable and must be interrupted by variations in large-scale atmospheric circulation. As the deep convective regions shift away from regions of high SST due primarily to seasonal variation and secondarily to interannual variation of the large-scale atmospheric and oceanic circulation, both trade wind and evaporative cooling in the high SST region increase, leading to a reduction in SST. We conclude that the evaporative cooling associated with the seasonal and interannual variations of trade winds in the primary factor that prevent the warm pool SST from increasing to a value much higher than what is observed.
Author
Sea Surface Temperature; Solar Heating; Atmospheric Circulation; Annual Variations; Cloud Cover; Convection

20020080885 University of South Florida, Dept. of Marine Science, Saint Petersburg, FL USA
Surface Circulation and the Transport of the Loop Current in the Northeastern Gulf of Mexico ***Final Report, Mar. 1997 - Sep. 01***
Muller-Karger, F. E.; Vukovich, F.; Leben, R.; Nababan, B.; Jan. 2002; 62p; In English
Report No.(s): PB2002-108329; MMS-2001-102; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

AVHRR SST, SeaWiFS pigment concentrations and TOPEX and ERS Sea Surface height SSH fields were merged with concurrent buoy track, hydrographic, and wind velocity data to examine circulation patterns in the Northeastern Gulf of Mexico. The AVHRR data provided substantial information during October-May. SeaWiFS data were useful for tracing circulation in summer. During May-July 1998, unusual upwelling occurred along the Florida Panhandle. Strong upwelling occurred near the shelf break after hurricanes Earl (September 2-4, 1998) and Georges (September 25-October 1, 1998). In January-July 1996 flow at the shelf break near DeSoto Caynon was from west to east, and in the west Florida Shelf region from north to south. In August, flow reversed. Waters from the Mississippi River spread eastward in summers 1998, 1999, and 2000. In spring and winter there was no significant eastward entrainment of Mississippi water. 24 years of data (1976-1999) show the Loop Current and associated warm water penetrated as far as 27.5 degrees N about 2 events every 3 years, and 28 degrees n about 2 events every 5 years with cross-shelf exchange associated with cold-core rings. No penetration to 29 degrees N was detected.
NTIS
Gulf of Mexico; Ocean Currents

20020080886 Louisiana State Univ., Coastal Studies Inst., Baton Rouge, LA USA
Velocity and Transport Characteristics of the Louisiana-Texas Coastal Current during 1994 ***Final Report, 1 Oct. 1993 - 31 Dec. 1999***
Murray, S. P.; Joarosz, E.; Weeks, E. T.; Nov. 2001; 80p; In English
Report No.(s): PB2002-108326; OCS-MMS-2001-093; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Variability currents and salinity on time scales of days to weeks on the inner Louisiana shelf south of Isle Dernieres as well as transport variability of the Louisiana-Texas Coastal Current (LTCC) through the transect near Cameron were examined.
NTIS
Coastal Currents; Temporal Distribution; Velocity; Salinity; Variability

20020080891 National Oceanic and Atmospheric Administration, Channel Islands National Marine Sanctuary, Santa Barbara, CA USA
Integration of NOAA Aerial Monitoring and GIS Programs for Research, Education, and Management Within the Channel Islands National Marine Sanctuary
Waltenberger, B.; Pickett, M.; 2001; 8p; In English
Report No.(s): PB2002-109199; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The objective of this project is to monitor and analyze physical and anthropogenic phenomena within the National Oceanic and Atmospheric Administration's (NOAA) Channel Islands National Marine Sanctuary using a Geographic Information System (GIS) and aerial Global Positioning System (GPS) collection strategy. Data are used to enhance Sanctuary goals of research, education, and resource management. The aerial monitoring program allows near-realtime collection of data vital to coastal zone management and resource protection. Collected floral and faunal data are used to monitor kelp distribution; marine mammal populations and migration patterns; and general resource health within the Sanctuary. Vessel traffic and type surveys allow anthropogenic use patterns to be studied. Data downloaded into the Sanctuary GIS are used to analyze historical trends and detect correlations across data types. Maps are created and made available via the World Wide Web as a public education tool. Additionally, the program is being prototyped as a response tool for resource emergencies such as oil spills. Data collected on spill perimeter changes, oil types, and oiled animals can be downloaded to a portable GIS at Unified Command Centers to aid in both immediate response decisions and long term impact analysis.
NTIS
Global Positioning System; Geographic Information Systems; Resources Management; Coastal Ecology; Marine Biology

20020080898 USA Coral Reef Task Force, Working Group on Ecosystem Science and Conservation, Washington, DC USA
Coral Reef Protected Areas: A Guide for Management
Tilmant, J.; Mar. 10, 2000; 20p; In English
Report No.(s): PB2002-109231; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
On June 11, 1998, President Clinton issued Executive Order 13089 on Coral Reef Protection. The order directs federal agencies to identify their actions that may affect U.S. coral reef ecosystems, to use their authorities and programs to protect and enhance these ecosystems, and, to the extent permitted by law, ensure that any actions they authorize, fund, or carry out will not degrade the conditions of coral reef ecosystems. Coral reef ecosystems are defined to mean those species, habitats, and other natural resources associated with coral reefs. The order establishes an interagency U.S. Coral Reef Task Force and assigns to it specific duties for coral reef protection. Among the duties are coordination of a program to map and monitor U.S. coral reefs

including those located in special marine protected areas such as national marine sanctuaries, national estuarine research reserves, national parks and national wildlife refuges.
NTIS
Coral Reefs; Environment Protection; Ecosystems; Conservation; Resources Management

20020080906 Louisiana State Univ., Dept. of Oceanography and Coastal Sciences, Baton Rouge, LA USA
Wave Climate and Bottom Boundary Layer Dynamics with Implications for Offshore Sand Mining and Barrier Island Replenishment in South-Central Louisiana ***Final Report, 1994 - 2000***
Stone, G. W.; Dec. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-100291; OCS-MMS-2000-053; No Copyright; Avail: National Technical Information Service (NTIS)
The results of a three-year field study of wave climate, wave-current interactions and bottom boundary layer dynamics, and sediment transport on Ship Shoal, off the Isles Dernieres in south-central Louisiana, are presented.
NTIS
Water Waves; Water Currents; Boundary Layers; Erosion; Deposition; Sands; Mining; Islands

20020080943 Daedalus Enterprises, Inc., Ann Arbor, MI USA
Ocean Observation Instrument
Spinoff 1993; 1993, pp. 67; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.
The Airborne Ocean Color Imager (AOCI) was developed by Daedalus Enterprises, Inc. for Ames Research Center under a Small Business Innovation Research (SBIR) contract as a simulator for an advanced oceanographic satellite instrument. The instrument measures water temperature and detects water color in nine wavelengths. Water color indicates chlorophyll content or phytoplankton. After EOCAP assistance and technical improvements, the AOCI was successfully commercialized by Daedalus Enterprises, Inc. One version provides commercial fishing fleets with information about fish locations, and the other is used for oceanographic research.
Author
Oceanographic Parameters; Oceanography; Satellite Instruments; Remote Sensing; Simulators

20020081121 NASA Goddard Space Flight Center, Greenbelt, MD USA
Predictability of the California Current System ***Final Report, 15 Oct. 1997 - 14 Oct. 2001***
Miller, Arthur J., Scripps Institution of Oceanography, USA; Chereskin, T., Scripps Institution of Oceanography, USA; Cornuelle, B. D., Scripps Institution of Oceanography, USA; Niiler, P. P., Scripps Institution of Oceanography, USA; Moisan, J. R., NASA Wallops Flight Facility, USA; [2001]; 15p; In English
Contract(s)/Grant(s): NAG5-6497; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The physical and biological oceanography of the Southern California Bight (SCB), a highly productive subregion of the California Current System (CCS) that extends from Point Conception, California, south to Ensenada, Mexico, continues to be extensively studied. For example, the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program has sampled this region for over 50 years, providing an unparalleled time series of physical and biological data. However, our understanding of what physical processes control the large-scale and mesoscale variations in these properties is incomplete. In particular, the non-synoptic and relatively coarse spatial sampling (70km) of the hydrographic grid does not completely resolve the mesoscale eddy field (Figure 1a). Moreover, these unresolved physical variations exert a dominant influence on the evolution of the ecosystem. In recent years, additional datasets that partially sample the SCB have become available. Acoustic Doppler Current Profiler (ADCP) measurements, which now sample upper-ocean velocity between stations, and sea level observations along TOPEX tracks give a more complete picture of the mesoscale variability. However, both TOPEX and ADCP are well-sampled only along the cruise or orbit tracks and coarsely sampled in time and between tracks. Surface Lagrangian drifters also sample the region, although irregularly in time and space. SeaWiFS provides estimates of upper-ocean chlorophyll-a (chl-alpha), usually giving nearly complete coverage for week-long intervals, depending on cloud coverage. Historical ocean color data from the Coastal Zone Color Scanner (CZCS) has been used extensively to determine phytoplankton patterns and variability, characterize the primary production across the SCB coastal fronts, and describe the seasonal and interannual variability in pigment concentrations. As in CalCOFI, these studies described much of the observed structures and their variability over relatively large space and time scales.
Derived from text
Ocean Dynamics; Ocean Currents; Oceanography; Mesoscale Phenomena; Marine Meteorology; Marine Biology

20020082936 Scripps Institution of Oceanography, La Jolla, CA USA

Bayesian Hierarchical Air-Sea Interaction Modeling: Application to the Labrador Sea ***Final Report***

Niiler, Pearn P., Scripps Institution of Oceanography, USA; [2002]; 2p; In English

Contract(s)/Grant(s): NAG5-8322; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objectives are to: 1) Organize data from 26 MINIMET drifters in the Labrador Sea, including sensor calibration and error checking of ARGOS transmissions. 2) Produce wind direction, barometer, and sea surface temperature time series. In addition, provide data from historical file of 150 SHARP drifters in the Labrador Sea. 3) Work with data interpretation and data-modeling assimilation issues.

Author

Wind Direction; Sea Surface Temperature; Air Water Interactions; Data Processing

20020083083 Naval Undersea Warfare Center, Newport, RI USA

Rapid Environmental Assessment Methodology (REAM) of Coral Reef Ecosystems at the Atlantic Undersea Test and Evaluation Center (AUTEC) on Andros Island, Bahamas

Szlyk, Thomas K.; Ciminello, Marc D.; Jun. 18, 2002; 14p; In English; Original contains color images

Report No.(s): AD-A406088; NUWC-NPT-TD-11378; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Atlantic Undersea Test and Evaluation Center (AUTEC) was established in the 1960s to meet the Navy's research, development, test and evaluation requirements. AUTEC is an undersea instrumented test facility located in the Tongue of the Ocean (TOTO) off the east coast of Andros Island in the Bahamas. The facility is adjacent to one of the largest near-shore coral reef ecosystems in the world. As part of the Navy's environmental stewardship, AUTEC has developed a baseline reef assessment methodology using high-resolution imagery data obtained from the IKONOS satellite and light detection and ranging (LIDAR) data. Analysis of these data allows for: (1) the determination of the presence of reef structure in and around the waters adjacent to the AUTEC facility; (2) the classification of reefs into general groups, such as patch reef, reef crest, and fore reef; and (3) the assessment of the reef development in terms of long-term sustained growth. This report describes the methodology used in developing of the baseline coral reef assessment using remotely sensed data, results derived from the analysis of the data, and the verification of the methodology using in situ data collected by independent researchers.

DTIC

Coral Reefs; Environmental Monitoring; Environmental Surveys; Test Facilities; Remote Sensing; Marine Environments

20020083190 Massachusetts Inst. of Tech., Cambridge, MA USA

Interactions Between Mantle Plumes and Mid-Ocean Ridges: Constraints from Geophysics, Geochemistry, and Geodynamical Modeling

Georgen, Jennifer E.; Sep. 2001; 226p; In English; Prepared in cooperation with Woods Hole Oceanographic Institution

Contract(s)/Grant(s): OCE-9811924; OCE-9907630

Report No.(s): AD-A405859; MIT/WHOI-2001-08; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This thesis studies interactions between mid-ocean ridges and mantle plumes. Chapter 1 investigates the effects of the Marion and Bouvet hotspots on the ultra-slow spreading, highly-segmented Southwest Indian Ridge (SWIR). Gravity data indicate that Marion and Bouvet impart high-amplitude mantle Bouguer anomaly lows to the ridge axis, and suggest that long-offset transforms may diminish along-axis plume flow. Chapter 2 presents a series of 3D numerical models designed to quantify the sensitivity of along-axis plume-driven mantle flow to transform offset length, spreading rate, and mantle viscosity structure. The calculations illustrate that long-offset transforms in ultra-slow spreading environments may indeed significantly curtail plume dispersion. Chapter 3, an investigation of helium isotope systematics along the western SWIR (9 deg - 24 deg E), reports uniformly low 3He/He ratios of 6.3-7.3 RIRa, compared to values of 8+1 R for normal mid-ocean ridge basalt. There is no evidence for influence of the Bouvet plume on this section of the SWIR from elevated 3He/4He ratios. Chapter 4 studies 3D mantle flow and temperature patterns beneath oceanic ridge-ridge-ridge triple junctions (TJs). For the slowest-spreading ridge, model results for non-hotspot-affected TJs like the Rodrigues TJ predict: (1) an increase of temperature and upwelling velocity within a few hundred kilometers of the TJ to approach those of the fastest-spreading ridge, and (2) a strong component of along-axis flow directed away from the TJ. For hotspot-affected TJs like the Azores TJ, this along-axis flow is predicted to advect a hotspot thermal anomaly away from its deep-seated source.

DTIC

Plumes; Earth Mantle; Anomalies; Mid-Ocean Ridges; Three Dimensional Models; Transformations (Mathematics)

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20020080722 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA USA
Interstellar Communication Channel Based on a Biological Universal
Weber, Arthur L., Search for Extraterrestrial Intelligence Inst., USA; [1999]; 1p; In English; 6th Bioastronomy Meeting, 2-6 Aug. 1999, Kohala Coast, HI, USA
Contract(s)/Grant(s): NCC2-1075; No Copyright; Avail: Issuing Activity; Abstract Only

Cellular biosynthesis starts with sugar substrates and continues energetically downhill to yield amino acid, rapid, and nucleotide products. To understand the energetics of these processes, we calculated the energy for biosynthesis from sugars of E. cali's amino acids, nucleotides, and lipids. We found that the biosynthesis of amino acids and lipids from sugar substrates proceeds by redox disproportionation. of sugar carbon with a favorable energy of about -11 kcal/mole of carbon. Overall, redox disproportion of sugar carbon accounted for 84% and 96% (ATP only 6% and 1%) of the total biosynthetic energy of amino acids and lipids (the major cellular constituents). Next, we calculated for all 48 possible 3-carbon substrates the energy of maximal disproportionation to carbon dioxide and methane. We found no other carbon substrates than matched sugars in biosynthetic energy, efficiency, and simplicity. From this, we concluded that sugars are the optimal biosynthetic substrate. Since this conclusion is based on universal properties of carbon chemistry, other carbon-based life throughout the Universe would also use optimal sugar substrates. Furthermore, this rather obvious universal role of sugars as the optimal biosubstrate would probably be common knowledge of technological civilizations throughout the Universe. Since the elemental building block of all sugars is formaldehyde, the common knowledge that sugars are the universal optimal biosubstrate could reasonably lead to the selection of a line(s) in the microwave spectrum of formaldehyde as a frequency for interstellar communication.
Author
Interstellar Communication; Biosynthesis; Amino Acids; Oxidation-Reduction Reactions; Lipids; Energy Conservation

20020080857 NASA Ames Research Center, Moffett Field, CA USA
Prebiotic Nitrogen Fixation by FeS Reduction of Nitrite Under Acidic Conditions
Summers, David P., Search for Extraterrestrial Intelligence Inst., USA; Mar. 19, 1999; 1p; In English; 9th ISSOL Meeting, 11-16 Jul. 1999, San Diego, CA, USA
Contract(s)/Grant(s): NCC2-836; RTOP 344-38-22-12; No Copyright; Avail: Issuing Activity; Abstract Only

Theories for the origin of life require the availability of reduced nitrogen for the formation of such species as amino acid and nucleic acids. In a strongly reducing atmosphere, compounds essential to the chemical evolution of life, such as amino acids, can form by reactions between HCN, NH3, and carbonyl compounds produced in spark discharges. However, under non-reducing atmospheres, electric discharges produced NO rather than HCN or NH3. This raises the questions of; how ammonia can be formed under a neutral atmosphere, and what conditions are needed such formation to occur? On possibility is the conversion of NO into nitric and nitrous acids (through HNO) and rained into the oceans. The reduction of nitrite by aqueous Fe(II) (6 Fe(+2) + 7 H(+) + NO2(-) yields 6 Fe(III) + 2 H2O + NH3) such as was present on the early Earth could then have produced ammonia. However, this reaction does not proceed at pHs less than 7.3. An alternative is reduction by other forms of Fe(II), such as FeS. We will present results that show that FeS can reduce nitrite to ammonia at pHs as low as pH 5 under a variety of conditions.
Author
Nitrogenation; Reduction (Chemistry); Acidity; Chemical Evolution; Nitrites; Iron Compounds; Sulfides

20020080942 Quantum Devices, Inc., Barneveld, WI USA
Light Source
Spinoff 1993; 1993, pp. 69; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Research on food growth for long duration spacecraft has resulted in a light source for growing plants indoors known as Qbeam, a solid state light source consisting of a control unit and lamp. The light source, manufactured by Quantum Devices, Inc., is not very hot, although it generates high intensity radiation. When Ron Ignatius, an industrial partner of WCSAR, realized that terrestrial plant research lighting was not energy efficient enough for space use, he and WCSAR began to experiment with light

emitting diodes. A line of LED products was developed, and QDI was formed to market the technology. An LED-based cancer treatment device is currently under development.
Author
Light Sources; Plants (Botany); Light Modulation; Vegetation

20020082984 Ohio State Univ., Research Foundation, Columbus, OH USA
Development of KGF Antagonist as a Breast Cancer Therapeutic ***Annual Report, 1 Jul. 2000-30 Jun. 2001***
Sugimoto, Yasuro; Jul. 2001; 9p; In English
Contract(s)/Grant(s): DAMD17-99-1-9341
Report No.(s): AD-A405915; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This grant proposal is to synthesize potential KGF antagonists which will then be evaluated for efficacy in in vitro assay systems. The results generated for the proposed study will be useful for designing new therapeutic agent for breast cancer. KGF antagonist candidate peptides have been synthesized and evaluated its ability. There is, however lack of sensitivity issue underlies on the functional assay procedure. We then developed several KGF-receptor overexpressed cell lines for further use. We are on the process to evaluate the cell lines.
DTIC
Mammary Glands; Cancer

20020082985 Thomas Jefferson Univ., Philadelphia, PA USA
HRAD51 Involvement in Genomic Instability and Development of Breast Cancer ***Annual Report, 23 Aug. 2000-24 Aug 2001***
Fishel, Richard A.; Sep. 2001; 24p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9406
Report No.(s): AD-A405919; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
During the second year of the funded period, we focused on the characterization of interactions between hRAD5l and the five hRAD5l paralogs as well as interactions between these proteins and BRCA2, the BRCAl-interacting protein BARD1 and RPA. We detected strong interactions suggesting a stable complex, and weaker interactions. Some of these weaker interaction signals between hRAD5l paralogs increased in the presence of ATP and decreased in the presence of ADP which may indicate a regulatory role for adenosine nucleotides. Examination of the functional significance of these interactions is currently in progress. We have also examined the role of hRAD51-dependent DNA repair by homologous recombination in BCR/ABL-expressing cells. We found that the oncogenic tyrosine kinase BCR/ABL upregulates hRAD5l and several hRAD5l paralogs. Elevated DNA repair by recombination seems to be a major pathway by which BCR/ABL-expressing cells become drug resistant. These findings may have significant implications for cancer therapy.
DTIC
Genetic Engineering; Cancer; Mammary Glands

20020082999 Oregon Health Sciences Univ., Portland, OR USA
A Novel Member of the Insulin-Like Growth Factor Binding Protein Superfamily in Prostate Cancer ***Annual Report, 1 Feb. 2001-31 Jan. 2002***
Rosenfeld, Ron G.; Feb. 2002; 98p; In English
Contract(s)/Grant(s): DAMD17-00-1-0042
Report No.(s): AD-A406049; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
The insulin-like growth factors (IGFs) are potent mitogens for normal and cancerous prostatic cells. The IGFs are found complexed to IGF binding proteins (IGFBPs), which modulate IGF bioactivity, but may themselves act in an IGF-independent manner. We have recently characterized a series of IGFBPs in the amino-terminus, bind IGFs with low affinity, and regulate cell growth through both lOF-dependent and IGF-independent actions. This grant is directed at the study of IGFBP-rP2 (more commonly known as connective tissue growth factor) as a regulator of normal and malignant prostatic growth. The specific aims are to: 1) analyze IGFBP-rP2 mRNA and protein expression and distribution in normal and malignant prostatic tissues; 2) determine the transcriptional, translational and post-translational regulation of IGFBP-rP2; and 3) determine the mechanism by which IGFBP-rP2 regulates prostatic growth.
DTIC
Growth; Cancer; Prostate Gland; Insulin

20020083000 Stanford Univ., Stanford, CA USA

Integrating Organ Motion and Setup Uncertainty into Optimization of Modulated Electron Beam Treatment of Breast Cancer ***Annual Report***

Pawlicki, Todd A.; Aug. 2001; 56p; In English; Original contains color images

Report No.(s): AD-A406052; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This project is to develop, implement, and evaluate models of organ motion and setup uncertainty for dose calculation of radiotherapy treatment of the breast. These models are applied to accurate dose calculation for breast treatment using energy- and intensity-modulated electron radiotherapy (MERT). The premise is that MERT treatments will deliver a more conformal dose to the breast while minimizing the dose to normal tissues over conventional photon techniques. We have completed the following tasks: (1) developed theoretical models of organ motion and setup uncertainty based on published data, and (2) implemented those models into a Monte Carlo dose calculation code. We have developed a model of organ motion that correlates the dose in a static computed tomography scan to the actual case of patient breathing. A Gaussian model has been developed to account for setup uncertainty due to the random nature of setup uncertainty in radiotherapy, which has been demonstrated in published literature. These models have been implemented in a Monte Carlo code for radiotherapy dose calculations based on patient specific computed tomography scans. The successful completion of our goals now permits further study (specific aims 3 and 4) on the effect of these effects on MERT radiotherapy breast treatment.

DTIC

Radiation Therapy; Cancer; Mammary Glands

20020083001 Massachusetts General Hospital, Boston, MA USA

Targeting Immunity to Biothreats

Scadden, David; Apr. 03, 2002; 19p; In English; Original contains color images; Workshop paper from the New England Bioterrorism Preparedness Workshop held 3-4 april 2002 at MIT Lincoln Laboratory, Lexington, MA, The original document contains color images

Contract(s)/Grant(s): F19628-00-C-0002

Report No.(s): AD-A406053; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Partial contents: Cellular immunity and HIV disease, Evidence for CTL control of HIV, Optimal CTL function depends on virus-specific T helper cells, HIV-specific CD4+T cell responses are associated with control of HIV, HIV specific helper T cell function, Treatment of acute HIV-1 infection results in augmentation of T helper cell responses, Preserved HIV specific T cell helper function is associated with control of HIV without HAART, Structured treatment interruptions (STI) in acute HIV infection may result in immunologic control of viremia, CD4 gamma- modified T-cell survival and gene expression in peripheral blood mononuclear Persistence of cells with chimeric TCR DNA, CD4+ T cell counts after cell infusions, cells(PBMC), Plasma viral load over time.

DTIC

Infectious Diseases; Lymphocytes; Human Immunodeficiency Virus; Acquired Immunodeficiency Syndrome

20020083003 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA

Treatment Decisions in Localized Prostate Cancer: Patient, Partner, and Physician ***Annual Report, 15 Mar. 2001-14 Mar 2002***

Armstrong, Katrina; Apr. 2002; 42p; In English; Original contains color images

Contract(s)/Grant(s): DAMD18-00-1-0097

Report No.(s): AD-A406057; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

'Treatment Decisions in Localized Prostate Cancer: Patient, Partner and Physician,' is a project that aims to develop and refine an innovative new model of prostate cancer decision making, that will form the foundation of a research and clinical program to understand, support and improve decision making in prostate cancer. This project is using a cross-sectional survey to explore the role of the patient, partner and physician in treatment decisions and to examine the effect of preferences, perceived preferences, and actual preferences on treatment decisions, decision satisfaction and decision process. Many valuable steps have been taken in the first year of this grant, including the development of a pilot questionnaire, administration of the pilot questionnaire, development of the protocol for the study and development of patient, spouse and physician questionnaires. Enrollment for the study began in November, 2000.

DTIC

Decision Making; Prostate Gland; Cancer

20020083009 Naval Medical Research Center, Silver Spring, MD USA

Hibernation, a State of Natural Tolerance to Profound Reduction in Organ Blood Flow and Oxygen Delivery Capacity

McCarron, Richard M.; Sieckmann, Donna G.; Yu, Erik Z.; Frerichs, Kai; Hallenbeck, John M.; Jan. 2001; 21p; In English

Report No.(s): AD-A405751; NMRC-01-026; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Hibernation represents a seasonal physiological adaptation, which allows conservation of energy and down-regulation of cellular functions. Hibernating animals exhibit multiple biological alterations which contribute to their dramatic ability to tolerate the ischaemic conditions associated with reduced rates of respiration and blood flow while in the hibernating state. There is accumulating evidence that mammalian hibernation involves a controlled suppression of interactive physiological responses that preserves homeostatic balance. Mammalian hibernation is a regulated state of torpor with a profound suppression of energy requirements that has evolved in at least six mammalian orders as a strategy to cope with seasonal cold and shortages of food and water (Wang, 1988). A hibernation bout may last up to several weeks in some mammals and consists of entry into, maintenance of, and arousal from hibernation. Arousal is maintained for a few hours to a few days before the animal initiates another bout of hibernation.

DTIC

Oxygen; Hibernation; Blood Circulation; Blood Flow; Respiration; Organs

20020083032 Pennsylvania Univ., Wistar Inst., Philadelphia, PA USA

Characterization of Two Proteins Which Interact With the BRCA 1 Gene ***Final Report, 1 Jun. 1996-31 May 2001***

Rauscher, Frank J.; Jun. 2001; 44p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-96-1-6141

Report No.(s): AD-A406224; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have made extensive progress to support our analysis of the BAPl-BRCAl interaction. We have published the co-localization and cell-cycle patterns of intranuclear distribution for the two proteins. In addition, we have shown that BAP-1 is a bonafide tumor suppressor gene which is able to inhibit the malignant growth characteristics of cell lines when transfected back into the BAP1 null cells. This activity is dependent upon enzymatic function of the ubiquitin hydrolysis domain. Our recent studies are aimed at exploring whether BAP1, like BRCAl, might have a direct role in transcription-coupled DNA repair. The work accomplished conforms to the original SOW and has shed new light on the role of BRCAl as a tumor suppressor in early onset familial breast-ovarian cancer families.

DTIC

Proteins; Genes; Cancer

20020083033 Cornell Univ., Ithaca, NY USA

Characterization of the Hen as a Model for Human Ovarian Cancer ***Annual Report, 1 Sep. 2000-31 Aug. 2001***

Johnson, Patricia A.; Sep. 2001; 13p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0560

Report No.(s): AD-A406221; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Investigation of basic factors involved in malignant transformation of the ovary has been hampered by the lack of an appropriate animal model. The overall hypothesis of this project is that the hen is an excellent model for human ovarian epithelial cell cancer. We will take a three-pronged approach in this project. First, we will compare differences in spontaneous incidence between two strains of hens as they age and examine for pathological ovarian changes that may indicate site of origin of the tumors. We have not yet compared the incidence of tumors in the two strains of hens because we were not able to obtain 2-year old hens at the start of the experiment. We have begun to histologically analyze the ovarian surface epithelium (OSE) as well as ovary proper for pre-tumor lesions. Our second approach was to evaluate possible differences between the strains in response to reproductive manipulations highly correlated to incidence in women. Because we did not have access to 2 year old hens at the initiation of the experiment, we have not yet begun experiments to manipulate the incidence of adenocarcinoma. These experiments will be initiated in the coming year. Our third approach was to examine potential differences in cell signaling that may underlie the different incidence between the strains. We have made the most progress on this task with respect to validating and characterizing our culture system for OSE cells. We have determined that significant quantities of hen OSE cells can be obtained and can be cultured in two commercially available types of media (CM) or (MCDB) for at least 10 days. The cultured OSE cells are positive for cytokeratin and negative for vimentin. In combination with Hoechst staining, these results indicate that the cultures are not contaminated with fibroblasts.

DTIC

Cancer; Ovaries; Fibroblasts; Epithelium

20020083036 University of South Florida, Tampa, FL USA

Phosphoinositide 3-Kinase/AKT1 Pathway and Human Ovarian Cancer ***Annual Report, 1 Sep. 2000-31 Aug. 2001***

Cheng, Jin Q.; Sep. 2001; 44p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0559

Report No.(s): AD-A406214; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Extensive studies have demonstrated that the Akt pathway is essential for cell survival and anti-apoptosis; however, alterations of Akt in human malignancy have not been documented. We have recently demonstrated significantly increased AKT1 and AKT2 kinase activity in primary ovarian carcinomas. We have also shown that PI3K is frequently activated in the specimens with activation of Akt. The majority of cases with PI3K/Akt activation are late stage and high grade. The biological significance of AKTl activation in human cancer was demonstrated by malignant transformation of NIH 3T3 cells transfected with constitutively active AKTl, but not cells transfected with wild type AKT 1. Moreover, inhibition of PI3K/Akt pathway inhibits cell growth and induces apoptosis in human ovarian cancer cell lines. We have also observed that estrogen receptor (ER)a interacts and activates PI3K/Akt pathway. PI3K/Akt feedback regulates ERalpha by phosphorylation of serine-167 of ERalpha. These data indicate that AKT 1 kinase, which is frequently activated in human cancer, is a determinant in oncogenesis and a potential target for cancer intervention.

DTIC

Cancer; Phosphorylation; Enzyme Activity; Apoptosis

20020083054 Georgetown Univ., Washington, DC USA

The Role of SRc Tyrosine Kinase Signaling Networks in the Development and Progression of Ovarian Cancer in a Mouse Model ***Annual Report, 1 Sep. 2000-31 Aug. 2001***

Taylor, Christopher C.; Sep. 2001; 46p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0557

Report No.(s): AD-A406212; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ovarian cancer is among the most common and deadly malignancies in women, accounting for nearly 15,000 deaths per year in the USA. We have developed a mouse model of ovarian cancer, which will allow for new studies into the biochemical changes that occur in the tumorigenic process. We have determined that SRc tyrosine kinase is over expressed and constitutively activated in these mouse ovarian cancer cells. This leads to constitutive activation of downstream kinases such as phosphatidylinositol-3-kinase (PI3-kinase) and focal adhesion kinase (FAK). Pharmacologic inhibition of SRc suppresses cell migration, alters localization of FAK, decreases protein tyrosine kinase phosphorylation and enhances the cell killing effects of the taxol, a commonly used chemotherapeutic agent in women with ovarian cancer. We have produced an inducible, epitope tagged SRc dominant negative and are currently isolating clonal cell lines for characterization of the effects of SRc dominant negative expression. These cells lines will be used for both in vitro and in vivo studies on the role of SRc tyrosine kinase and its substrates in the growth of ovarian cancer cells and on the chemotherapeutic sensitivity.

DTIC

Cells (Biology); Cancer; Chemotherapy; Tyrosine

20020083056 Texas Univ., M.D, Anderson Cancer Center, Houston, TX USA

Radiation-Induced Chemosensitization: Potentiation of Antitumor Activity of Polymer-Drug Conjugates ***Annual Report, 1 Apr. 2001-31 MAr 2002***

Li, Chun; Apr. 2002; 33p; In English

Contract(s)/Grant(s): DAMD17-00-1-0314

Report No.(s): AD-A406209; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Conjugating drugs with polymeric carriers is one way to improve selective delivery to tumors. Poly(L-glutamic acid)-paclitaxel (PG-TXL) is one such conjugate. Compared with paclitaxel, its uptake, retention in tumors, and antitumor efficacy are increased. Our initial studies showed that PG-TXL given before or after radiotherapy enhanced tumor growth delay significantly more than paclitaxel. We further demonstrated that when the treatment end point was tumor cure, enhancement factors of 8.4 and 7.2 were observed after fractionated and single dose radiation, respectively. These values, to our knowledge, were greater than those produced by other taxanes or by any other chemotherapeutic drugs or radiosensitizer tested so far. Our results support the idea that increased tumor uptake of PG-TXL and sustained release of paclitaxel in the tumor are responsible for enhanced radiopotentiation activity of PG-TXL.

DTIC

Cancer; Chemotherapy; Augmentation

20020083058 Georgetown Univ., Washington, DC USA
C-7 Progesterone Analogues and MDR1 in Breast Cancer ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Clark, Robert R.; Sep. 2000; 26p; In English
Contract(s)/Grant(s): DAMD17-96-1-6231
Report No.(s): AD-A406203; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have generated novel analogs of progesterone (PgA) as potent inhibitors of the MDRl multidrug resistant phenotype in breast cancer. The objectives of this Research Project include the optimization of the PgA's MDRl-reversing activity through the generation of additional compounds, using an analog design approach, the definition of these compounds' in vivo efficacy, and of their mechanism of action. In the course of the fourth year of the Project, we have: 1. tested the in vivo MDR-reversing activity of PgA4, the most potent among our initial progesterone analogs; 2. designed and synthesized additional progesterone analogs and evaluated their structure-activity relationships; 3. related the in vitro activity of some of the analogs to their in vitro toxicity.
DTIC
Drugs; Cancer; Mammary Glands; Hormones

20020083059 Lehigh Univ., Bethlehem, PA USA
Mammogram Screening by Automated Followup: A Feasibility Study ***Final Report, 15 Jun. 1996-14 Jun 2000***
Brzakovi, Dragana; Jul. 2000; 15p; In English
Contract(s)/Grant(s): DAMD17-96-1-6128
Report No.(s): AD-A406200; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report addresses the problem of image registration in eases where pixel-to-pixel correspondence can't be established. Specifically, the interest is in images containing 3-D elastic and nonstructured objects whose appearance varies with acquisition parameters. The work is motivated by the problem of mammogram screening based on comparison between mammograms of the same patient acquired in different screenings. Misregistration between temporally spaced screenings arises from minor differences in 3-D positioning and compression, as well as, normal changes in tissue that are function of time. The objective is to identify corresponding regions in two images, similarly to what is done by medical experts. The locations of the regions are determined based on the locations of identifiable landmark points, and each corresponding region's extent is determined by characteristics of the older mammogram. An image pair is covered with overlapping circular regions without gaps and the proposed algorithm provides for further splitting of larger regions. In order to gain an insight into the problem of mammogram misregistration, the work has been extended into problem of mammogram simulation. The developed simulation algorithms encompass the problems of modeling breast tissue, compression and X-ray image acquisition.
DTIC
Image Processing; Mammary Glands; Pattern Registration

20020083060 McGill Univ., Montreal, Quebec Canada
Biology of Somatostatin and Somatostatin Receptors in Breast Cancer ***Final Report, 12 Aug. 2000-11 Aug 2001***
Patel, Yogesh C.; Sep. 2001; 12p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-96-1-6189
Report No.(s): AD-A406199; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The twelve tasks comprising this four year project were completed and a' full report submitted in September 2000. However, in the course of these studies three new leads were pursued as three separate tasks (Tasks 13, 14, 15) which were not part of the original contract but because of their importance were nonetheless developed substantially and also reported upon in September 2000. We then requested and received approval for a no-cost extension to allow us to round off these three new tasks up to the period ending September 2001. We made reasonable progress in each of these three areas as outlined in this report despite the time and budgetary constraints and personnel departures. As emphasized in our Final Report, however, each of these three new tasks represented substantial new projects which we intend to pursue fully with renewed new longterm funding.
DTIC
Cancer; Mammary Glands

20020083074 Dana Farber Cancer Inst., Boston, MA USA
Cell Cycle Analysis of the BRCA1 Gene Product ***Final Report, 15 Aug. 1997-14 Aug 2000***
Lynch, Dennis M.; Sep. 2000; 65p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-97-1-7180
Report No.(s): AD-A405841; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This project is focused upon a functional analysis of BRCA1, the hereditary breast/ovarian cancer susceptibility gene. Our aims were to identify proteins that interact with BRCA1 and to determine the functional significance of such interactions. to this end, we discovered that BRCA1 interacts with the product of the second major hereditary breast/ovarian cancer gene, BRCA2. Each of these proteins interacts with the recombination protein, Rad51, suggesting a role for BRCA1 and BRCA2 in double strand break repair (DSBR). We developed a functional assay capable of distinguishing between wild-type and mutant alleles of BRCA1. Wild-type but not mutant alleles of BRCA1 were able to restore efficient DSBR to a BRCA1 -/- cell line, HCC1937. Finally, we cloned a novel helicase, termed BACH1, that interacts specifically and directly with the BRCT motifs of BRCA1. Our data suggest that the interaction of BRCA1 with BACH1 is required for efficient DSBR, and that mutation of BACH1 may contribute to human breast cancer susceptibilty.
DTIC
Genetics; Mammary Glands; Cancer; Proteins; Genes; Functional Analysis

20020083078 Baylor Coll. of Medicine, Houston, TX USA
Mechanisms of Mutation in Non-Dividing Cells ***Annual Report***
Petrosino, Joseph F.; May 2002; 16p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0144
Report No.(s): AD-A406067; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Understanding how mutations arise in non-growing cells will help illuminate mechanisms of oncogenesis, tumor progression, and resistance to chemotherapeutic drugs. to this end, I have been addressing how antibiotic resistance mutations occur in non-, or slowly-growing enterobacteria cells. Previously, our laboratory discovered that RecA (an hRAD51 homolog) and RecBCD recombination repair proteins are necessary for the acquisition of 13-lactam drug-resistant mutations in the Escherichia coli chromosome during stationary-phase. The data suggest that either the SOS DNA damage-repair response, recombinational DNA repair, or both, are involved in the mutation pathway. I have improved the E. coli-based system to examine the genetic and biochemical processes involved in this mutational mechanism in detail. Initial results in this improved system suggest that 13-lactam resistance mutations occur not only in a growth-dependent manner but also in response to stress induced by starvation. The starvation conditions may mimic the environment pathogens or tumor cells may encounter in inflicted patients under stress, chemotherapeutic treatment, or other anti-tumor drug regimen in which cells are in a state of slow, or non-growth. In addition, I have engineered a reporter construct that will allow me to enrich for those cells undergoing stationary-phase mutation so I may study the genetic and biochemical intermediates involved in this mutation mechanism.
DTIC
Mutations; Cells (Biology); Cancer; Mammary Glands; Resistance; Bacteria

20020083079 Jackson (Henry M.) Foundation, Rockville, MD USA
Neuronal Sodium Channels in Neurodegeneration and Neuroprotection ***Annual Report, 1 Jun. 2001-31 May 2002***
Tortella, Frank C.; Jun. 2002; 132p; In English; Original contains color images
Report No.(s): AD-A406069; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The purpose of this research project is to study the role of neuronal sodium channels in mechanisms of neuronal injury neurodegeneration, and neuroprotection. The primary objective of this research project is to characterize the expression, and study the functional significance, of neuronal sodium channels (hiring the process of injury and recovery. Also, the effects of sodium channel blockade (using antisense and channel blockers) on gene expression and neurodegeneration will be studies. The progress during our 3rd year of this project was excellent. Several important and critical discoveries providing a greater understanding of the injury/neurodegeneration process and the role of brain NAChs in this process were elucidated. Our key observations were 1) using ASO for the Nal .1 NaCh it was demonstrated that functional blockade of this channel results in brain neuroprotection following injury; 2) our in situ hybridization experiments defined the regional anatomical distribution of Nav1. 1 sodium channel gene expression in normal and at various time-post MCAo and confirmed our QRT-PCR data showing the Nal - 1 expression to be down-regulated in subcortical and cortical regions of injured and, to some degree of contralateral hemispheres. In addition, these in situ hybridization studies revealed that the expression of other NaCh gene appears not to be of significance to the brain injury process; 3) our preliminary results show that treatment of neurons with RS-1000642 at least partially reverses the down-regulation of Nav1. 1 caused by MCAo injury. Importantly, evidence eindicates that this is an effect selective for the Nal.1 NaCh and not other NAChs; 4) Based upon our QRT-PCR results, it does not appear that sodium-calcium exhanger genes, namely NCXl, NCX2 and NCX3, re involved in the NaCh mechanisms of ischemia brain injury, at least not at early time-points post-MCAo injury.
DTIC
Aging (Biology); Toxins and Antitoxins; Neurons; Ion Channels (Biology); Brain Damage

20020083080 Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM USA

Role of Respirable Saudi Arabian Sand and Pyridostigmine in the Gulf War syndrome: An Autoimmune Adjuvant Disease ***Final Report, 10 Feb. 2000-10 Feb 2002***

Sopori, Mohan L.; Mar. 2002; 24p; In English

Contract(s)/Grant(s): DAMD17-00-1-0073

Report No.(s): AD-A406084; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the Lewis rat, inhalation of silica (SL) in realistic doses for 6 wk exacerbated the Mycobacterium- induced autoimmune adjuvant disease and impaired the humoral as well as cellular immune responses. In addition to the lung, significant SL deposition was observed in the spleen and the brain. In the lung, SL exposure resulted in granulomatous and fibrogenic changes, and decreased airway hyperresponsiveness. In addition to the increased number and changes in the surface phenotype, alveolar macrophages exhibited strong anti-apoptotic responses. The bronchoalveolar lavage fluids had moderate (metalloproteinase-9) to highly significant (metalloproteinase-2) increases in extracellular matrix digesting enzyme activities. We also observed that the anti-nerve gas agent, pyridostigmine bromide (PB), affected the immune system only when it was administered directly into the brain, indicating that PB and other cholinergic agents are unlikely to affect the immune response unless they cross the blood-brain-barrier. Future experiments will be directed to understand the mechanism of anti- apoptotic responses in alveolar macrophages. This response may be crucial for the development of SL- induced lung pathology. In addition, experiments are planned to ascertain the mechanism and the effects of SL sequestration in the brain.

DTIC

Sands; Respiration; Immune Systems; Bromides; Diseases

20020083082 California Univ., San Francisco, CA USA

A New Perspective on DCIS Using MRI: Correlation of Tumor and Vessel Proliferation with MR Signal Enhancement ***Annual Report, 1 Oct. 2000-30 Sep. 2001***

Esserman, Laura J.; Hwang, Shelley; Hylton, Nola; Oct. 2001; 13p; In English

Contract(s)/Grant(s): DAMD17-00-1-0597

Report No.(s): AD-A406087; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to correlate density of contrast enhancement on breast MRI images with pathology characteristics and markers of proliferation and angiogenesis in women with ductal carcinoma in situ (DCIS) of the breast. The specific aims of our study are two fold. 1) We will first develop a novel method for characterizing DCIS lesions based on cellular proliferative activity within the tumor surrounding vascular endothelium. Using immunohistochemical techniques, we will determine whether this proliferation is found in the DCIS itself, in the surrounding stroma, or in vascular endothelial cells and whether they are proximate. 2)Secondly, we will correlate this proliferative profile with MRI characteristics in order to determine whether MR can predict the biological characteristics of DCIS. Thus MR could potentially serve as a surrogate marker of biological behavior. The two aims mentioned above toward this goal we wish to acquire a better understanding of the basis and timing for transformation of DCIS which would help us to find more optimal ways to treat DCIS, and indeed, help us to treat invasive breast cancer and develop strategies for prevention.

DTIC

Mammary Glands; Cancer; Blood Vessels; Growth

20020083084 Illinois Univ., Broad of Trustees, Chicago, IL USA

A Small Scale Proteomics Approach for Identifying Proteins Regulated by the Breast Tumor Kinase BRK Signal Transduction Pathway ***Final Report, 15 May 2001-14 May 2002***

Tyner, Angela L.; Jun. 2002; 10p; In English

Contract(s)/Grant(s): DAMD17-01-1-0534

Report No.(s): AD-A406106; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The breast tumor kinase BRK is not expressed in normal breast tissue, but is expressed in a high proportion of breast tumors and breast tumor cell lines. Because of its high expression in breast tumor cells, we propose that BRK regulates signaling that leads to protein expression that contributes to breast cancer development. We are currently examining changes in protein expression due to ectopic expression of BRK in the normal murine mammary gland cell line NMuMG. Availability of the human genome sequence has led to our discovery of tight linkage of the SRm tyrosine kinase gene to the BRK gene on human chromosome 2Oq13.3. Because of the tight linkage of these two genes, it is possible that they are coregulated in breast cancer cells. Expression of SRm in normal breast tissue and breast tumor cells is currently under investigation. While BRK has a low degree of homology to other intracellular tyrosine kinases including SRm, Frk/Rak, and SRc42A/Dsrc4l, the exon structures of these kinases is highly

conserved, and distinct from other families of intracellular kinases including c-SRc. Frk/Rak, is also expressed in breast cancers, suggesting a general role for the BRK family of kinases this disease.
DTIC
Chromosomes; Genetics; Genome; Mammary Glands; Proteins; Tumors

20020083085 JAYCOR, San Diego, CA USA
Modeling for Military Operational Medicine Scientific and Technical Objectives ***Annual Report, 7 Aug. 2000-6 Aug 2002***
Stuhmiller, James H.; Sep. 2002; 30p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-C-0031
Report No.(s): AD-A406110; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes progress toward scientific and technical objectives of the Military Operational Medicine Research Program. The further development of the Toxic Gas Assessment Software (TGAS) includes models for respiratory, circulatory, and metabolic systems and the control of breathing. The first year's work on developing a biomechanically- based assessment of behind body armor blunt trauma is described, including measurements of actual loads and estimated response.
DTIC
Military Operations; Mathematical Models; Biodynamics; Respiratory System

20020083086 California Univ., San Francisco, CA USA
Identification of Novel Breast Cancer Antigens Using Phage Antibody Libraries ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Marks, James D.; Sep. 2001; 120p; In English
Contract(s)/Grant(s): DAMD17-98-1-8189
Report No.(s): AD-A406113; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The purpose of this project is to use phage antibody libraries to identify novel breast tumor antigens. The antibodies could be used for breast cancer immunotherapy and the antigens could be used as cancer vaccines. In the first year, we used a model system to identify the factors allowing successful phage antibody library selection on tumor cell lines. Multivalent display of phage antibodies led to more efficient selection of cell binding antibodies, as did recovery of phage from within the cell after binding to an internalizing cell surface receptor. The methods were used to select a panel of phage antibodies which bound the breast tumor cell line SKBR3. Some of the antibodies bound ErbB2, some the transferring receptor, and one a novel antigen overexpressed on breast tumor cells. All were efficiently endocytosed as native antibody fragments and thus potentially useful for targeted cancer therapy. To widen the utility of this approach, a large human phage antibody library was constructed in a true phage vector in which multiple copies of antibody fragment are displayed on each phage. We have validated the utility of this library and are currently in the process of characterizing a large panel of breast tumor cell specific antibodies. We also developed a high throughput assay which allows rapid screening of unpurified antibody fragments for endocytosis into tumor cells.
DTIC
Antibodies; Antigens; Cancer; Cells (Biology); Mammary Glands; Bacteriophages

20020083087 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA
Study of the Regulation of ErbB Signaling by Receptor-Mediated Endocytosis ***Annual Report***
Lee, Anthony; Lemmon, Mark A.; May 2002; 14p; In English
Contract(s)/Grant(s): DAMD17-99-1-9351
Report No.(s): AD-A406114; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
My proposal has envisioned a study of endocytic rate of EUFR in cells expressing different versions of erbE2. ErbB receptors are dimerized by their ligands, leading to receptor activation and internalization. internalized receptors are degraded in lysosorne, terminating the signal. The C-terminal region of EOFR contains endocytic motifs that regulate the internalization of EOFR. ErbB2 may also contain endocytic motifs. ErbB2 dimerizes with EUFR, and it may regulate the endocytosis rate of its dimerization partner. The presence of erbE2 may retard the internalization of EGFR, prolonging its presence on cell surface and potentiating its activation. I was able to show in transiently transfected BeLa cells that transient overexpression of erblB2 led to a decrease of endocytosis, measured indirectly by phosphorylation of brs 1. I was unable to develop a stable erbB2 overexpressing line, however. Several studies since the submission of my proposal supported the idea that erbB2 expression leads to a decrease in EGFR internalization (Wang et al., 1999; Worthylake et al., 1999). Another study showed that erbB2 overexpression in BT-20 cells led to prolonged downstream signaling by Raf- 1 and MAPK, compared with cells that expressed lower level of erbB2 (Zhang

et al., 2002). These studies provided support to my hypothesis that erblB2 plays a regulatory role on EGFR signaling by modulating its internalization.
DTIC
Ligands; Receptors (Physiology); Signals; Genetics

20020083088 Pittsburgh Univ., Pittsburgh, PA USA
Ovarian Cancer Risk and Survival in BRCA 1/2 Carriers ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Modugno, Francesmary; Sep. 2001; 33p; In English
Contract(s)/Grant(s): DAMD17-00-1-0569
Report No.(s): AD-A406117; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This project is evaluating whether oral contraceptives and parity are as protective against ovarian cancer in BRCAl/2 carriers as they are for women in general. It is also determining whether there are survival differences between BRCAl/2 carriers with ovarian cancer compared to women with sporadic disease. The study employs a case-case design. We will identify about 400 Jewish women with epithelial ovarian cancer. We will genotype these women for the 3 BRCAl/2 mutations found in Ashkenazi women. We will then compare oral contraceptive use and parity between carriers and non-carriers. We will also compare survival differences between the two groups. In the first year of the project, we have identified 36 eligible subjects. Risk factor data and pathologic specimens have been obtained on these women. Using the pathology specimens, we have genotyped the 36 subjects and identified l7 mutation carriers. to date, we are on schedule to complete this project as outlined in the original Work Plan.
DTIC
Cancer; Females; Pathology; Ovaries

20020083090 Sloan-Kettering Inst. for Cancer Research, New York, NY USA
Mammary-Specific Gene Transfer for Modeling Breast Cancer ***Annual Report, 1 Aug. 2000-31 Jul. 2001***
Li, Yi; Varmus, Harold E.; Aug. 2001; 7p; In English
Report No.(s): AD-A406121; DAMD17-99-1-9312; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In order to develop a mouse model system that allows for rapid assessment of genetic lesions involved in breast tumor development, we are adapting a somatic gene transfer system based on avian leukosis virus A (ALV-A) expression vectors and TVA, the receptor for ALV-A. Transgenic mice have been generated that target tv-alpha to the mammary epithelial cells using MMTV and WAP promoters. Mammary epithelial cells from these transgenic mice are susceptible to infection both in vivo and in vitro. Low-grade carcinomas can be induced to progress to higher-grade tumors using viruses that express potent oncogenes. The mouse lines generated will be valuable research tools for gene delivery using the ALV-TVA system. PTEN is a tumor suppressor gene mutated in many neoplasias including breast cancer. It encodes a lipid phosphatase that prevents the activation of Akt. Breeding of a Pten mutant allele into female mice predisposed to mammary oncogenesis, due to transgenic expression of MMTV-Wnt-1, led to more rapid formation of mammary tumors. This finding confirmed the role of Pten in breast tumorigenesis.
DTIC
Cancer; Genetics; Mammary Glands; Oncogenes; Tumors

20020083091 Wayne State Univ., Detroit, MI USA
Analysis of Genes Differentially Expressed in a Human Ovarian Cancer Model ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Lancaster, Wayne D.; Jul. 2002; 5p; In English
Contract(s)/Grant(s): DAMD17-01-1-0735
Report No.(s): AD-A406122; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Most epithelial cell cancers (cervix, colon, skin, prostate, breast, etc.) develop from precursor lesions resulting from an accumulation of mutations in growth regulatory genes. Such precursor lesions have not been identified for OVCA but it has been proposed that OVCAs arise by a multistep process through increasingly aggressive stages. We have shown that immortalized human ovarian surface epithelial (HOSE) cells undergo stepwise progression to the malignant phenotype in vitro. We now hypothesize that this phenotypic presentation reflects changes in the expression of genes in biochemical pathways required for transition from benign cells to malignantly transformed cells. The long-range goal of these studies is to identify aberrantly expressed genes in NOSE cells at various stages along the path to the malignant phenotype for the purpose of characterizing biochemical pathways whose expression is dysregulated.
DTIC
Biochemistry; Cancer; Gene Expression; Ovaries; Epithelium

20020083092 Houston Univ., TX USA

Functional Analysis of C-CAM Tumor Suppressor Gene by Targeted Gene Deletion ***Annual Report, 1 Jan. 2001-31 Dec. 2001***

Lin, Sue-Hwa; Jan. 2002; 23p; In English

Contract(s)/Grant(s): DAMD17-00-1-0031

Report No.(s): AD-A406123; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

C-CAM1 (also named Ceacam1) is a cell adhesion molecule of the immunoglobulin supergene family. We have shown that C-CAM1 plays critical roles in prostate cancer initiation and progression and that loss of C-CAM1 is an early event in the development of prostate cancer. Although tumorigenesis studies in mouse xenograft model have suggested the involvement of C-CAMl in epithelial cell growth and differentiation, the fictional roles of C-CAMl in normal prostate development, prostate homeostasis, and prostate tumorigenesis remain unclear. We propose to determine the roles of C-CAMl's growth suppressive activity in prostate growth and tumorigenesis by using gene targeting and embryonic stem cell technologies to generate C-CAMl knockout mice. We have designed a gene targeting strategy that is specific to Ceacam1 gene. In addition, the Ceacam 1 gene in the targeted vector was flanked by loxP sites to allow for generating both straight and conditional knockout of Ceacaml gene. The targeting vector has been constructed and 24 embryonic stem cell clones containing the recombinant gene allele have been established. Three of the embryonic cell clones have been injected into blastocysts for germ line transmission of the targeting construct.

DTIC

Cancer; Cell Division; Genetic Engineering; Suppressors; Functional Analysis

20020083096 Case Western Reserve Univ., Cleveland, OH USA

Prostatic Fluid Cells ***Annual Report, 1 Apr. 2001-31 Mar. 2002***

Pretlow, Thomas G.; Apr. 2002; 8p; In English

Contract(s)/Grant(s): DAMD17-01-1-0039

Report No.(s): AD-A406134; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Most research that requires the long-term propagation of prostate cancer (PCA) cells in culture is carried out with three cell lines: DU 145, PC-3, and LNCaP. Ml of these lines were derived from metastases; only one, LNCaP, makes prostate specific antigen (PSA) and/or androgen receptor. Neither DU 145 nor PC-3 exhibit any phenotypic markers specific for prostatic epithelial cells. Better models are needed. There is evidence that some prostatic fluids contain PCA cells. For this proposal, our goals are (1) to test the tumorigenicity of and to develop transplantable xenografts from PCA cells in prostatic fluid, (2) to develop methods for enhancing the tumorigenicity of small numbers of these PCA cells without deliberately altering their genes, (3) to test these methods for enhancement of tumorigenicity with prostatic fluid cells, and (4) to initiate clinical follow-up. to date, we have detected a marginal elevation of PSA in the blood of one mouse that received prostatic fluid cells 28 days after injection, unequivocal elevation of PSA in the blood of two mice 2-4 months after transplantation, and no elevation of PSA 6 months after transplantation. We have studied the coinjection of lethally irradiated, growth-factor-producing cells from several tumors with encouraging results in the case of some tumors.

DTIC

Cancer; Genes; Prostate Gland; Fluids; Cells (Biology)

20020083097 Duke Univ., Medical Center, Durham, NC USA

Relationships of Stress Exposure to Health in Gulf War Veterans ***Annual Report, 1 Oct. 2000-30 Sep. 2001***

Fairbanks, John A.; Oct. 2001; 47p; In English

Report No.(s): AD-A406137; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Original Study Summary. Research on Gulf War (GW) illnesses leaves many questions unanswered about diagnostic syndromes of GW illnesses, dimensions of stressor exposures encountered by OW veterans, relations among stressor exposures and GW syndromes or symptoms, and factors that may mediate these relationships. The proposed study has five key aims intended to address these gaps and enhance understanding of illnesses reported by GW veterans: (1) to identify and examine dimensions of illnesses and health problems commonly reported by GW veterans; (2) to assess exposures to environmental toxins and psychosocial stressors comprehensively and to identify the dimensions of these exposures; (3) to examine the extent to which particular types of dimensions of exposure experienced during deployment and participation in Operation Desert Shield/Desert Storm (ODS/S) are associated with the commonly reported and undefined post-war health problems of GW veterans; (4) to clarify how premilitary and predeployment adversities, risk factors, and protective factors affect GW illness outcomes; (5) to examine the mediating role of post-ODS/S factors (e.g., instrumental and emotional social support, general psychological functioning, specific comorbid psychiatric disorders, such as posttraumatic stress disorder and depression) on GW illness outcomes. These

aims will be achieved by obtaining in-depth data from a national probability sample of GW veterans, including both men and women in active and reserve components.
DTIC
Warfare; Health Physics; Persian Gulf; Stress (Psychology)

20020083098 Yale Univ., School of Medicine, New Haven, CT USA
Permanent Implantation Brachytherapy for Prostate Cancer Using a Mixture of Radionuclides With Different Half Lives ***Annual Report, 1 Mar. 2001-28 Feb. 2002***
Nath, Ravinder; Mar. 2002; 41p; In English
Contract(s)/Grant(s): DAMD17-00-1-0052
Report No.(s): AD-A406180; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of the project is to test whether the therapeutic effectiveness of permanent implant brachytherapy for prostate cancer can be improved by using a combination of short and long half life radionuclides simultaneously. A theoretical model for continuous low dose rate irradiation using a mixture of radionuclides has been developed. Experiments have been performed using BAll12 tumor cells and Chinese Hamster cells growing in vitro and BAlll2 cells growing in vivo as solid tumors in WAG/rij rats. Radiobiology parameters for these cells have been determined and used in the theoretical radiobiology model to improve our understanding of the experimental observations. We have designed and fabricated applicators for in vivo irradiations as well as developed the animal care procedures. We have performed in vivo experiments for tumor growth studies using the BAlll2 rat model with 1251 seed applicators. Further experiments with 103Pd and mixed radionuclides are in progress. The in vivo studies with the rat model have been very difficult to perform because of the nature of these brachytherapy experiments, which involve long irradiation times. We would focus on completing the studies using the rat model in the next year.
DTIC
Radiation Damage; Prostate Gland; Cancer; Irradiation

20020083100 Virginia Polytechnic Inst. and State Univ., Management Systems Labs., Blacksburg, VA USA
Insecticide Exposure in Parkinsonism ***Annual Report, 1 Jan. 2000-31 Dec. 2001***
Bloomquist, Jeffrey R.; Jan. 2002; 38p; In English
Contract(s)/Grant(s): DAMD17-98-1-8633
Report No.(s): AD-A406185; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Behavioral, neurochemical, and immunocytochemical studies characterized the possible role of insecticide exposure in the etiology of Parkinson's disease as it may relate to Gulf War Syndrome. Chlorpyrifos (CP) and permethrin (PM) were given 3 times over a two week period by injection (CP subcutaneous and PM intraperitoneal) with or without a single dose of the Parkinsonian neurotoxin, MPTP (10-30 mg/kg, intraperitoneal) . Some synergism was observed at 30, but not 10 mg/kg MPTP with respect to behavior and dopamine depletion. PM (0.8-1.5 mg/ kg) increased dopamine transporter protein expression 30%, similar to its ability to increase dopamine uptake and GBR12935 binding at these doses. Time course studies showed that the magnitude of transporter expression increased to roughly double the value of controls 4 weeks after treatment, suggesting a slow process underlies this effect. In immunocytochemical studies, PM at 200 mg/kg, and mixed doses of PM and CPF (200 and 50 mg/kg, respectively) showed no change in tyrosine hydroxylase staining, but did cause an increase in glial fibrillary acidic protein consistent with neuronal injury. Similarly, PM (200 mg/kg) and CPP (75 mg/kg) down regulated both high and low affinity binding sites for the nicotinic receptor ligand, epibatidine. Further work is underway to characterize this down regulation.
DTIC
Insecticides; Occupational Diseases; Neurophysiology; Diseases

20020083103 Burnham Inst., La Jolla, CA USA
New Anti-Metastatic and Anti-Angiogenic Compound for Ovarian Cancer ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Ruoslahti, Erkki I.; Sep. 2001; 14p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0556
Report No.(s): AD-A406191; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed a novel substance, a polymeric form of fibronectin that we have named sFN, which has profound anti-tumor activities. Importantly, there seems to be no toxicity associated with systemic sFN treatment, even when given over several months. At least two characteristics of sFN contribute to its anti-tumor effects: it is both anti-angiogenic and anti-metastatic. sFN is a complex of fibronectin itself and a fragment from fibronectin, anastellin, which binds tightly to fibronectin and causes polymerization of fibronectin. We have now found that anastellin alone reproduces the anti-angiogenic effects of sFN and that plasma fibronectin is needed for anastellin to work in vivo. This is an important advance in understanding

how anastellin (and other anti-angiogenic proteins) function. sFN is particularly effective in suppressing the growth and spreading of experimental ovarian cancer in mice. Anastellin, which would be easier to produce and administer may be a better compound to attempt to advance into clinical trials.
DTIC
Polymerization; Plasmas (Physics); Cancer; Metastasis

20020083104 Boston Univ., Boston, MA USA
A Re-Examination of Neuropsychological Functioning in Persian Gulf War Era Veterans ***Annual Report, 24 Jan. 2001-23 Jan 2002***
White, Roberta F.; Feb. 2002; 44p; In English
Contract(s)/Grant(s): DAMD17-00-1-0063
Report No.(s): AD-A406193; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Existing data from our group suggest that Gulf War (GW) veterans score worse on a specific group of neuropsychological tests than GW-era veterans not deployed to the Gulf. These findings raise the possibility of subtle, ”subclinical” central nervous system (CNS) damage associated with Gulf deployment. A critical question is whether these findings may be attributable to exposure to neurotoxicants in the Gulf environment. Recently some PGW%1 veterans have reported that their cognitive functioning has been worsening over the time since their return from the Gulf. This report is at odds with the usual course of CNS effects of intoxication, which generally remit or remain static in the absence of exposure. The reports of declining cognition raise the issue of exposure to toxicants that might produce a progressive condition versus the existence of other conditions that might affect cognition in individuals who are experiencing progressive functional declines. The specific aims of the project are: 1) to determine whether objective test measures reveal progressive diminution in cognitive function by comparing test performance observed initially (1995-1998) to performance 4 years (+/- 6 months) later and 2) to identify the factors associated with any cognitive diminution including chemical exposures, stress, or psychiatric disorders.
DTIC
Central Nervous System; Neurology; Psychology; Warfare; Persian Gulf

20020083106 Georgetown Univ., Washington, DC USA
Gene Therapy for Prostate Cancer Radiosensitization Using Mutant Poly (ADP-Ribose) Polymerase ***Annual Report, 1 Jan.-31 Dec. 2001***
Soldatenkov, Viatcheslav A.; Jan. 2002; 20p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0019
Report No.(s): AD-A406195; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
During the first year of funding we have developed a recombinant plasmid (pPSA (e/p)-DBD/F) comprised of the coding region of the PARP-DBD linked to 5’-flanking sequences (1.3 kb upstream enhancer/0.6 kb minimal promoter) of the human PSA gene. The present study reports the development and characterization of LNCaP prostate carcinoma cell sublines expressing the human PARP-DBD protein in constitutive and androgen-inducible fashion. Tissue specificity of PARP-DBD expression in human tumor cells was confirmed using the PSA-positive (LNCaP) and PSA-negative (PC-3) prostate cancer cells and cells of non-prostate origin, Ewing’s sarcoma (A4573 cells). We found that exposure of LNCaP cells stably transfected with pPSA (e/p)-DBD/F to synthetic androgen (R1881) resulted in dose-dependent stimulation of PARP-DBD expression at levels of mRNA and protein. Androgen-dependent fashion of PARP-DBD expression in LNCaP cells was further confirmed by in situ immunodetection of DBD-Flag fusion protein using fluorescence microscopy. Established cell lines provide a convenient experimental model to study effects of the PARP-DBD expression on prostate tumor responses to ionizing radiation and genotoxic drugs.
DTIC
Genetic Engineering; Gene Therapy; Cancer; Dosage

20020083107 Colorado Univ., Health Sciences Center, Denver, CO USA
The Identification of Genes Differentially Regulated by Progestins and Glucocorticoids in Human Breast Cancer Cells ***Annual Report, 1 Jul. 1999-30 Jun. 2002***
Wan, Yihong; Nordeen, Steven K.; Jul. 2002; 42p; In English
Contract(s)/Grant(s): DAMD17-99-1-9445
Report No.(s): AD-A406196; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Glucocorticoids and progestins bind to receptors that share many structural and functional similarities. Nonetheless, they mediate district biological functions. Progestins are associated with the incidence and progression of breast cancer, whereas

glucocorticoids are growth suppressive in mammary cancer cells. to understand the mechanisms that engender biological specificity, we have employed two systematic approaches to identify genes that are differentially regulated by the two hormones. The first approach is a retroviral promoter-trap, which allowed the identification of two novel genes that are differentially regulated as well as another novel gene induced by both hormones. The second strategy is to utilize Affymetrix microarrays to compare glucocorticoid- and progestin- regulated gene expression in a human breast cancer cell line. This global analysis reveals that the two hormones regulate overlapping but distinct sets of genes, including 31 genes that are differentially regulated. Examination of the set of differentially regulated genes suggests mechanisms behind the distinct growth effects of the two hormones in breast cancer. The differential regulation of four genes was confirmed by RT-PCR and northern blot analyses. Detailed analyses of genes identified here will furnish a mechanistic understanding of differential gene regulation by glucocorticoids and progestins in breast cancer.
DTIC
Hormones; Hormone Metabolisms; Cancer; Genes; Gene Expression

20020083108 East Carolina Univ., Greenville, NC USA
Culturally Based Intervention for Breast Cancer in Rural African Americans ***Final Report, 1 Sep. 1996-30 Nov. 2001***
Lannin, Donald R.; Dec. 2001; 97p; In English
Contract(s)/Grant(s): DAMD17-96-1-6142
Report No.(s): AD-A406197; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
The purpose of this project is to develop methods to encourage earlier detection of breast cancer in rural African Americans. Our focus is on cultural and psychosocial beliefs that contribute to patient delay in seeking treatment for the symptoms of breast cancer. For the intervention phase, educational programs featuring a documentary video, public service announcements, and culturally sensitive brochures have been presented to over 2100 people in Pitt County. The final phase of the project involved post intervention surveys of women in both Pitt and Wilson Counties. Over 1400 surveys were completed and data analysis is currently underway.
DTIC
Signs and Symptoms; Cancer; Education

20020083109 Yale Univ., New Haven, CT USA
Growth Factor Antagonism in Breast Cancer Chemotherapy ***Final Report, 1 May 1999-30 Apr. 2002***
Hamilton, Andrew D.; May 2002; 64p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9458
Report No.(s): AD-A406198; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The primary focus of this work is the identification of molecules that block the interaction of growth factors with their receptor tyrosine kinases (RTKs) . We have designed, synthesized and evaluated a novel series of synthetic agents that bind to the surface of growth factors and block their interaction with their RTKs. We have now prepared two classes of protein binding agents. The first involves the attachment of four peptide loops to a central scaffold based on the calix4arene unit. The second is based around a tetraphenylporphyrin unit in which different recognition groups are attached. We have identified one molecule that binds to the surface of platelet derived growth factor and shows potent antitumor activity in a mouse xenograft model of a human cancer that is activated by PDGF. From a different family of agents we have identified a molecule that binds tightly to epidermal growth factor.
DTIC
Chemotherapy; Peptides; Molecules; Proteins; Tyrosine

20020083169 Texas Univ., Southwestern Medical School, Dallas, TX USA
Telomere Length and Genomic Stability as Indicators of Breast Cancer Risk ***Annual Report, 1 May 2001-30 Apr. 2002***
Baur, Joseph A.; Shay, Jerry W.; May 2002; 12p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0419
Report No.(s): AD-A406125; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Telomeres are repetitive sequences that protect the ends of linear chromosomes and shorten during each cell division. Very short telomeres have been associated with changes in gene expression (in yeast) and decreased genomic stability. In the first year we published the first proof that silencing effects can occur at human telomeres. A luciferase reporter near a telomere showed on average a 10-fold reduction in expression relative to internal control genes. Furthermore, we showed that the silencing is reversible through inhibition of hi stone deacetylases and that the strength of silencing is dependent on telomere length. Only 5-10% of breast

cancers are hereditary and very little is known about the factors influencing sporadic cases. Further study of gene expression near telomeres will help determine whether telomere length could play a role in the progression of breast cancer.
DTIC
Cancer; Genome; Mammary Glands; Stability; Gene Expression

20020083171 Fox Chase Cancer Center, Philadelphia, PA USA
Ovarian Cancer Prevention Program ***Annual Report, 30 Sep. 2000-29 Sep 2001***
Engstrom, Paul F.; Oct. 2001; 40p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8650
Report No.(s): AD-A406118; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals of this research are to develop interdisciplinary studies of the etiology, biology and prevention of ovarian cancer. Project I, Ovarian Cancer Consortium has registered 687 participants including 234 patients representing 320 families. The Core Laboratory has collected, processed and banked biospecimens from 496 subjects. Project II, Facilitating Decision Marking About Prophylactic Oophorectomy: baseline data on 80 women are available for preliminary analysis; 15 women, (19%) made a decision about having prophylactic oophorectomy while 66 women (76%) have not made a decision, and 4 women (5%) did not answer the questionnaire. Fifteen women said they would likely have a prophylactic oophorectomy in the near future. Project II, Phase II chemoprevention Study of Ovarian Cancer: this placebo-controlled randomized protocol using 4HPR has been written, approved by the Dept. of Defense, the National Cancer Institute Chemoprevention Branch, and the FDA. The Gynecologic Oncology Group has implemented the study throughout the country for interested gynecologic oncologists. Data entry and quality control systems have been established and 14 different case report forms are finalized. Seven women have signed consent forms, 6 were enrolled in the Ovarian Tissue Donation Portion of the study, and one has randomized to treatment and completed her prophylactic oophorectomy in March 2000.
DTIC
Cancer; Etiology; Ovaries; Gynecology

20020083172 Fox Chase Cancer Center, Philadelphia, PA USA
Quality of Life After Prophylactic Oophorectomy ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Daly, Mary B.; Sep. 2001; 7p; In English
Contract(s)/Grant(s): DAMD17-00-1-0568
Report No.(s): AD-A406115; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Epithelial ovarian cancer continues to be the leading cause of death from gynecologic cancer in the USA and is responsible for over 14,500 deaths per year. The availability of cancer risk counseling and genetic testing for BRCA1 and BRCA2 have prompted increasing numbers of women to seek information about their ovarian cancer risk estimation and advice on risk reduction strategies. Because effective methods for early detection are so limited, primary prevention options are actively being sought. A primary surgical preventive option being considered by increasing numbers of women is prophylactic oophorectomy, a procedure that can now be performed laparoscopically with minimal surgical morbidity. However, little data exists on the long-term physical, psychological and social consequences of such surgery. Identifying the quality of life issues following oophorectomy through this pilot study will foster a better understanding of the multidimensional process experienced by women in this situation, in order to better address their needs and to facilitate effective preventive actions.
DTIC
Ovaries; Cancer; Prophylaxis; Genetics

20020083173 Howard Univ., Cancer Center, Washington, DC USA
Relationships Between IGF-1, IGF-Binding Proteins and Diet in African American and Caucasian Men ***Annual Report, 15 Dec. 2000-14 Dec 2001***
Agurs-Collins, Tanya; Jan. 2002; 37p; In English
Contract(s)/Grant(s): DAMD17-00-1-0024
Report No.(s): AD-A406111; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The study aims to determine racial differences between insulin-like growth factor-I (IGF-1), insulin-like binding protein -2 (IGFBP-2), insulin-like binding protein-3 (IGFBP-3), prostate specific antigen (PSA), testosterone, body mass index (BMI), and diets high in calories, protein and fat. Specifically, the study objectives are to: 1) define racial differences in serum levels of free and total IGF-1, IGFBP-2, IGFBP-3, and testosterone; 2) define how diet and BMI impact serum levels of IGF-1, IGFBP-2, IGFBP-3, testosterone and PSA in African American and Caucasian men; and 3) determine the associations between serum levels of free and total IGF-1, IGFBP-2, IGFBP-3, testosterone, PSA, BMI and specific nutrients. The proposed study will help to explain

the increased risk of prostate cancer for African American men and the role of specific nutrients in influencing IGF-1 and IGF-binding protein concentrations. This report covers primarily patient accrual activities during the first and second year of the project. These activities include finalizing the clinical protocol, hiring and training of study personnel, reviewing clinical questionnaires to determine study eligibility, and determination of stored frozen samples for use. A total of 544 men were recruited to participate in the study. Approximately 599 assays have been analyzed for IGF- 1, IGFBP-2, and IGFBP-3. A total of 100 men were stratified and randomized for the telephone interview. of this number, 25 men were interviewed to determine nutritional intake.
DTIC
Diets; Insulin; Males; Proteins; Races (Anthropology); Genes

20020083177 Washington Univ., Grant and Contract Services, Seattle, WA USA
Ex Vivo Expansion of HER2-Specific T Cells for the Treatment of HER2-Overexpressing Breast Cancer ***Annual Report, 3 Apr. 2001-2 Apr 2002***
Knutson, Keith L.; May 2002; 117p; In English
Contract(s)/Grant(s): DAMD17-00-1-0492
Report No.(s): AD-A406151; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Adoptive T cell therapy has the potential to eradicate existing malignancy in humans. I have been investigating the immune effector arms most efficacious in eradicating malignancy in the neu-transgenic mouse model. These mice develop spontaneous tumors that are histologically similar to those observed in humans. Two helper peptides, p781-795 and pll66-ll8O, of neu have been identified to which T helper cell lines can be generated. The T cell lines are CD4+ and demonstrate a Thl phenotype with the production of IFN-gamma but not ITh-4. Cell lines derived using these peptides, were tested for the ability to eradicate existing bulky malignancy. It was observed that T cell injection resulted in a partial tumor response when cells line were used individually. Small increases in survival time were observed. When the cell lines were combined, survival was also improved and some tumors had lost antigen neu expression at the cell surface. In addition to ThI immunity it is hypothesized that other immune effector arms, such as Th2, could also be effective. Vaccination strategies have been developed that elicit Th2 T cells. Expansion of Th2 cells ex vivo and their therapeutic efficacy is being examined. A monoclonal antibody therapy strategy has also been developed that will be tested in combination with adoptive T cell transfer. Techniques for optimal ex vivo expansion of human HER-2/neu-specific T cells are also being developed. Peptide presentation during culture can impact antigen-specific T cell responsiveness of human T cell lines. The inclusion of IL-l2 during culture with HER-2/neu peptides can greatly enhance the antigen-specificity of the cultures. The findings in the animal model and ex vivo expansion of human T cells will be directly translated to human clinical trials of adoptive T cell therapy.
DTIC
Antibodies; Lymphocytes; Cells (Biology); Mammary Glands; Cancer

20020083178 Brigham and Women's Hospital, Boston, MA USA
Mapping Critical DNA Sequence Elements Required for Amplification of erbB2 in Breast Cancer ***Annual Report, 3 Apr. 2001-2 Apr 2002***
Machida, Yuichi; Dutta, Anindya; May 2002; 30p; In English
Contract(s)/Grant(s): DAMD17-00-1-0166
Report No.(s): AD-A406150; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Recent studies show that 80-90% of breast carcinomas are associated with gene amplification. Each amplicon most likely has an origin of replication. In Drosophila, DmORC (Origin Recognition Complex) binds to specific DNA sequences and this binding is essential for chorion gene amplification. to study the implications of replication initiator proteins to gene amplification, we characterized two proteins required for DNA replication (ORC2 and Mcml0). We created hypomorphic mutation in the ORC2 gene of a cancer cell line through homologous recombination. We found that these cells failed to support the replication of an extrachromosomal plasmid bearing the oriP replicator of Epstein Barr virus (EBV). Geminin, an inhibitor of replication initiation complex, inhibited replication of this episome. The result identifies a novel means by which to cure cancer with gene amplification where the amplicons are carried as episomes. We also report that Xenopus Mcml0 (XMcml0) is not required for origin binding of XMcm2-7. Instead, the chromatin binding of XMcml0 at the onset of DNA replication requires chromatin-bound XMcm2-7, and it is independent of Cdk2 and CDC7. In the absence of XMcml0, XCDC45 binding, XRPA binding, and initiation-dependent plasmid supercoiling are blocked. Therefore, XMcml0 performs its function after pre-RC assembly and before origin unwinding.
DTIC
Deoxyribonucleic Acid; Cancer; Mammary Glands; Genes

20020083179 Utah Univ., Salt Lake City, UT USA

Role of Mammalian Homologs of the Drosophila Discs Large 1 (dlg 1) Gene in the Genesis of Epithelial Ovarian Cancer ***Annual Report, 1 Oct. 2000-30 Sep. 2001***

Adashi, Eli Y.; King, Gretchen J.; Stoltzman, Carrie A.; Kirkman, Nikki J.; Oct. 2001; 12p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0588

Report No.(s): AD-A406149; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We implemented an approach toward investigating the development and progression of ovarian cancer that involved ”species hopping”. This approach made use of strong genotype-phenotype correlations in Drosophila melanogaster to identify a fly tumor suppressor gene, discs large 1 (dlg 1), whose mouse homologs could serve as candidates for study into the etiology of mammalian ovarian cancer. The proposed study was designed (1) to identify% dlg 1 homologs whose gene products were localized to the cells of the ovarian surface epithelium (0 SE), (2) to generate mice bearing a systemic deletion of a dlg 1 homolog normally expressed in the OSE, and (3) to characterize the ovarian phenotype resulting from such systemic deletion of the selected homolog. As a result of effort toward accomplishing the first goal, protein products of the mouse genes SAP 102 and ZO-l were identified by immunodetection in granulosa cells, but not in OSE. ZO-3 protein was identified by immunodetection in oviduct lumen epithelium, but not in OSE. Both ZO-2 and CASK proteins were immunodetected in OSE, but were also present in other ovarian cell types. Efforts at localizing the Dlgh1, Dlgh2, Dlgh3, pS5 and PSD95 proteins are ongoing and may yet provide a candidate for further study by systemic deletion.

DTIC

Cancer; Ovaries; Genes; Etiology

20020083180 Texas Univ. Health Science Center, San Antonio, TX USA

Regulation of BRCA1 Function by DNA Damage-Induced Site-Specific Phosphorylation ***Annual Report, 1 May 2001-30 Apr. 2002***

Boyer, Thomas G.; May 2002; 48p; In English

Contract(s)/Grant(s): DAMD17-01-1-0408

Report No.(s): AD-A406148; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

BRCA1, a hereditary breast and ovarian specific tumor suppressor, ensures genomic integrity through its control of transcription and repair of damaged DNA. Considerable evidence implicates DNA damage-induced site-specific phosphorylation in the modulation of its biological activity. However, it is not presently clear whether and how the transcription and DNA repair activities of BRCA1 are modulated in response to DNA damage signals. We have engineered and refined a unique combination of biochemical and genetic tools to address this issue. First, we have developed a biochemical means by which to resolve BRCA1-containing complexes involved in transcription from those involved in DNA double-strand break repair. This should render it feasible to identify DNA damage-induced site-specific phosphorylation events with potential functional relevance to the role of BRCA1 in these two processes. Second, we have established fibroblast cultures from brca1-deficient mouse embryos and developed BRCA1-dependent transcription and repair assays based on the use of these cells. This system will expedite the facile and efficient analysis of the effects of targeted BRCA1 mutations at identified or predicted sites of phosphorylation on its transcription and DNA repair activities. Collectively, these studies should illuminate the molecular basis for the caretaker properties of BRCA1.

DTIC

Deoxyribonucleic Acid; Phosphorylation; Cancer; Mammary Glands

20020083181 Rush-Presbyterian-Saint Luke’s Medical Center, Chicago, IL USA

SPECT and fMRI Analysis of Motor and Cognitive Indices of Early Parkinson’s Disease: The Relationship of Striatal Dopamine and Cortical Function ***Annual Report, 1 Oct. 2000-30 Sep. 2001***

Gabrieli, John D.; Oct. 2001; 8p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-99-1-9498

Report No.(s): AD-A406147; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This is a research paper concerning: SPECT (Single Photon Emission Computed Tomography) and fMRI (Functional Magnetic Resonance Imaging) Analysis of Motor and Cognitive Indices of Early Parkinson’s Disease: The Relationship of Striatal Dopamine and Cortical Function.

DTIC

Cognition; Nervous System; Parkinson Disease; Tomography

20020083183 California Univ., Los Angeles, CA USA

Genetic Definition and Phenotype Determinants of Human Ovarian Carcinomas ***Annual Report, 1 Oct. 2000-30 Sep. 2001***

Karlan, Beth Y.; Oct. 2001; 85p; In English

Contract(s)/Grant(s): DAMD17-99-1-8503

Report No.(s): AD-A406144; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Ovarian cancer is the fourth leading cause of cancer-related death in U.S. women. This program project approaches the ovarian cancer problem by: 1) Establishing a human ovarian tissue and clinical data base core facility to support the proposed projects and future investigations; 2) Identifying genes which are differentially expressed in ovarian cancers and thereby discovering biomarkers for early detection; 3) Studying ovarian tumorigenesis in ovarian tissues obtained from gremlin BRCA 1 mutation carrier to better understand the interaction between mutational inactivation of BRCA 1, the cellular caretaker gene and p53, the cellular gatekeeper gene; and 4) Developing a genetically defined mouse model of epithelial ovarian cancer. to date, the ovarian tissue core has banked over 160 surgical specimens and provided sufficient resources for the ongoing projects and other collaborative research on ovarian cancer etiology. Representational difference analysis was used to identify 160 genes specific for normal ovarian epithelium and 95 genes specific for ovarian cancer. The BRCA 1 mutation associated ovarian tissues required to understand the functional interaction between of p53 and BRCA1 have been identified. And, a new viral construct carrying the cre recombinase under the control of the Kl 8 promoter has been tested to establish its ability to mediate recombination in mouse ovarian epithelial cells.

DTIC

Epithelium; Etiology; Ovaries; Cancer; Genes

20020083184 Duke Univ., Medical Center, Durham, NC USA

Rapamycin Inhibits Estrogen-Mediated Transcription in Breast Cancer Cell Lines ***Annual Report, 1 Jul. 1999-30 Jun. 2000***

Merine, Kendra M.; Marks, Jeffrey R.; Jul. 2000; 17p; In English

Contract(s)/Grant(s): DAMD17-97-1-7225

Report No.(s): AD-A406142; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Breast cancer is the second most common malignancy affecting women in the USA. Approximately 182,000 new cases are diagnosed each year. In 1866, Broca was the first to recognize the heritability of breast and ovarian cancer in certain families. In 1990 transmission of breast cancer was genetically linked to a locus on the long arm of chromosome 17. This was followed by the localization of the genes responsible for site-specific hereditary breast cancer and breast/ovarian cancer tandems, BRCA1 and BRCA2. These discoveries led to the important quest to determine how these genes function and what if any role they might play in sporadic (non-hereditary) forms of breast cancer. The types of mutations that have been described in the BRCA genes are consistent with loss of function, a characteristic of tumor suppressor genes. Loss of heterozygosity (LOH) at the BRCA1 locus occurs in approximately 50-70% of sporadic breast and ovarian cancers. LOH at the BRCA2 locus occurs in 30-40% of sporadic breast and ovarian tumors. As with other hereditary tumor suppressor genes (e.g. p53 and APC), it was anticipated that BRCA1 and BRCA2 genes have shown few mutations in non-hereditary breast cancer.

DTIC

Mutations; Genes; Cancer; Mammary Glands; Heredity

20020083192 Medical Univ. of South Carolina, Charleston, SC USA

Development of Triplex-Forming Oligonucleotides to Inhibit Expression of the c-myc Oncogene in Breast Cancer Cells ***Annual Report, 6 Mar. 2001-5 Mar 2002***

McGuffie, Eileen M.; Catapano, Carlo V.; Apr. 2002; 7p; In English

Contract(s)/Grant(s): DAMD17-00-1-0339

Report No.(s): AD-A406166; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Triple helix-forming oligonucleotides (TFOs) directed to regulatory sequences in gene promoters can selectively block transcription. We are investigating TFO-mediated reduction of c-myc oncogene expression as a means of decreasing breast tumor growth. We designed a novel parallel/antiparallel TFO (Myc-GTC) that had high binding affinity in vitro, but required modifications for increased stability in cells. to further optimize TFO activity we investigated effects of conjugation with the anthracycline antibiotic daunomycin (Dnm), which intercalates into double-stranded DNA. We synthesized short Dnm-conjugated TFOs corresponding to parallel and antiparallel elements of Myc-GTC. Electrophoretic mobility shift and footprinting assays showed that Dnm-TFOs formed highly specific, stable triplex. Dnm-TFOs inhibited binding to the target duplex of transcription-activating proteins present in MCF-7 nuclear extracts. Fluorescence microscopy determined that Dnm-TFOs were efficiently internalized by MCF-7 cells. At nanomolar concentrations, a Dnm-TFO inhibited expression in

MCF-7 and MDA-MB-23 1 cells of a luciferase gene under the control of the c-myc promoter. These results suggest that Dnm-conjugated TFOs are effective in cells, and that Dnm may stabilize binding of the full-length parallel/ antiparallel TFO in cells.
DTIC
Deoxyribonucleic Acid; Oncogenes; Cancer; Mammary Glands

20020083204 South Carolina Univ., Columbia, SC USA
Interrelationship of Prenatal and Postnatal Growth, Hormones, Diet and Breast Cancer ***Annual Report***
Sanderson, Maureen; Jun. 2002; 40p; In English
Contract(s)/Grant(s): DAMD17-00-1-0340
Report No.(s): AD-A406330; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this Career Development Award was to expand Dr. Sanderson's current breast cancer research from the effect of intrauterine exposure to estrogen on breast cancer to the interrelationships of prenatal and postnatal growth, hormones, diet and breast cancer. Eased on these interrelationships, we hypothesized that insulin resistance will be positively associated with breast cancer. Further, we hypothesized that genetic susceptibility, and adolescent/ adult diet and physical activity will modify the effect of insulin resistance on breast cancer. Specific aims were: 1) to undergo intensive training in cancer biology, and nutritional, molecular and genetic epidemiology, 2) to obtain funding to conduct case-control studies of the insulin resistance-breast cancer relationship, and 3) to obtain funding to conduct a cohort study of the association between prenatal and postnatal growth and infant hormone levels. During the second year of the study, Dr. Sanderson audited Introduction to Genetic and Molecular Epidemiology, conducted analyses of dietary intake and anthropometric measurements from the Shanghai Breast Cancer Study, submitted a preproposal for a HECUIMI Partnership Award to the Department of Defense to investigate insulin resistance and breast cancer, and participated in the Lower Rio Grande Valley Nutrition Intervention Research Initiative consortium.
DTIC
Hormones; Metabolism; Cancer; Mammary Glands

20020083205 Brigham and Women's Hospital, Boston, MA USA
Multidisciplinary Strategies in the Prevention and Early Detection of Ovarian Cancer ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Mok, Samuel C.; Sep. 2001; 258p; In English
Contract(s)/Grant(s): DAMD17-99-1-9563
Report No.(s): AD-A406315; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This program project consists of 4 research projects. Project I studies genetic changes in microdissected microscopic Stage I ovarian cancer cells, and identify markers for early detection of the disease. Using state of the art technology, we have shown that different histological subtypes of ovarian cancer have different allelic loss profiles. Furthermore, we have also identified several candidate serum markers including prostasin, and GA733 autoantibody, which may be used as markers for early detection of ovarian cancer. Project II evaluates the use of Protease M as early diagnostic marker for ovarian cancer. We have shown that Protease M is secreted by ovarian cancer cells, and is highly expressed in ovarian tumors of different stages and subtypes. Project III studies the effect of hormones on growth and differentiation of normal ovarian surface epithelial cells, evaluate whether they contribute to ovarian carcinogenesis. We have established an in vitro system to evaluate the effect the various hormones on the growth of normal ovarian epithelial cells. We have shown that El, E2, and FSH can induce cell proliferation and enhance colony formation potential in soft agar. Project IV uses lysophospholipids (LPA) to develop a highly sensitive and specific marker for the early detection of ovarian cancer. Using the newly developed ESI-MS-based method, we have found that besides LPA, other lysophospholipids, including alkyl-LPA, alkenyl-LPA, LPI, SPC, and LPC are also elevated in ascites from patients with ovarian cancer. Receptors of SPC and LPC have also been identified.
DTIC
Detection; Cancer; Ovaries

20020083206 Michigan Univ., Ann Arbor, MI USA
Gene Transfer Using StarburstTM Dendrimers
Kukowska Latallo, J. F.; Bielinska, A. U.; Chen, C.; Rymaszewski, M.; Tomalia, D. A.; Jan. 1998; 98p; In English
Report No.(s): AD-A406313; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The new class of synthetic, highly branched, spherical Starburst(Trademark) polyamidoamine (PAMAM) dendrimer polymers is unique in structure. These molecules are uniform in size with a high density of charged primary amino groups restricted to the surface, as well as being highly soluble and stable in aqueous solution. The major structural differences in PAMAM dendrimers relate to the initiator molecule, either ammonia (NH3) as trivalent or ethylenediamine (EDA) as a tetravalent

core, that starts the stepwise polymerization process and determines the overall shape, density, and surface charge of the molecule. With each new layer, or generation, the molecular weight of the polymer more than doubles and the number of surface amino groups exactly doubles. Dendrimers range in size from 10 to 130 A, with each polymerization step adding approximately 10 A to the diameter of the molecule. At least 10 generations of both types of PAMAM dendrimers (NH3 and EDA core) can be synthesized. Each final dendrimer preparation is purified using ultrafiltration and structurally characterized using a number of techniques including electrospray-ionization mass spectroscopy, C-13 and H-1 nuclear magnetic resonance spectroscopy, size exclusion chromatography, capillary electrophoresis, high performance liquid chromatography (HPLC), and gel electrophoresis. Starburst(Trademark) PAMAM dendrimers are identified using a standard nomenclature; for example G10 EDA is the 10th generation of an EDA core dendrimer. PAMAM dendrimers are currently the only class of dendritic macromolecules that are reliably produced in large quantities and that can be precisely synthesized over a broad range of molecular weights.
DTIC
Genes; Dendrimers

20020083209 University of Southern California, Los Angeles, CA USA
Plant Estrogens: Effects on Cell Cycle Progression in Breast Cancer Cells ***Annual Report, 1 Jun. 2001-31 May 2002***
Cadenas, Enrique; Jun. 2002; 33p; In English
Contract(s)/Grant(s): DAMD17-99-1-9375
Report No.(s): AD-A406272; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We investigated the cellular uptake of genistein by p53-deficient T47 cells and the effects of genistein on redox status and cell cycle progression as well as signaling pathways. Cell-associated levels of genistein and metabolite in T47D breast cancer cells at 2 and 24 hours were increased. In comparison with other dietary flavanoids, cell-associated levels of genistein were relatively higher in breast cancer cells treated with genistein (5-50 mM). This metabolite was also present in the medium at both 2 and 24 hours, thus suggesting that genistein is taken up into the cells where it is metabolized and extruded into the media. Genistein treatment resulted in an 80% decrease in intracellular GSH levels. Changes in redox cellular status can influence signaling pathways. Indeed, redox-sensitive protein STAT3, which controls the cell cycle inhibitor, p21, was upregulated in response to genistein treatment. Furthermore, there was an inhibition of cell proliferation and G2 cell cycle arrest, which was further supported by a downregulation of cdc-2 expression and cdc2 kinase activity. Genistein modulated mitochondrial-linked apoptotic protein. This included the upregulation Bcl-2 and Bcl-x, Apaf-1 (apoptotic protease activating factor), caspase 9, and procaspase 3, which resulted in DNA fragmentation. These results suggest that genistein is taken up into cells where it causes STAT3 and p21 upregulation, G2 cell cycle arrest, with subsequent inhibition of cell proliferation and induction of apoptosis. Collectively, these data show that genistein can elicit an antiproliferative effect via a p53-independent mechanism.
DTIC
Epidemiology; Estrogens; Mammary Glands; Cancer; Plants (Botany); Regeneration (Physiology)

20020083210 Ohio State Univ., Columbus, OH USA
Proto-oncogene PML and Tumor Evasion in Prostate Cancer ***Annual Report, 1 Nov. 2000-31 Oct. 2001***
Zheng, Pan; Nov. 2001; 122p; In English
Contract(s)/Grant(s): DAMD17-00-1-0041
Report No.(s): AD-A406271; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This is the second annual report on the grant ”Proto-oncogene PML and tumor evasion in prostate cancer”. The purpose of the grant proposal is to identify the molecular mechanisms of tumor evasion of host anti-tumor immunity. We proposed to identify the antigen presentation defects in human prostate cancer samples and to use mouse prostate cancer model (TRAMP mice) to study the immune regulation and immune tolerance in prostate cancer. In the past funding period, we have shown that thymic clonal deletion is a major mechanism for immune tolerance to tumor antigens that previously regarded as prostate specific. We provided the direct evidence that the T cell repertoire specific for tumor antigens can be shaped by negative selection in the thymus. During the process of examine antigen presentation defects in different tumor cell lines, we identified a new novel mechanism for antigen presentation gene regulation, i.e. the degradation of mRNA of an antigen presentation gene was involved in tumor evasion of immune recognition. We have also analyzed the transcription regulation of one of the antigen presentation genes and identified two new promoter regions and the essential role of the interferon response factor-binding element (IRFE) in that promoter region.
DTIC
Genes; Antigens; Viruses; Cancer; Prostate Gland; Gene Expression; Immunity

20020083214 Mayo Clinic, Rochester, MN USA

Characterization of Genetic Alterations in Ovarian Cancer ***Annual Report, 1 Oct. 2000-30 Sep. 2001***

Smith, David I.; Oct. 2001; 97p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-99-1-9504

Report No.(s): AD-A406237; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Ovarian cancer is a highly lethal malignancy specific to women. We have set up the infrastructure at Mayo for an Ovarian Cancer Research Program utilizing the rich resources of clinical material. This Program Project focuses specifically upon a genetic analysis of ovarian cancer using the transcriptional profiling strategies of cDNA microarrays and subtraction suppression hybridization. We have linked the work of cancer geneticists with cell biologists to begin to understand the functional role that some of the consistently aberrantly-regulated genes play in ovarian cancer development. There are three projects in this grant. The first project focuses on the identification of consistently down-regulated genes in ovarian cancer. The second project focuses on the role of gene amplification in familial versus sporadic ovarian cancer. The third project is to characterize genes that are consistently down-regulated in ovarian tumors that are derived from within common fragile site regions. This Program Project is centered within a larger institutional effort to better understand the biology of the development of ovarian cancer and to devise better strategies for the prevention, early detection, and treatment of this lethal disease.

DTIC

Human Resources; Clinical Medicine; Genetics; Ovaries; Cancer; Aging (Biology)

20020083215 Howard Univ., Washington, DC USA

Pharmacists as Health Educators and Risk Communicators in the Prevention of Prostate Cancer ***Annual Report, 1 Apr. 2001-31 Mar. 2002***

Warrick, Cynthia A.; Apr. 2002; 42p; In English

Contract(s)/Grant(s): DAMD17-00-1-0082

Report No.(s): AD-A406233; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to determine if and how pharmacists can play a significant part in the prevention of prostate cancer. The study is divided into three phases. Phase 1 (Year 1) involved the identification of community pharmacists who are willing to serve as health educators on prostate cancer in the community-pharmacy setting. Phase II is the design, pilot testing, and evaluation of a prostate cancer education and communication program that will be used to educate pharmacists on prostate cancer and how this information should be communicated to the public.

DTIC

Cancer; Education; Pharmacology; Prostate Gland

20020083216 Maryland Univ., Baltimore, MD USA

Fourth Annual Program in Neuroscience Symposium, Molecular Biology of Neurodegeneration ***Final Report, 1 May-1 Oct. 2001***

Fiskum, Gary; Oct. 2001; 22p; In English

Contract(s)/Grant(s): DAMD17-01-1-0756

Report No.(s): AD-A406231; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research document presents the proceedings for the fourth annual symposium entitled ”The Molecular Biology of Neurodegeneration”.

DTIC

Molecular Biology; Nervous System

20020083218 Mount Sinai Hospital, Toronto, Ontario Canada

Are p53 Mutations Associated With Increased Risk of Developing Breast Cancer? A Molecular Epidermiological Study ***Annual Report, 1 Sep. 2000-1 Sep 2001***

Kandel, Rita A.; Oct. 2001; 15p; In English

Contract(s)/Grant(s): DAMD17-99-1-9301

Report No.(s): AD-A406153; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In a case-control study, nested within a cohort of 4,888 women with EBD, we demonstrated that p53 protein accumulation detected by immunohistochemistry was associated with a 2.5-fold increase in the risk of subsequent breast. However, by using immunohistochemistry alone, we may have underestimated the true risk of developing breast cancer. We hypothesized that p53 mutations in benign breast tissue are associated with increased risk of subsequent breast cancer. We are testing our hypothesis by: (1) analyzing benign breast tissue from 138 cases and 556 controls for the presence of p53 mutations using PCR-SSCP and

PCR-direct DNA sequencing; and 2) estimating the risk of breast cancer in relation to: (a) the presence of p53 mutations in BBD; and (b) the presence of both p53 mutations and p53 protein accumulation in BBD. We also propose to compare mutations detected in the cancers with those detected in their preceding benign breast tissue samples. In the second year of the grant, we have continued the analysis of the p53 gene in DNA extracted from paraffin-embedded breast tissue. Tissue sections were cut from paraffin blocks, epithelium enriched tissue microdissected out, and DNA extracted. The DNA has undergone PCR-SSCP under two conditions for exons 2 to 1 land those with abnormal gel patterns have undergone repeat PCR-SSCP. Abnormal migrating bands have been cut from the gel. These are being sequenced. We have determined that manual sequencing rather than automated sequencing is more appropriate to analyze the p53 gene in these small benign lesions in the paraffin embedded tissue.
DTIC
Tissues (Biology); Mammary Glands; Cancer; Clinical Medicine; Genes; Mutations

20020083224 Fayetteville State Univ., NC USA
Changing the Attitudes and Behaviors of Black Men to Screening for Prostate Cancer ***Annual Report, 1 Mar. 2001-28 Feb. 2002***
Twum, Maxwell; Mar. 2002; 11p; In English
Contract(s)/Grant(s): DAMD17-00-1-0016
Report No.(s): AD-A406116; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objectives of the project are a) to explore the prevailing attitudes toward screening for prostate cancer among Black men in the Cape Fear region of North Carolina b) to determine the comparative effectiveness of a one-time presentation of information advocating prostate cancer screening to that of repeated presentation of the message, and c) to determine the characteristics and impact of the agent of information delivery on the attitudes and behaviors of Black men toward screening for prostate cancer. The study involves the presentation of uniform messages advocating the benefits of prostate cancer screening to a group of 120 Black men 40 years and older who have never screened for prostate cancer, not participated in a prostate cancer screening education program. Researchers, health professionals, and peer facilitators will deliver educational messages once to one group, and three times to a second group. The comparison of attitudes before exposure to the messages to that after exposure will help determine the impact of the program on attitudes in the groups. The number of men screened following exposure to the messages will determine the impact of the program on behavior change. The study is at the stage of recruiting eligible individuals for participation in the project.
DTIC
Cancer; Males; Prostate Gland; Human Behavior

20020083239 Duke Univ., Medical Center, Durham, NC USA
Methylation of Select Tumor Suppressor Genes in Sporadic Breast Cancer ***Final Report, 1 Jul. 1997-30 Jun. 2001***
Magee, Kendra P.; Jul. 2001; 49p; In English
Contract(s)/Grant(s): DAMD17-97-1-7225
Report No.(s): AD-A406105; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Breast cancer is the most frequently diagnosed cancer in American women and the second most frequent cause of cancer death. Breast cancer growth is regulated by estrogen. Estrogen receptor (FR) status is used to predict prognosis and to determine which patients will benefit from antihormonal therapy. Tamoxifen is the most commonly used antiestrogenic agent. Its long-term use leads to tumor resistance. This has led investigators to search for antiestrogens that can be used as second-line therapy for patients who develop tamoxifen resistant tumors. This proposal investigates the effectiveness of rapamycin as an antiestrogenic agent. Four specific aims are described: 1) Flow cytometry was used to show that rapamycin can inhibit the estrogen-induced cell cycle progression of ER+ breast cancer cells. 2) Rapamycin was found to inhibit estrogen-mediated transcription in ER+ breast cancer cells which had been transiently transfected with the artificial construct 3XERE-TATA-Luc. 3) Since rapamycin could potentially be used clinically its efficacy at inhibiting estrogen-dependent breast cancer growth in a mouse xenograft tumor model is currently being tested. 4) Some cytotoxic agents are also antiangiogenic. Three different assays; a cellular migration assay, an aortic ring assay and a corneal pocket assay are being developed to determine if rapamycin has any antiangiogenic effects.
DTIC
Genes; Methylation; Mammary Glands; Cancer

20020083240 Washington Univ., Saint Louis, MO USA
Patient Preferences for Outcomes Associated with Surgical Management of Prostate Cancer ***Final Report, 1 Oct. 1998-31 Mar. 2002***
Catalona, William; Apr. 2002; 37p; In English

Contract(s)/Grant(s): DAMD17-98-1-8498
Report No.(s): AD-A406096; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We evaluated preferences for current urinary and sexual function following radical prostatectomy in men with clinically localized prostate cancer. We used utility assessment to quantify patient preferences. Methods: We measured preferences in 209 community volunteers enrolled in a prostate cancer screening study who had radical prostatectomy between 1994 and 1998. We compared preferences in three outcome groups: (1) men who were bothered by both their current urinary and sexual functioning, (2) men who were only bothered by their current sexual functioning, and (3) men who were not bothered by either. Preferences were assessed via computer-based interview using time trade-off and standard gamble methods. Functioning was assessed via standardized questionnaire. Results: Differences in utilities were found by outcome group, with median utilities high across groups (0.9 for TTO and Standard Gamble), indicating that men were not willing to give up much remaining life years (1 year or 10% risk of death) with current functioning to achieve ideal functioning. Conclusion: Health related quality of life is generally good in patients treated for prostate cancer with radical prostatectomy; and those who have urinary and/or sexual dysfunction would not be willing to trade much of their remaining life span to have perfect functioning.

DTIC

Prostate Gland; Cancer; Surgery; Patients

20020083241 New Mexico State Univ., Las Cruces, NM USA

A Multidisciplinary Approach to Generating Effective Therapeutics for Emerging Hantaviruses ***Annual Report, 23 Apr. 2001-22 Apr 2002***

Jonsson, Colleen B.; Arnold, Edward; May 2002; 28p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0513
Report No.(s): AD-A406094; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The major goals of this project are to purify hantavirus proteins (Jonsson) for X-ray structure determination (Arnold). by defining the three-dimensional structures of the N and RDRP proteins of hantaviruses, our studies will afford a means to model drugs that specifically interfere with important stages of viral replication. Particularly, disrupting one or more functions of the RDRP is expected to result in effective disease treatment with little toxicity to host cells. In addition, our research will yield a high through-put in vitro assay for identification of new antiviral drugs. Together, these studies should lead toward effective therapeutic measures for controlling and treating hantaviral infections.

DTIC

Viruses; Proteins

20020083242 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA

Clinical Evaluation of Digital Mammography ***Annual Report, 1 Feb. 2001-31 Jan. 2002***

Fajardo, Laurie L.; Feb. 2002; 20p; In English
Contract(s)/Grant(s): DAMD17-99-1-9001
Report No.(s): AD-A406093; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The investigations being conducted under DAMD award 17-999-I -9001 involve a unique group of expert physicists and clinical researchers who have previously collaborated to establish a research group known as the International Digital Mammography Group. Our study entails two aspects of translational research related to the clinical application of digital mammography: technology optimization (Phase I) & a clinical evaluation (Phase 2). The technology/system optimization work is near completion and has focused on optimizing the operational parameters most likely to impact mammographic image quality for radiodense breasts (x-ray tube target material, filter composition, tube voltage, and exposure level/radiation dose). Because the dynamic range of x-ray signals recorded with standard screen-film mammography systems is greatly exceeded by digital systems, one of the most promising contributions of digital mammography is improved imaging of moderate to markedly dense breast tissue. The second phase of this project is a multi-center clinical evaluation comparing optimized digital mammography to SFM in women with moderate or marked breast density who present for problem-solving mammography. Eligible women consenting to participate will undergo a 4-view screen-film and digital mammogram. The primary outcome of interest-lesion detectability on digital versus screen-film mammograms-will be evaluated based on a receiver operating characteristic curve analysis of 12 readers' assessments of the likely presence of malignant lesions based on mammographic findings. Secondarily, differences in case management between the two imaging modalities will be measured. Since 7115/2000,217 eligible patients have been enrolled in this trial (38 Group 1 patients, 107 Group 2 patients and 64 Group 3 patients), representing 20-25% ofthe total accrual planned for the study.

DTIC

X Ray Imagery; Mammary Glands; Cancer; Digital Techniques

20020083243 Johns Hopkins Univ., Baltimore, MD USA

Enzymatice Activation of Proteasome Inhibitor Prodrugs by Prostate-Specific Antigen as Targeted Therapy for Prostate Cancer ***Annual Report, 1 Dec. 2000-30 Nov. 2001***

Denmeade, Samuel R.; Dec. 2001; 23p; In English

Contract(s)/Grant(s): DAMD17-00-1-0028

Report No.(s): AD-A406091; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of this proposal is to develop a method to target novel cytotoxic agents specifically to sites of metastatic prostate cancer. In the original proposal, proteasome inhibitors were selected as the cytotoxic agent. Initial studies revealed that this approach was not tenable due to the inherent instability of these compounds. An alternative agent was then selected to continue this targeted prodrug approach. Thapsigargin (TG) induces apoptosis in a proliferation independent manner in prostate cancer cells. This cytotoxicity, however, is not prostate cell type specific and TG could not be given systemically without significant toxicity. to achieve targeted cytotoxicity the TG analogs will be converted to inactive prodrugs by coupling to a peptide carrier that is a substrate for the serine protease activity of Prostate-Specific Antigen (PSA). Since PSA is expressed in high levels only by normal and malignant prostate cells, this approach should allow specific targeting of the killing ability of TC to prostate cancer cells. Therefore a series of amine containing TC analogs have been synthesized and characterized for their ability to induce apoptosis in prostate cancer cell lines. The lead TC analog has been chemically linked via a peptide bond to a previously identified PSA-specific peptide (i.e. 6 amino acids) to produce an inactive prodrug. This prodrug can be hydrolyzed by PSA and a 25-fold increase in toxicity is seen in the presence of enzymatically active PSA. In vivo studies using this lead TC prodrug to treat PSA-producing human prostate cancers are underway. Additional prodrugs will also be synthesized in order to optimize PSA-targeting.

DTIC

Enzymes; Prostate Gland; Cancer; Antigens

20020083278 McGill Univ., Montreal, Quebec Canada

Locating a Prostate Cancer Susceptibility Gene on the X Chromosome by Linkage Disequilibrium Mapping Using Three Founder Populations in Quebec and Switzerland ***Annual Report, 1 Mar. 2001-28 Feb. 2002***

Foulkes, William D.; Mar. 2002; 8p; In English

Contract(s)/Grant(s): DAMD17-00-1-0033

Report No.(s): AD-A405914; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The funded proposal has not yet been activated at all sites. Approval was given to commence the research at the McGill University hospital site only. IRB approval was obtained from in Switzerland and Chicoutimi and we are working on obtaining the appropriate documents for the final review. Realistically, we anticipate that within the next 6 weeks, we will have obtained the documents needed for approval by Army. Prevalent cases were identified at all McGill University Hospitals (N=497). Treating physicians were contacted to obtain permission to contact their patients. 159 patients were contacted by letter and 93 responses were received. 77 had given consent to participate. 34 pedigrees have been drawn for cases and 3 for controls. 37 cases were shown Ishihara charts and results were recorded. 40 cases and 3 controls have donated their blood and 33 are scheduled to donate blood in the. DNA has been extracted from all blood samples of participants. We are still in the process of contacting patients and extracting DNA as we receive donations from patients. We will be meeting with three physicians who have not yet given permission to contact patients within the next month and will therefore be able to contact the balance of prevalent cases.

DTIC

Chromosomes; Genetics

20020083280 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Antibody Engineering for Expression in Insect Cells and Larvae ***Final Report, Jun. 2001-May 2002***

Anderson, Patricia E.; Valdes, James J.; O'Connell, Kevin P.; Aug. 2002; 21p; In English; Original contains color images

Report No.(s): AD-A405911; ECBC-TR-252; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Antibodies are currently deployed as the recognition component of sensors that detect biological threat agents. Antibodies that detect simulants of bio-threat agents are also currently incorporated into detection platforms for testing and evaluating new devices and materials. Previously, we developed an anti-botulinum toxin antibody using a powerful genetic technology known as phage display, in which a very large library of immunoglobulin (antibody) genes are expressed on the surface of bacteriophage (bacterial virus) particles. However, antibodies expressed in bacteria lack molecular modifications made post-translationally by animal (eukaryotic) cells. It was therefore desirable to express Fab fragment antibody genes in insect cell lines and larvae. The use of insects as gene expression 'bioreactors' poses far fewer ethical concerns than the use of mammalian systems. In this study we improved an existing baculovirus expression vector by inserting the reporter gene DsRed, then modified and inserted the heavy

and light chain genes encoding an anti-botulinum toxin-binding Fab antibody. The structures of all plasmids constructed were verified by restriction analysis and sequencing. Preliminary data demonstrate that the reporter gene DsRed is strongly expressed in larvae of Trichoplusia ni, suggesting that this system may be an economical manufacturing process for recombinant antibodies. DTIC

Antibodies; Genes; Insects; Cells (Biology)

20020083281 Naval Medical Research Inst., Silver Spring, MD USA

Immunogenicity of Well-Characterized Synthetic Plasmodium Falciparum Multiple Antigen Peptide Conjugates

Joshi, Manju B.; Gam, Albert A.; Boykins, Robert A.; Kumar, Sanjai; Sacci, John; Aug. 2001; 8p; In English

Report No.(s): AD-A405909; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Given the emerging difficulties with malaria drug resistance and vector control, as well as the persistent lack of an effective vaccine, new malaria vaccine development strategies are needed. We used a novel methodology to synthesize and fully characterize multiple antigen peptide (MAP) conjugates containing protective epitopes from P!asmodium falciparum and evaluated their immunogenicity in four different strains of mice. A di-epitope MAP (T3-T1) containing two T-cell epitopes of liver stage antigen-1 (LSA-1), a di-epitope MAP containing T-cell epitopes from LSA-1 and from merozoite surface protein-1, and a tri-epitope MAP (T3-CS-T1) containing T3-T1 and a potent B-cell epitope from the circumsporozoite protein central repeat region were tested in this study. Mice of all four strains produced peptide-specific antibodies; however, the magnitude of the humoral response indicated strong genetic restriction between the different strains of mice. Anti-MAP antibodies recognized stage-specific proteins on the malaria parasites in an immunofluorescence assay. In addition, serum from hybrid BALB/cJ x A/J CAF1 mice that had been immunized with the tri-epitope MAP T3-CS-T1 successfully inhibited the malaria sporozoite invasion of hepatoma cells in vitro. Spleen cells from immunized mice also showed a genetically restricted cellular immune response when stimulated with the immunized in vitro. This study indicates that well-characterized MAPs combining solid-phase synthesis and conjugation chemistries are potent immunogens and that this approach can be utilized for the development of subunit vaccines. DTIC

Vaccines; Diseases; Inoculation

20020083284 California Univ., Los Angeles, CA USA

Targeting Angiogenic Factors Contributing to Etiology and Progression of Human Ovarian Cancer ***Annual Report, 1 Sep. 2000-31 Aug. 2001***

Pietras, Richard J.; Sep. 2001; 12p; In English

Contract(s)/Grant(s): DAMD17-00-1-0558

Report No.(s): AD-A406165; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Development of human ovarian cancer depends, in part, on formation of an adequate blood supply. Tumor angiogenesis is essential for cancer growth, and vascular endothelial growth factor (VEGF) is important in stimulating growth of vascular endothelial cells. VEGF is produced by many ovarian cancers, and our data show that VEGF secretion is markedly up-regulated in ovarian cancers with HER-2 gene overexpression. Herceptin, an antibody to HER-2 receptor, has direct antitumor effects, but the antireceptor antibody also elicits a significant reduction in VEGF secretion from ovarian cancer cells, and, thereby, also retards ovarian tumor- associated angiogenesis. More complete suppression of angiogenesis can be elicited by treatments that suppress blood vessel proliferation, such as squalamine, an angiostatic steroid recently approved by the FDA as an orphan drug candidate for the treatment of ovarian cancer. In studies with ovarian cancer cells in vivo, squalamine elicits antitumor activity by suppressing the angiogenic action of several vascular growth factors including VEGF. This ongoing work evaluates the efficacy of squalamine alone and combined with other antitumor therapies, including cisplatin and Herceptin, in suppressing the growth of ovarian cancers with and without HER-2 gene overexpression.

DTIC

Etiology; Receptors (Physiology); Blood Circulation; Endothelium; Ovaries; Cancer

20020083285 California Univ., Irvine, CA USA

Novel Mechanisms by Which Estrogen Induces Antiapoptosis in Breast Cancer ***Annual Report, 10 Jul. 2001-9 Jul 2002***

Levin, Ellis R.; Aug. 2002; 35p; In English

Contract(s)/Grant(s): DAMD17-00-1-0188

Report No.(s): AD-A406164; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have investigated the interactions between estrogen and caveolin proteins in breast cancer. There is a physical interaction between caveolin-1 and the plasma membrane estrogen receptor in cultured breast cancer cells that is strongly downregulated by estradiol in 30 minutes. This leads to enhanced ERK activation and proliferation of the cells. Overexpressing caveolin-1 leads

to a downregulation of the ability of estradiol to activate the ERK (MAP kinase) signal pathway. Estrogen also inhibits caveolin-1 synthesis in breast cancer cells. Caveolin-1 facilitates ER localization to the plasma membrane, demonstrated in breast cancer cells (MCF-7). As for the structure/function of the plasma membrane estrogen receptor, expression and targeting of only the E domain (ligand binding) to the plasma membrane is sufficient for estrogen signaling to ERK.
DTIC
Estrogens; Cancer; Mammary Glands

20020083287 Ohio State Univ., Research Foundation, Columbus, OH USA
Potential Risk of Growth Promoter in Beef for Breast Cancer Growth ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Young, Lin; Jul. 2000; 14p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8140
Report No.(s): AD-A406158; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Anabolic agents increase weight gain in meat-producing farm animals by enhancing protein deposition and improving feed conversion, as well as increasing the muscle-to-fat ratio. by promoting growth, reducing feed costs and improving the quality of meat produced, the use of such agents has become an important practice in the meat-producing industry. These anabolic agents have biological activities in common with natural estrogenic, androgenic and progestogenic steroid hormones that have potential effects on protein metabolism. The liver easily degrades trace amounts of natural steroid hormones, such as testosterone and estradiol-17beta in foodstuffs consumed by humans, therefore the concern that these natural compounds may pose a health risk to humans is considered negligible. Our research project has focused on the anabolic compound, zeranol (Ralgro) which is a non-steroidal, synthetic agent possessing estrogenic action similar to the natural estrogens. Zeranol has been approved by the FDA (Food and Drug Administration) as a growth promotant for use in the beef, veal, and lamb industries in the U.S. The FDA-approved route and dosage of administration is the subcutaneous implantation in the ear of a pellet containing 36 mg of zeranol per beef heifer followed by a second pellet 30 days later. Although concerns regarding the potential health risk of zeranol residues in the edible tissues (such as muscle, fat, liver and kidney) of zeranol-implanted beef cattle exist, no scientific evidence has demonstrated in a convincing manner the presence of such a risk to federal regulatory agencies such as the FDA and the USDA (US Department of Agriculture) or to the U.S. consumers at large. Our research focus has been the potential health risk posed by the consumption of meat from zeranol-implanted beef cattle for human breast cancer growth.
DTIC
Cancer; Mammary Glands; Hazards; Cattle; Food

20020083288 State Univ. of New York, Buffalo, NY USA
DNA Replication Arrest and DNA Damage Response Induced by Alkylating Minor Groove Binders ***Annual Report***
Kuo, Shu-Ru; Melendy, Thomas; May 2002; 12p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0418
Report No.(s): AD-A406157; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report, we study the cellular mechanism of adozelesin-induced DNA replication arrest. Adozelesin is an analog of CC-1065, a cyclopropylpyrroloindole (CPI) isolated from Streptomyces zelensis. Several CPI compounds have entered clinical studies for solid tumors, including breast cancer. Adozelesin is capable of binding to the minor groove of A/T-rich DNA sequences and alkylating the N3 of adenine at 3'-end of the binding sites (1, 21). These two activities contribute to its anti- cancer ability. Binding of adozelesin does not distort the duplex structure of targeted DNA (1) or cause any DNA strand break (2). Although nucleotide excision repair might be involved in the removal of CPI-induced lesions (4, 6), CC-1065:DNA adducts persist in BSC-1 green monkey cells (22). It is possible that these DNA adducts are been repaired inefficiently in treated cells.
DTIC
Deoxyribonucleic Acid; Cancer; Mammary Glands

20020083289 Kaiser Foundation Research Inst., Oakland, CA USA
Management Options for Women at Risk for Inherited Breast Cancer in a Multi-Ethnic Health Plan Population: A Randomized Control Trial ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Schaefer, Catherine A.; Sep. 2001; 10p; In English
Contract(s)/Grant(s): DAMD17-96-1-6207
Report No.(s): AD-A406156; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project has addressed possible differences by ethnicity and socioeconomic status in the family history of breast cancer, and in the knowledge and attitudes of women who may be interested in testing for inherited susceptibility to breast cancer. The aims of this study are: a) to survey a population-based, ethnically diverse sample to examine relationships between family history

of breast cancer, knowledge of and attitudes toward genetic testing for inherited susceptibility, and sociodemographic factors, such as education and ethnicity; b) to conduct focus groups with Asian, Hispanic, African American, and White women to learn about possible differences in their attitudes concerning genetic testing. A new aim was planned and developed during the last year. The third aim is to follow-up the survey respondents from Aim 1 to determine the influence of the respondents' family history of breast cancer, ethnicity, and knowledge and attitudes towards breast cancer and genetic testing on their use of genetic counseling and genetic testing, and use of services such as mammography and pap tests in the 4-5 years elapsed since the original survey. This annual report describes our progress in developing and conducting the follow-up study planned as Aim 3.
DTIC
Ethnic Factors; Genetics; Cancer; Mammary Glands

20020083290 Vanderbilt Univ., Nashville, TN USA
C/EBP(Beta) Isoforms - An Innovative Transcription Factor Therapy for Breast Cancer ***Annual Report, 1 May 2001-30 Apr. 2002***
Sealy, Linda J.; May 2002; 27p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0484
Report No.(s): AD-A406154; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The transcription factor, C/EBPbeta, is critical for growth and differentiation of the mammary gland. Three forms of C/EBPbeta are expressed in cells through alternative translation of the C/EBPbeta mRNA. C/EBPbeta-1 and -2 activate transcription; C/EBPbeta-2 is a truncated form that represses transcription. Based upon their distinct expression patterns in normal and transformed cells as well as functional studies, we propose that C/EBPbeta-1 and -3 (or both) will be potent anti-tumor therapies when used either singly or in combination by suppressing the expression of genes which drive the cell cycle (C/EBPbeta-3) and/or reactivating a differentiation program (C/EBPbeta-1). The purpose of this study is to develop non-replicating murine retroviral and adenoviral vectors carrying genes selectively encoding either C/EBPbeta-1 or -3. These vectors will be used to efficiently re-express C/EBPbeta-1 and/or overexpress C/EBPbeta-3 in breast cancer cells lines and evaluate the growth potential of the cells. We have successfully generated murine retroviral vectors encoding C/EBPbeta-1 and C/EBPbeta-3 as well as an adenovirus encoding C/ ebpbeta-3. We have infected breast cancer cell lines with each of these viruses and documented nuclear expression of C/EBPbeta-1 and -3 by both immunohistochemistry and immunoblotting. Studies on the growth potential of the infected cells are confidential and will be presented in the annual report.
DTIC
Cells (Biology); Cancer; Mammary Glands; Gene Therapy; Transcription (Genetics)

20020083291 Burnham Inst., La Jolla, CA USA
Diagnosing Breast Cancer Using Protease Fingerprint ***Annual Report, 1 Jun. 2001-31 May 2002***
Chen, Emily I.; Jun. 2002; 43p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9091
Report No.(s): AD-A406152; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The utility of using substrate phage display library to study disease-relevant metalloproteinase was further proved by identifying the selective substrates for MMP-l4 (NTl-MNP). In addition, a different proteomic approach of achieving the original aim of identifying new diagnostic marker for breast cancer was applied and reported in this report. An activity-based probe, FP-biotin, was used to analyze the global activity pattern of a class of disease-relevant enzymes, serine hydrolases, in normal epithelial cells and several breast cancer cells. A novel potential tumor suppressor protein, human carboxylesterase-2, was identified as the result of the comparison. Initial confirmation of the cell line comparison was done by analyzing the regulation at the transcription and translation level. This result is a good demonstration of the usefulness of applying proteomic approaches to analyze complex biological samples in health and disease states.
DTIC
Diagnosis; Mammary Glands; Cancer; Protease

20020083292 Duke Univ., Medical Center, Durham, NC USA
Characterization of the Chicken Ovarian Cancer Model ***Annual Report, 15 Jul. 2000-14 Jul 2001***
Rodriquez, Gustavo C.; Aug. 2001; 10p; In English
Contract(s)/Grant(s): DAMD17-00-1-0570
Report No.(s): AD-A406141; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
We believe that the domestic laying hen has great potential as an animal model for ovarian cancer prevention research. Unlike other ovarian cancer models, which require experimental induction of ovarian tumors, chickens develop ovarian adenocarcinoma

spontaneously, with an incidence ranging from 13 to 40 percent between four and six years of life. No investigators have taken advantage of the chicken to study ovarian cancer. Thus, the chicken ovarian cancer model has yet to be validated and developed. As part of a prevention trial in chickens funded by the Department of Defense, we have accumulated 1400 chicken reproductive tracts including 140 with adenocarcinomas, and gathered valuable data regarding the natural history of these tumors. This provides the remarkable opportunity to critically evaluate the chicken ovarian cancer animal model and determine its relevance to human ovarian cancer research. The aim of the current proposal is to increase our understanding of the molecular and histologic features of chicken ovarian cancers. In addition, we will develop a histologic classification for chicken ovarian cancers, which is a critically important prerequisite to the widespread use of this animal model for ovarian cancer research.
DTIC
Cancer; Ovaries; Models; Histology; Chickens

20020083293 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA
Study of the Regulation of erbB Signaling by Receptor-Mediated Endocytosis ***Annual Report, 1 May 2000-30 Apr. 2001***
Lee, Anthony; May 2001; 12p; In English
Contract(s)/Grant(s): DAMD17-99-1-9351
Report No.(s): AD-A406140; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The purpose of my project remains the same. In the paper Vieira et al. (1996), it was demonstrated that endocytosis of EGF receptors (EGFR) played a role in the regulation of their signaling. EGFR is internalized following its activation and dimerization with a second receptor. A second receptor that is internalization-impaired, such as erbB-2, would presumably slow down internalization of EGFR. Internalization and down-regulation of receptors is the mechanism by which cells control signaling from EGFR. Inhibition of endocytosis leads to persistence of the activated receptors on cell surface and increases the duration and strength of signaling from EGFR, which may lead to unregulated cell growth and transformation. My plan is to show that erbB-2 does indeed affect EGFR endocytosis, and this will lead to alteration of downstream signaling. by making mutations in the regulatory cytoplasmic tail of erbB-2, I could potentially enhance its capability for endocytosis, and this should restore normal signaling to EGFR.
DTIC
Cytoplasm; Receptors (Physiology); Genetics; Cell Division; Mammary Glands

20020083294 Albany Medical Coll., NY USA
Gravidomimetic Prevention of Breast Cancer ***Final Report, 14 May 2001-13 May 2002***
Andersen, Thomas T.; Jun. 2002; 35p; In English
Contract(s)/Grant(s): DAMD17-01-1-0472
Report No.(s): AD-A406139; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
To test the hypothesis that a novel synthetic peptide can prevent breast cancer, we utilized a standard model to induce breast cancer in rats and initiated a dose-finding study in which four log doses of peptide were administered daily beginning 10 days after treatment with carcinogen, and lasting for 23 days, a time period that mimics pregnancy. Treatment with peptide was then discontinued, and animals were palpated for tumors daily for 100 days. The number of animals with tumors, number of tumors per animal, time to generation of palpable tumors, and mass of tumors (at autopsy) were noted as endpoints, and weight, weight gain, cage activity and fur texture were used as gross assessments of toxicity. The study was not complete at the time of report preparation, but to date no evidence of toxicity due to the peptide has been noted. Early generation of tumors associated with pregnancy was not observed, suggesting that the anti-oncotic peptide does not posses an undesirable immunosuppressive activity. Pre-100 day data indicate fewer cancers in the Peptide- compared to No Peptide groups. We conclude that the model can appropriately assess prevention capability and should generate data concerning dosages for use in assessing the gravidomimetic prevention potential of this novel drug.
DTIC
Cancer; Mammary Glands; Peptides; Tumors

20020083295 Duke Univ., Medical Center, Durham, NC USA
A Unique Class of Topoisomerase Mutants That Are Hypersensitive to Multiple Antitumor Agents ***Annual Report, 1 Mar. 2001-28 Feb. 2002***
O'Reilly, Erin K.; Mar. 2002; 51p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0235
Report No.(s): AD-A406138; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The goal of this research is to understand the detailed mechanism of action of antitumor drugs that target type II topoisomerases. Bacteriophage T4 provides a useful model system for the study of these antitumor agents. Previous analysis showed that a drug resistant bacteriophage T4 mutant harbored two amino acid substitutions (S79F, G269V) in topoisomerase subunit gp52. When both mutations are present, the O269V substitution suppresses a topoisomerase negative phenotype caused by the S79F substitution while the O269V substitution by itself was shown to confer hypersensitivity in vivo (Cancer Research 58, 1260-1267). I purified the G269V enzyme and found it to be hypersensitive to a number of cleavage-inducing antitumor agents. The G269V enzyme displayed an apparent 10-fold increase in drug-independent DNA cleavage, suggesting a novel mechanism of sensitivity in which the enzyme equilibrium has been shifted to favor the cleavage complex. I have also purified the S79F mutant enzyme and am in the process of characterizing the defect caused by this substitution. The O269V mutant defines a new category of type II topoisomerase mutants, namely those that are hypersensitive to all inhibitors that stabilize the cleavage complex, and thereby offers new insights into the mechanism of drug action.
DTIC
Drugs; Mutations; Bacteriophages; Cancer; Isomers

20020083296 Louisville Univ. Foundation, Inc., KY USA
Mechanism of Action of Novel Antiproliferative Oligonucleotides ***Annual Report, 15 Apr. 2001-14 Apr 2001***
Bates, Paula J.; May 2002; 31p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0067
Report No.(s): AD-A406133; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
G-rich oligonucleotides (GROs) are a novel class of non-antisense nucleic acids that exhibit potent antiproliferative effects against malignant cells, including prostate cancer cells. The antiproliferative activity of GROs was found to correlate with their ability to bind to nucleolin protein. Therefore, it was our hypothesis that these potentially therapeutic agents work by binding to and inhibiting the function of nucleolin. Because nucleolin is a multi functional protein that is involved in many cellular processes including ribosome biogenesis, DNA replication, cell cycle regulation, and apoptosis, the overall goal of this study was to identify the functions of nucleolin that are affected by GRO binding. After the first year of this study, several significant results have emerged. We have shown that GROs cause cell cycle arrest and induce apoptosis in prostate cancer cells but not normal skin cells, and that this arrest is due to specific inhibition of DNA replication. We have further shown that the inhibition of DNA replication may be linked to the ability of GROs to block unwinding by cellular helicases. In addition, we have identified the regions of nucleolin that interact with GROs. These results have been published in peer-reviewed journals and presented at International meetings.
DTIC
Nucleotides; Conferences; Oligomers; Cytology

20020083333 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Process Development for the Production of a Monoclonal Antibody Against Francisella Tularensis ***Final Report, 1 Aug. -2 Apr. 2002***
Park, Jun T.; Cork, Sarah J.; Collano, Tracy; Cao, CHeng J.; Menking, Derrel; Jun. 2002; 28p; In English
Contract(s)/Grant(s): MIPR-1DERDEC042
Report No.(s): AD-A405736; ECBC-TR-243; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Antibodies are essential components in biosensors and enable the detection of biological warfare agents with both sensitivity and selectivity. A biomanufacturing process was developed for the production of a monoclonal antibody (mAb) specific for detecting the Frencisella tularensls organism in the environment. This report describes a process for the production of 12 g of monocional antibody from an in vitro call culture system. Hybridoma calls were grown in 2-L gas permeable call culture bags. The numbers of both total and live calls in culture media were measured throughout the process and correlated with antibody concentration over time. Antibody concentrations in samples collected during culture were monitored and during the purification process were analyzed by analytical high-performance liquid chromatography. Antibodies were purified from spent culture media, using a single-step Protein-A affinity chromatography procedure. The overall yield for the downstream purification process is approximately 78%. The purifies of the purified mAb lots were around 94 - 99%, as determined by an analytical gel permeation chromatographic method. The purified mAb was active as reference lots of the antibody produced elsewhere, as determined by direct enzyme-linked immunosorbent assays.
DTIC
Antibodies; Bioinstrumentation; Culture Techniques; Biological Weapons

20020083341 Naval Medical Research Center, Silver Spring, MD USA
Malaria Vaccine Research at the Naval Medical Research Center
Carucci, Daniel J.; Oct. 2001; 6p; In English
Report No.(s): AD-A405748; NMRC-01-006; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

At a time in bioscience when many people assume that vaccines are available for most infectious diseases, it often comes as a surprise that the ancient disease, malaria, is still the most important parasitic infectious disease in the world today. It also poses one of the greatest threats to the U.S. military operational forces than any other naturally-occurring infectious disease. In fact, in every campaign this century fought where malaria was present, more casualties resulted from malaria than from bullets. During the war in Vietnam, entire divisions were rendered ineffective due to large numbers of malaria cases.(1) Even more importantly for the world population there are between 300 and 500 million cases each year and between 1.5 and 2.7 million deaths annually, mostly in children living in Sub Saharan Africa.(2) Drugs used to prevent malaria infection, though universally effective until the 1960's and 1970's, are either no longer effective or are becoming less effective in many parts of the world due to the development of drug resistance. and yet despite over 15 years of research, there is still no licensed vaccine against malaria.
DTIC
Infectious Diseases; Medical Science; Parasitic Diseases; Vaccines

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

20020080856 Diagnostic Ultrasound Corp., Kirkland, WA USA
Bladder Monitor
Spinoff 1993; 1993, pp. 60; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Diagnostic Ultrasound Corporation's Bladder Scan Monitor continuously records and monitors bladder fullness and alerts the wearer or caretaker when voiding is required. The sensor is held against the lower abdomen by a belt and connected to the monitor by a cable. The sensor obtains bladder volume data from sound waves reflecting off the bladder wall. The device was developed by Langley Research Center, the Ames Research Center and the NASA Technology Applications Team. It utilizes Langley's advanced ultrasound technology. It is licensed to the ARC for medical applications, and sublicensed to Diagnostics Ultrasound. Central monitoring systems are planned for the future.
Author
Monitors; Bladder; Diagnosis; Ultrasonic Scanners; Genitourinary System

20020080867 Impulse Sports Training Systems, Inc., Rocky River, OH USA
Rehabilitation Tool
Spinoff 1993; 1993, pp. 62-63; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Biotran, or Fastex as named by Cybex, the company that manufactures it, is a force sensing system that helps physicians and physical therapists treat people with movement deficiencies. Based on NASA sensor technology, it also has applications in sports training and evaluation. Biotran provides a means of testing weight-bearing capabilities that may have been compromised by injury or disease. It also assists in the rehabilitation process by putting patients through a course of computer-directed exercises designed to improve strength and balance reaction time. The system tests and documents progress until maximum medical improvement is achieved. Lewis Research Center also assisted the company in the selection of the material used in the Biotran force sensing platforms. Biotran is currently manufactured by Cybex under the name Fastex.
Author
Detection; Locomotion; Sports Medicine; Muscular Strength

20020080871 Vision Research Corp., Birmingham, AL USA
Vision Screening
Spinoff 1993; 1993, pp. 58; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The Visi Screen OSS-C, marketed by Vision Research Corporation, incorporates image processing technology originally developed by Marshall Space Flight Center. Its advantage in eye screening is speed. Because it requires no response from a subject, it can be used to detect eye problems in very young children. An electronic flash from a 35 millimeter camera sends light into a child's eyes, which is reflected back to the camera lens. The photorefractor then analyzes the retinal reflexes generated and produces an image of the child's eyes, which enables a trained observer to identify any defects. The device is used by pediatricians, day care centers and civic organizations that concentrate on children with special needs.
Author
Eye (Anatomy); Vision; Retina; Image Processing

20020080895 Synthecon, Inc., Friendswood, TX USA
Medical Research System
Spinoff 1993; 1993, pp. 56-57; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Based on Johnson Space Flight Center's development of a rotating bioreactor cell culture apparatus for Space Shuttle medical research, Johnson Space Flight Center engineers who worked on the original project formed a company called Synthecon, with the intention of commercializing the bioreactor technology. Synthecon grows three dimensional tissues in the bioreactor. These are superior to previous two-dimensional tissue samples in the study of human cell growth. A refined version of the Johnson Space Center technology, Synthecon's Rotary Cell Culture System includes a cell culture chamber that rotates around a horizontal axis. The cells establish an orbit that approximates free fall through the liquid medium in the chamber. The technology has significant applications for cancer research and treatment as well as AIDS research.
Author
Space Shuttles; Bioreactors; Cells (Biology); Aerospace Medicine

20020080905 Proportional Technologies, Inc., Houston, TX USA
Heart Imaging System
Spinoff 1993; 1993, pp. 59; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Johnson Space Flight Center's device to test astronauts' heart function in microgravity has led to the MultiWire Gamma Camera, which images heart conditions six times faster than conventional devices. Dr. Jeffrey Lacy, who developed the technology as a NASA researcher, later formed Proportional Technologies, Inc. to develop a commercially viable process that would enable use of Tantalum-178 (Ta-178), a radio-pharmaceutical. His company supplies the generator for the radioactive Ta-178 to Xenos Medical Systems, which markets the camera. Ta-178 can only be optimally imaged with the camera. Because the body is subjected to it for only nine minutes, the radiation dose is significantly reduced and the technique can be used more frequently. Ta-178 also enables the camera to be used on pediatric patients who are rarely studied with conventional isotopes because of the high radiation dosage.
Author
Heart Function; Imaging Techniques; Cardiology; Pharmacology; Cameras

20020080912 Life Support Systems, Inc., Mountain View, CA USA
New Help for MS Patients
Spinoff 1993; 1993, pp. 52-55; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The Mark VII MicroClimate Medical Personal Cooling system enables multiple sclerosis' victims, as well as cerebral palsy, spinabifida patients and others to lower their body temperatures. Although this is not a cure, cooling can produce a dramatic improvement in symptoms. The Multiple Sclerosis Association of America has placed cool suits in MS research care centers. This technology originated in the need for cooling systems in spa@esuits. "Cool Suits" are now used by hazardous materials workers, armored vehicle crews, firefighters and crop dusters. A surgical personal cooling system has also been developed for medical personnel working in hot operating room environments.
Author
Diseases; Medical Science; Cooling Systems; Space Suits; Climate

20020080945 Bio-Brite, Inc., Bethesda, MD USA

Light Visor

Spinoff 1993; 1993, pp. 61; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Seasonal Affective Disorder is a form of depression brought on by reduced light. For some people, this can lead to clinical depression. NASA has conducted research in light therapy and employs it to help astronauts adjust internal rhythms during orbital flight. Dr. George Brainard, a medical researcher and NASA consultant, has developed a portable light therapy device, which is commercially available. The Light Visor allows continuous light therapy and can be powered by either batteries or electricity. Dr. Brainard continues to research various aspects of light therapy.

Author

Visors; Mental Health; Therapy; Light (Visible Radiation)

20020083286 Henry Ford Health System, Health Sciences Center, Detroit, MI USA

Influence of Bone Remodeling Inhibition on the Development of Experimental Stress Fractures ***Annual Report, 1 Sep. 2000-31 Aug. 2001***

Boyd, Robert; Schaffler, Mitchell B.; Sep. 2001; 38p; In English

Contract(s)/Grant(s): DAMD17-98-1-8515

Report No.(s): AD-A406161; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Stress fractures result from repetitive loading and have been regarded as a mechanical fatigue-driven process. However, data suggests that increased remodeling precedes the occurrence of bone microdamage and stress fractures, suggesting a central role for increased intracortical remodeling in the pathogenesis of stress fractures. Our ongoing experiments test the hypothesis by pharmacological inhibition of bone remodeling will slow the subsequent accumulation of microdamage, diminishing the severity of the stress fracture. We are using a bisphosphonate (BP) in the rabbit tibial stress fracture model, to test the hypothesis that reactive remodeling within the cortex drives the development of stress fractures. Ongoing studies suggest that BP antiresorptive therapy reduces the intensity of the stress fracture response, as indicated by technetium bone scans. This effect was most pronounced with short-term loading (3 weeks), with (99) technetium uptake in BP treated animals reduced approximately 25 percent from control levels; this effect was diminished by 6 weeks of loading. Reduction of bone 99technetium uptake at 3 weeks in drug-treated animals is consistent with suppression of the acute activation of new intracortical resorption foci by bisphosphonates. The implication of this suppression of the later accumulation of bone microcracks, and the evolution of final stress fracture, are unknown.

DTIC

Bones; Fracturing; Stress Analysis

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20020081287 Federal Aviation Administration, Office of Aerospace Medicine, Washington, DC USA

Risk Perception and Risk Tolerance in Aircraft Pilots ***Final Report***

Hunter, David R., Federal Aviation Administration, USA; September 2002; 32p; In English

Contract(s)/Grant(s): FAA-AM-A-01-HRR-189

Report No.(s): DOT/FAA/AM-02/17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Poor pilot decision-making has been identified as a factor in a large percentage of fatal aviation accidents. Risk perception and risk tolerance are two factors that can significantly impact pilot decision-making. Inaccurate risk perception can lead pilots to ignore or misinterpret external cues that demand immediate and effective decisions to avoid hazards. High risk tolerance can lead pilots to choose courses of action that unnecessarily expose them to hazards and increased likelihood of accident. Risk perception and risk tolerance are related and often confounded constructs. This study sought to separate these two constructs and to develop and evaluate measures that could be used to compare individual pilots on the constructs. A large sample of pilots visiting a government web site completed two risk perception, and three risk tolerance measures.They also completed a short scale assessing their involvement in hazardous aviation events and provided demographic information. Analysts of the data showed that the five new measures demonstrated acceptable internal consistency. The measures of risk perception were only mildly related to risk tolerance, suggesting that these are separate constructs. As hypothesized, pilot perception of risk was negatively related to risk tolerance. In addition, risk perception demonstrated a small, but significant, correlation with self-reported involvement in

hazardous aviation events. However, contrary to expectations, risk tolerance was not significantly related to hazardous events. The results suggest that it is differences in cognitive skills required for accurate risk perception that place pilots are greater likelihood of accident involvement, rather than differences in underlying personality traits related to risk tolerance. The implications of the findings are discussed, along with limitations on the generalizability of the results, and suggestions for future research to improve the measurement scales are given.
Author
Risk; Decision Making; Hazards; Aircraft Pilots

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..

20020080884 Michigan Univ., Transportation Research Inst., Ann Arbor, MI USA
Quantitative Evaluation of Seat Surface Pressure Distributions, Body Weight Distributions, and Postures Obtained with Human Surrogates ***Final Report***
Reed, M. P.; Lehto, M. M.; Apr. 2001; 46p; In English
Report No.(s): PB2002-108728; UMTRI-2001-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Seat surface pressure distributions of Hybrid III dummies and Occupant Classification Anthropomorphic Test Devices (OCATDs) representing small adult women and six-year-old children were recorded in a range of postures on two test seats. Support forces under the feet and surrogate postures were also measured. The pressure distribution data were analyzed using quantitative metrics developed in previous testing with human subjects.
NTIS
Seats; Dummies; Air Bag Restraint Devices; Human Factors Engineering

20020080887 Michigan Univ., Transportation Research Inst., Ann Arbor, MI USA
Destination Entry while Driving: Speech Recognition Versus a Touch-Screen Keyboard ***Progress Report***
Tsimhoni, O.; Smith, D.; Green, P.; Jun. 2002; 112p; In English
Report No.(s): PB2002-107998; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
To determine the effect of several destination-entry methods on driving performance, as a function of driving workload, 24 participants drove a simulator on roads with curves of different radii while entering street addresses into a simulated in-vehicle navigation system. Three destination-entry methods were examined: (1) speech recognition by word, (2) speech recognition by character, and (3) typing on a touch-screen keyboard. For each method, driving performance, glance behavior, task partitioning, and subjective evaluation were examined. While driving, speech recognition by word yielded the shortest task completion time (15.3 s), followed by speech recognition by character (41.0 s), and then the touch-screen keyboard (86.0 s). Overall, driving performance degraded when entering destinations, especially with the touch-screen keyboard, and when driving workload increased. The participants made 21% shorter glances to the navigation display, and 40% longer glances at the road scene as a function of increasing driving workload.
NTIS
Operator Performance; Automobiles; Autonomous Navigation

20020080937 Contemporary Design Co., Glacier, WA USA
Cardio-Muscular Conditioner
Spinoff 1993; 1993, pp. 83; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.
In the mid-sixties, Gary Graham, a Boeing designer, developed a cardiovascular conditioner for a planned Air Force orbiting laboratory. After the project was cancelled, Graham participated in space station conditioning studies for the Skylab program. Twenty years later, he used this expertise to develop the Shuttle 2000-1, a physical therapy and athletic development conditioner, available through Contemporary Designs. The machine is used by football teams, sports clinics and medical rehabilitation centers. Cardiovascular fitness and muscular strength development are promoted through both kinetic and plyometric exercises.
Author
Cardiovascular System; Muscular Strength; Sports Medicine; Exercise Physiology

20020080950 Biomedical Optics Co. of America, Inc., North Hollywood, CA USA

Radiation Blocking Lenses

Spinoff 1993; 1993, pp. 82; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The Biomedical Optical Company of America's Eagle 475 lens absorbs 100 percent of all photowavelengths considered hazardous to eye tissue, including ultraviolet and blue light, which are considered contributors to cataract and age-related macular degeneration. The lens absorbs hazardous wavelengths, but allows a higher percentage of visually useful areas of the spectrum to pass through. Polarization blocks out irritating glint and glare and heightens visual acuity. The Eagle 475 sunglasses are the latest in a series of spinoffs that originated at the Jet Propulsion Laboratory where two scientists developed a protective, welding curtain that filtered out harmful irradiance. The result was a commercial curtain that absorbs filters and scatters light, providing protection for personnel in welding areas. Further research focused on protective industrial glasses and later on consumer products.

Author

Eye (Anatomy); Lenses; Sunglasses; Ultraviolet Radiation

20020080966 Axiomatics Corp., Woburn, MA USA

Process Analyzer

Spinoff 1993; 1993, pp. 124; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under a NASA Small Business Innovation Research (SBIR) contract, Axiomatics Corporation developed a shunting Dielectric Sensor to determine the nutrient level and analyze plant nutrient solutions in the CELSS, NASA's space life support program. (CELSS is an experimental facility investigating closed-cycle plant growth and food processing for long duration manned missions.) The DiComp system incorporates a shunt electrode and is especially sensitive to changes in dielectric property changes in materials at measurements much lower than conventional sensors. The analyzer has exceptional capabilities for predicting composition of liquid streams or reactions. It measures concentrations and solids content up to 100 percent in applications like agricultural products, petrochemicals, food and beverages. The sensor is easily installed; maintenance is low, and it can be calibrated on line. The software automates data collection and analysis.

Author

Agriculture; Food Processing; NASA Space Programs; Closed Ecological Systems; Computer Programs

20020080988 Michigan Univ., Transportation Research Inst., Ann Arbor, MI USA

Development of Belt Fit Assessment Components for the Aspect Manikin

Reed, M. P.; Lehto, M. M.; Apr. 2001; 46p; In English

Report No.(s): PB2002-108727; UMTRI-2001-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As part of the Automotive Seat and Package Evaluation and Comparison Tools (ASPECT) program, UMTRI researchers developed a new H-point manikin that is intended to replace the current SAE J826 manikin. The original manikin is used in many automotive applications, including as a platform for a seatbelt deployment test device (BTD). In the current project, components and procedures were developed to measure belt fit using the ASPECT manikin.

NTIS

Seat Belts; Performance Tests; Crashes; Human Factors Engineering; Dummies

20020080993 Pennsylvania Univ., Philadelphia, PA USA

Human Factors Model

Spinoff 1993; 1993, pp. 89; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Jack is an advanced human factors software package that provides a three dimensional model for predicting how a human will interact with a given system or environment. It can be used for a broad range of computer-aided design applications. Jack was developed by the computer Graphics Research Laboratory of the University of Pennsylvania with assistance from NASA's Johnson Space Center, Ames Research Center and the Army. It is the University's first commercial product. Jack is still used for academic purposes at the University of Pennsylvania. Commercial rights were given to Transom Technologies, Inc.

Author

Applications Programs (Computers); Human Factors Engineering; Three Dimensional Models; Computer Graphics

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see categories 60 through 67.

20020080742 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
[ICASE Semiannual Report] ***Final Report, 1 Oct. 2001 - 31 Mar. 2002***
August 2002; 61p; In English
Contract(s)/Grant(s): NAS1-97046; NAS1-19480; NAS1-18605; NAS1-18107; NAS1-17070; NAS1-15810; NAS1-16394; NAS1-14101; NAS1-14472; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211921; NAS 1.26:211921; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report summarizes research conducted at ICASE in applied mathematics, fluid mechanics, computer science, and structures and material sciences during the period October 1, 2001 through March 31, 2002.
Author
Design Analysis; Fluid Mechanics; Computer Programs; Numerical Analysis

20020080752 Argonne National Lab., IL USA
Survey of star product geometry.
Zachos, C.; Aug. 15, 2000; 15p
Report No.(s): DE2002-761269; ANL-HEP-CP-00-085; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A brief pedagogical survey of the star product is provided, through Groenewold's original construction based on the Weyl correspondence. It is then illustrated how simple Landau orbits in a constant magnetic field, through their Dirac Brackets, define a noncommutative structure since these brackets exponentiate to a star product--a circumstance rarely operative for generic Dirac Brackets. The geometric picture of the star product based on its Fourier representation kernel is utilized in the evaluation of chains of star products. The intuitive appreciation of their associativity and symmetries is thereby enhanced. This construction is compared and contrasted with the remarkable phasespace polygon construction of Almeida.
NTIS
Surveys; Geometry; Magnetic Fields; Polygons

20020080830 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Approximation Properties APs AND p-Nuclear Operators (The Case 0 less than s less than or equal to 1)
Reinov, O. I.; May 2000; 24p; In English
Report No.(s): PB2002-106106; TRITA-MAT-00-MA-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We investigate Banach spaces, possessing (or not possessing) the approximation properties APs, less than s less than 1, in connection with the following known question in the geometrical theory of operators: under which conditions on Banach spaces X and Y and on positive numbers r, p for an continuous operator T from X to Y it follows from the p-nuclearity of its second adjoin the p-nuclearity of T itself. It is given, essentially, the necessary and sufficient conditions for the positive answer to this question moreover the corresponding counterexamples are obtained in the maximal strong form.
NTIS
Operators (Mathematics); Tensors

20020080831 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Estimates with Global Range for Oscillatory Integrals with Concave Phase
Walther, B. G.; 2001; 14p; In English
Report No.(s): PB2002-106090; TRITI-MAT-00-MA-14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In several papers during the last couple of years interest has been focused on summability processes for oscillatory Fourier integrals. The kernel of these summability processes have the feature of being non-summable.
NTIS
Integrals; Functions (Mathematics)

20020083040 NASA Glenn Research Center, Cleveland, OH USA
An Introduction to Tensors for Students of Physics and Engineering
Kolecki, Joseph C., NASA Glenn Research Center, USA; September 2002; 29p; In English

Contract(s)/Grant(s): RTOP 332-41-00
Report No.(s): NASA/TM-2002-211716; E-13468; NAS 1.15:211716; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Tensor analysis is the type of subject that can make even the best of students shudder. My own post-graduate instructor in the subject took away much of the fear by speaking of an implicit rhythm in the peculiar notation traditionally used, and helped us to see how this rhythm plays its way throughout the various formalisms. Prior to taking that class, I had spent many years ”playing” on my own with tensors. I found the going to be tremendously difficult but was able, over time, to back out some physical and geometrical considerations that helped to make the subject a little more transparent. Today, it is sometimes hard not to think in terms of tensors and their associated concepts. This article, prompted and greatly enhanced by Marlos Jacob, whom I’ve met only by e-mail, is an attempt to record those early notions concerning tensors. It is intended to serve as a bridge from the point where most undergraduate students ”leave off” in their studies of mathematics to the place where most texts on tensor analysis begin. A basic knowledge of vectors, matrices, and physics is assumed. A semi-intuitive approach to those notions underlying tensor analysis is given via scalars, vectors, dyads, triads, and higher vector products. The reader must be prepared to do some mathematics and to think. For those students who wish to go beyond this humble start, I can only recommend my professor’s wisdom: find the rhythm in the mathematics and you will fare pretty well.
Author
Students; Tensor Analysis; Physics; Analysis (Mathematics); Engineering

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 Electronics and Electrical Engineering. For computer vision see 63 Cybernetics, Artificial Intelligence and Robotics.

20020080924 Infogrip, Inc., Baton Rouge, LA USA
Advanced Keyboard
Spinoff 1993; 1993, pp. 109; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Using chordic technology, a data entry operator can finger key combinations for text or graphics input. Because only one hand is needed, a disabled person may use it. Strain and fatigue are less than when using a conventional keyboard; input is faster, and the system can be learned in about an hour. Infogrip, Inc. developed chordic input technology with Stennis Space Center (SSC). (NASA is interested in potentially faster human/computer interaction on spacecraft as well as a low cost tactile/visual training system for the handicapped.) The company is now marketing the BAT as an improved system for both disabled and non-disabled computer operators.
Author
Human-Computer Interface; Computer Programs; Data Processing Equipment; Education

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20020080870 Old Dominion Univ., Dept. of Computer Science, Norfolk, VA USA
Design and Analysis of Architectures for Structural Health Monitoring Systems ***Final Report***
Mukkamala, Ravi, Old Dominion Univ., USA; [2002]; 133p; In English
Contract(s)/Grant(s): NAG1-2279
Report No.(s): ODURF-102551; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

During the two-year project period, we have worked on several aspects of Health Usage and Monitoring Systems for structural health monitoring. In particular, we have made contributions in the following areas. 1. Reference HUMS architecture: We developed a high-level architecture for health monitoring and usage systems (HUMS). The proposed reference architecture is shown. It is compatible with the Generic Open Architecture (GOA) proposed as a standard for avionics systems. 2. HUMS kernel: One of the critical layers of HUMS reference architecture is the HUMS kernel. We developed a detailed design of a kernel to implement the high level architecture.3. Prototype implementation of HUMS kernel: We have implemented a preliminary

version of the HUMS kernel on a UNIX platform.We have implemented both a centralized system version and a distributed version. 4. SCRAMNet and HUMS: SCRAMNet (Shared Common Random Access Memory Network) is a system that is found to be suitable to implement HUMS. For this reason, we have conducted a simulation study to determine its stability in handling the input data rates in HUMS. 5. Architectural specification.
CASI
Design Analysis; Kernel Functions; Simulation; Stability; Systems Health Monitoring

20020080889 DiGraphics, Inc., Houston, TX USA
Risk Assessment System
Spinoff 1993; 1993, pp. 104; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

FEAT, a software system for evaluating risks, was developed by Lockheed and later enhanced under NASA funding. FEAT uses directed graph - or digraph - models to provide information on cause and effect if a set of failure events occurs. James Miller, the program designer at Lockheed, formed DiGraphics, Inc. to market the software that has evolved from FEAT. The Diquest Analyzer, the company's flagship product, assists product designers in identifying the redundancies and weaknesses of a system. The software has applications in the chemical industry for risk assessment, design evaluation, and change management. Additional markets have been found in operations monitoring diagnostics and training of new personnel.
Author
Risk; Design Analysis; Management Planning; Computer Program Integrity

20020080922 Avyx, Inc., Englewood, CO USA
Scheduling Software
Spinoff 1993; 1993, pp. 114; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Advanced Scheduling Environment is a software product designed and marketed by AVYX, Inc. to provide scheduling solutions for complex manufacturing environments. It can be adapted to specific scheduling and manufacturing processes and has led to substantial cost savings. The system was originally developed for NASA use in scheduling Space Shuttle flights and satellite activities. AVYX, Inc. is an offshoot of a company formed to provide computer-related services to NASA. TREES-plus, the company's initial product became the programming language for the advanced scheduling environment system.
Author
Scheduling; Software Engineering; Project Management; Manufacturing

20020080923 Symbiotics, Inc., Cambridge, MA USA
Small Business Innovations
Spinoff 1993; 1993, pp. 112-113; In English; Originial contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under an Army Small Business Innovation Research (SBIR) grant, Symbiotics, Inc. developed a software system that permits users to upgrade products from standalone applications so they can communicate in a distributed computing environment. Under a subsequent NASA SBIR grant, Symbiotics added additional tools to the SOCIAL product to enable NASA to coordinate conventional systems for planning Shuttle launch support operations. Using SOCIAL, data may be shared among applications in a computer network even when the applications are written in different programming languages. The product was introduced to the commercial market in 1993 and is used to monitor and control equipment for operation support and to integrate financial networks. The SBIR program was established to increase small business participation in federal R&D activities and to transfer government research to industry. InQuisiX is a reuse library providing high performance classification, cataloging, searching, browsing, retrieval and synthesis capabilities. These form the foundation for software reuse, producing higher quality software at lower cost and in less time. Software Productivity Solutions, Inc. developed the technology under Small Business Innovation Research (SBIR) projects funded by NASA and the Army and is marketing InQuisiX in conjunction with Science Applications International Corporation (SAIC). The SBIR program was established to increase small business participation in federal R&D activities and to transfer government research to industry.
Author
Computer Networks; Software Engineering; Systems Integration; Management Planning

20020080925 Society for Computer Simulation International, San Diego, CA USA

Seminar Software

Spinoff 1993; 1993, pp. 108; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The Society for Computer Simulation International is a professional technical society that distributes information on methodology techniques and uses of computer simulation. The society uses NETS, a NASA-developed program, to assist seminar participants in learning to use neural networks for computer simulation. NETS is a software system modeled after the human brain; it is designed to help scientists exploring artificial intelligence to solve pattern matching problems. Examples from NETS are presented to seminar participants, who can then manipulate, alter or enhance them for their own applications.

Author

Artificial Intelligence; Computer Systems Programs; Computerized Simulation; Computer Networks

20020080926 Fakespace, Inc., Mountain View, CA USA

Virtual Reality: You Are There

Spinoff 1993; 1993, pp. 106; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Telepresence or ”virtual reality,” allows a person, with assistance from advanced technology devices, to figuratively project himself into another environment. This technology is marketed by several companies, among them Fakespace, Inc., a former Ames Research Center contractor. Fakespace developed a teleoperational motion platform for transmitting sounds and images from remote locations. The ”Molly” matches the user’s head motion and, when coupled with a stereo viewing device and appropriate software, creates the telepresence experience. Its companion piece is the BOOM-the user’s viewing device that provides the sense of involvement in the virtual environment. Either system may be used alone. Because suits, gloves, headphones, etc. are not needed, a whole range of commercial applications is possible, including computer-aided design techniques and virtual reality visualizations. Customers include Sandia National Laboratories, Stanford Research Institute and Mattel Toys.

Author

Virtual Reality; Artificial Intelligence; Human-Computer Interface; Computer Graphics

20020080927 Software House, Inc., Waltham, MA USA

Security System Software

Spinoff 1993; 1993, pp. 102; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

C Language Integration Production System (CLIPS), a NASA-developed expert systems program, has enabled a security systems manufacturer to design a new generation of hardware. C.CURESystem 1 Plus, manufactured by Software House, is a software based system that is used with a variety of access control hardware at installations around the world. Users can manage large amounts of information, solve unique security problems and control entry and time scheduling. CLIPS acts as an information management tool when accessed by C.CURESystem 1 Plus. It asks questions about the hardware and when given the answer, recommends possible quick solutions by non-expert persons.

Author

Software Engineering; Computer Information Security; Information Management; Expert Systems

20020080941 Electronic Imagery, Inc., Delray Beach, FL USA

Image Processing

Spinoff 1993; 1993, pp. 71; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Electronic Imagery, Inc.’s ImageScale Plus software, developed through a Small Business Innovation Research (SBIR) contract with Kennedy Space Flight Center for use on space shuttle Orbiter in 1991, enables astronauts to conduct image processing, prepare electronic still camera images in orbit, display them and downlink images to ground based scientists for evaluation. Electronic Imagery, Inc.’s ImageCount, a spin-off product of ImageScale Plus, is used to count trees in Florida orange groves. Other applications include x-ray and MRI imagery, textile designs and special effects for movies. As of 1/28/98, company could not be located, therefore contact/product information is no longer valid.

Author

Image Processing; Software Engineering; Imagery; Technology Transfer

20020080947 Systems Control Technology, Inc., Palo Alto, CA USA

Reliability Prediction

Spinoff 1993; 1993, pp. 115; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

RELAV, a NASA-developed computer program, enables Systems Control Technology, Inc. (SCT) to predict performance of aircraft subsystems. RELAV provides a system level evaluation of a technology. Systems, the mechanism of a landing gear for example, are first described as a set of components performing a specific function. RELAV analyzes the total system and the individual subsystem probabilities to predict success probability, and reliability. This information is then translated into operational support and maintenance requirements. SCT provides research and development services in support of government contracts.

Author

Computer Systems Programs; Reliability Analysis; Systems Analysis; Performance Prediction

20020081014 Minnesota Univ., Dept. of Computer Science and Engineering, Minneapolis, MN USA

Structuring Formal Requirements Specifications for Reuse and Product Families ***Final Report***

Heimdahl, Mats P. E., Minnesota Univ., USA; Sep. 09, 2001; 464p; In English

Contract(s)/Grant(s): NAG1-2242; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

In this project we have investigated how formal specifications should be structured to allow for requirements reuse, product family engineering, and ease of requirements change, The contributions of this work include (1) a requirements specification methodology specifically targeted for critical avionics applications, (2) guidelines for how to structure state-based specifications to facilitate ease of change and reuse, and (3) examples from the avionics domain demonstrating the proposed approach.

Author

Software Engineering; Requirements

20020081245 Mississippi State Univ., Mississippi State, MS USA

The Use of Mathcad in Thermal/Fluids Calculations

Hodge, B. K., Mississippi State Univ., USA; Taylor, Robert P., Mississippi State Univ., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 143-160; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

General computational software systems (such as Mathcad, Matlab, and Mathematica) with great flexibility are available for use on personal computers. This paper examines the application of one of these systems, Mathcad, to a number of preliminary thermal sciences calculations. Application examples include piping networks, steady-steady system simulation, and simple and generalized one-dimensional compressible flows. Mathcad is demonstrated to be a useful tool that offers great flexibility and generality as well as congruence with problem formulation.

Author

Applications Programs (Computers); Thermal Analysis; Computerized Simulation

20020081254 NASA Glenn Research Center, Cleveland, OH USA

Interfacing SINDA/FLUINT with ROCETS

Sakowski, Barbara A., NASA Glenn Research Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 263-269; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

A complete thermal and fluid systems analysis for a Rocket-Based Combined Cycle (RBCC) type vehicle would optimally link the cycle analysis of the vehicle with the thermal and fluid systems analysis of the vehicle. Furthermore it would be advantageous if the cycle analysis could be dynamically linked to the thermal and fluids systems analysis. This would avoid the repetitive and tedious process of manually inputting the results of the cycle analysis as boundary conditions in the thermal and fluids systems analysis, and subsequently inputting those results as boundary conditions in the cycle analysis until a converged solution is achieved. The goal of this paper is to illustrate such an interface between the ROCket Engine Transient Simulator (ROCETS), a cycle analysis code, and a thermal and fluid systems analysis code, SINDA/FLUINT.

Author

Applications Programs (Computers); Data Integration; Interfaces; Computer Aided Design

20020081271 NASA Goddard Space Flight Center, Greenbelt, MD USA

REACH: Real-Time Data Awareness in Multi-Spacecraft Missions

Maks, Lori, NASA Goddard Space Flight Center, USA; Coleman, Jason, Aquilent, Inc., USA; [2002]; 9p; In English; SpaceOps 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

NASA's Advanced Architectures and Automation Branch at the Goddard Space Flight Center (Code 588) saw the potential to reduce the cost of constellation missions by creating new user interfaces to the ground system health-and-safety data. The goal is to enable a small Flight Operations Team (FOT) to remain aware and responsive to the increased amount of ground system information in a multi-spacecraft environment. Rather than abandon the tried and true, these interfaces were developed to run alongside existing ground system software to provide additional support to the FOT. These new user interfaces have been combined in a tool called REACH. REACH-the Real-time Evaluation and Analysis of Consolidated Health-is a software product that uses advanced visualization techniques to make spacecraft anomalies easy to spot, no matter how many spacecraft are in the constellation. REACH reads numerous real-time streams of data from the ground system(s) and displays synthesized information to the FOT such that anomalies are easy to pick out and investigate.

Author

Real Time Operation; Spacecraft Environments; Display Devices; Cost Reduction

20020081275 Ohio Univ., School of Electrical Engineer and Computer Science, Athens, OH USA

Adaptive Resource Management Technology for Satellite Constellations

Welch, Lonnie, Ohio Univ., USA; Tjaden, Brett, Ohio Univ., USA; Pfarr, Barbara B., NASA Goddard Space Flight Center, USA; [2002]; 4p; In English; ESTC 2002, 11-13 Jun. 2002, Pasadena, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This manuscript describes the Sensor Web Adaptive Resource Manager (SWARM) project. The primary focus of the project is on the design and prototyping of middleware for managing computing and network resources in a way that enables the information systems of satellite constellations to provide realtime performance within dynamic environments. The middleware has been prototyped, and it has been evaluated by employing it to manage a pool of distributed resources for the ITOS (Integrated Test and Operations System) satellite command and control software system. The design of the middleware is discussed and a summary of the evaluation effort is provided.

Author

Satellite Constellations; Software Engineering; Technology Utilization; Computer Networks; Command and Control; Management Systems

20020081282 NASA Goddard Space Flight Center, Greenbelt, MD USA

Application of Reconfigurable Computing Technology to Multi-KiloHertz Micro-Laser Altimeter (MMLA) Data Processing

Powell, Wesley, NASA Goddard Space Flight Center, USA; Dabney, Philip, NASA Goddard Space Flight Center, USA; Hicks, Edward, NASA Goddard Space Flight Center, USA; Pinchinat, Maxime, NASA Goddard Space Flight Center, USA; [2002]; 7p; In English; MAPLD Conference, 10-13 Sep. 2002, Laurel, MD, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Multi-KiloHertz Micro-Laser Altimeter (MMLA) is an aircraft based instrument developed by NASA Goddard Space Flight Center with several potential spaceflight applications. This presentation describes how reconfigurable computing technology was employed to perform MMLA signal extraction in real-time under realistic operating constraints. The MMLA is a "single-photon-counting" airborne laser altimeter that is used to measure land surface features such as topography and vegetation canopy height. This instrument has to date flown a number of times aboard the NASA P3 aircraft acquiring data at a number of sites in the Mid-Atlantic region. This instrument pulses a relatively low-powered laser at a very high rate (10 kHz) and then measures the time-of-flight of discrete returns from the target surface. The instrument then bins these measurements into a two-dimensional array (vertical height vs. horizontal ground track) and selects the most likely signal path through the array. Return data that does not correspond to the selected signal path are classified as noise returns and are then discarded. The MMLA signal extraction algorithm is very compute intensive in that a score must be computed for every possible path through the two dimensional array in order to select the most likely signal path. Given a typical array size with 50 x 6, up to 33 arrays must be processed per second. and for each of these arrays, roughly 12,000 individual paths must be scored. Furthermore, the number of paths increases exponentially with the horizontal size of the array, and linearly with the vertical size. Yet, increasing the horizontal and vertical sizes of the array offer science advantages such as improved range, resolution, and noise rejection. Due to the volume of return data and the compute intensive signal extraction algorithm, the existing PC-based MMLA data system has been unable to perform signal extraction in real-time unless the array is limited in size to one column, This limits the ability of the MMLA

to operate in environments with sparse signal returns and a high number of noise return. However, under an IR&D project, an FPGA-based, reconfigurable computing data system has been developed that has been demonstrated to perform real-time signal extraction under realistic operating constraints. This reconfigurable data system is based on the commercially available Firebird Board from Annapolis Microsystems. This PCI board consists of a Xilinx Virtex 2000E FPGA along with 36 MB of SRAM arranged in five separately addressable banks. This board is housed in a rackmount PC with dual 850MHz Pentium processors running the Windows 2000 operating system. This data system performs all signal extraction in hardware on the Firebird, but also runs the existing ”software based” signal extraction in tandem for comparison purposes. Using a relatively small amount of the Virtex XCV2000E resources, the reconfigurable data system has demonstrated to improve performance improvement over the existing software based data system by an order of magnitude. Performance could be further improved by employing parallelism. Ground testing and a preliminary engineering test flight aboard the NASA P3 has been performed, during which the reconfigurable data system has been demonstrated to match the results of the existing data system.
Author
Aircraft Instruments; Central Processing Units; Computation; Field-Programmable Gate Arrays; Laser Altimeters; Topography; Computer Programs

20020082975 Rochester Univ., Dept. of Computer Science, NY USA
A Dialogue-Based Architecture for a Tactical Picture Agent ***Final Report, 1 Jun. 1995-30 Sep. 2001***
Allen, James F.; Sep. 30, 2001; 5p; In English
Contract(s)/Grant(s): N00014-95-1-1008
Report No.(s): AD-A405855; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
This project developed technology to enable multi-modal dialogue-based interfaces for interactive analysis and problem solving. We developed a system that acts as a planning assistant, interacting with the user in conversational English to help with situation assessment and logistics planning. This enabled users without prior training to interact successfully with a set of sophisticated Al reasoning tools. The novel system architecture we developed will serve as the starting point for a new generation of mixed-initiative spoken dialogue-based systems.
DTIC
Speech Recognition; Architecture (Computers); Logistics; Speech; Human-Computer Interface

20020082976 New York Univ., Courant Inst. of Mathematical Sciences, New York, NY USA
Transformational Development of Reactive Systems ***Final Report, Nov. 1998-Sep. 2002***
Zuck, Lenore; Pnueli, Amir; Goldberg, Benjamin; Sep. 2002; 7p; In English
Contract(s)/Grant(s): N00014-99-1-0131
Report No.(s): AD-A405856; F0931; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This is the final technical report. It presents an enumeration of the research results of the effort, including a list of papers published and a brief summary of the content or the papers. The results were primarily in the area of compiler validation, formal methods, and verification. Applications or the work include reactive systems, as mentioned in the title of the effort, as well as more general software Systems.
DTIC
Reactivity; Program Verification (Computers); Computer Programs

20020083004 Naval Postgraduate School, Monterey, CA USA
Network Interdiction by Lagrangian Relaxation and Branch-and-Bound
Uygun, Adnan; Jun. 2002; 65p; In English
Report No.(s): AD-A406059; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The maximum-flow network-interdiction problem (MXFI) arises when an interdictor, using limited interdiction resources, wishes to restrict an adversary’s use of a capacitated network, MXFI is not easy to solve when converted to a binary integer program. Derbes uses Lagrangian relaxation to solve the problem, at least approximately, for a single value of available resource, R Bingol extends this technique to solve MXFI approximately for all integer values of R in a specified range But, ’problematic R-values’ with substantial optimality gaps do arise, We reduce optimality gaps in two ways, First, we find the best Lagrangian multiplier for problematic R-values by following the slope of the Lagrangian function, Secondly, we apply a limited-enumeration branch-and-bound algorithm We test our algorithms on six different test networks with up to 402 nodes and 1826 arcs, The algorithms are coded in Java 1,3 and run on a 533 MHz Pentium III computer The first technique takes at most 39,3 seconds for

any problem, and for one instance, it solves 8 of the problem's 15 problematic R-values, For that problem, the second technique solves four of the remaining problematic R-values, but run time increases by two orders of magnitude
DTIC
Networks; Lagrangian Function; Algorithms

20020083015 Operational Test and Evaluation Force, Norfolk, VA USA
Software Change and Regression Testing ***Final Report***
Hoover, Alex; Nov. 26, 2001; 8p; In English
Report No.(s): AD-A405771; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The only constant is change. Nowhere is this more evident than in the world of software. The addition of field changes, patches, updates and upgrades at regular, short-term intervals makes the acquisition of software intensive systems complex at best. Is the system configuration as stable today in test as it was six months ago at the last software review? Is today's test item representative of the item that will be delivered to the servicemember in the field a year from now? Traditional software metrics fall shot of providing useful answers to these questions. SLOC, version numbers, and release dates describe the physical characteristics of an application. The questions that most often arise in the management of a software program, however, need information on the operational performance of the application.
DTIC
Computer Programs; Program Verification (Computers); Computer Systems Programs

20020083020 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Reeducation to Expand the Software Engineering Workforce: Successful Industry/University Collaborations ***Final Report***
Ellis, Heidi J.; Moreno, Ana; Mead, Nancy R.; Seidman, Stephen B.; Jul. 2002; 41p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A405789; CMU/SEI-2002-SR-001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Software produced worldwide is growing at a phenomenal rate as software is used in such diverse products as automobiles, homes, and airplanes. In addition, the increasingly global business climate and expanding emphasis on distributed computing have accelerated the need for business software. However, there is currently an inadequate number of software engineers to produce and maintain software to meet this demand. One possible solution to correcting this shortfall is reeducating existing non-software engineering employees to become software engineers. For the past two years, the Industry/University (I/U) subgroup of the Working Group on Software Engineering Education and Training has been investigating active collaborations between companies and universities in which non-software professionals and practitioners who lack formal software education are reeducated to become software engineers. This paper reports on the I/U subgroup's findings by describing their approach to the investigation, the factors involved in successful collaboration construction and execution, and alumni views of the knowledge and skills transferred by the collaboration.
DTIC
Software Engineering; Education; Computer Programs; Engineers; Industries; Personnel

20020083022 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Quality Attribute Workshops, 2nd Edition ***Final Report***
Barbacci, Mario R.; Ellison, Robert; Lattanze, Anthony J.; Stafford, Judith A.; Weinstock, Charles B.; Wood, William G.; Jun. 2002; 39p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A405790; CMU/SEI-2002-TR-019; ESC-TR-2002-019; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Quality attribute workshops (QAWs) provide a method for analyzing a system's architecture against a number of critical quality attributes, such as availability, performance, security, interoperability, and modifiability, that are derived from mission or business goals. The QAW does not assume the existence of a software architecture. It was developed to complement the Architecture Tradeoff Analysis Method(Service mark) (ATAM(Service mark) in response to customer requests for a method to identify important quality attributes and clarify system requirements before there is a software architecture to which the ATAM could be applied. The analysis is based on applying a set of test cases to a system architecture. These test cases include questions and concerns elicited from stakeholders associated with the system. The process of building the test cases allows stakeholders to communicate among themselves, thereby exposing assumptions that may not have surfaced during requirements elicitation. Our experience to date includes multiple QAWs that were held with four different U.S. government acquisition programs. This is the

second edition of a technical report describing QAWs. This report clarifies the context in which a QAW is applicable, provides a rationale for developing the process and describes it in detail, and concludes with a list of lessons learned and a discussion of how these lessons have helped evolve the process to its current state.
DTIC
Quality Control; Architecture (Computers); Conferences

20020083023 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Plug-In Architecture for Mobile Devices ***Final Report***
Keshavamurthy, Madhu; Kim, Jung S.; Li, Mona; Sagetong, Vichaya; Aug. 2002; 47p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A405791; CMU/SEI-2002-TN-028; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This technical note describes plug-in architecture for mobile devices (PAMD)-an architectural specification that extends the function of applications in mobile devices. Users gain major benefits when the functionality of applications that run on these devices can be extended through the addition of new services that don't require changes to the application itself. PAMD provides interoperability between applications and plug-ins without sacrificing the performance of the mobile devices on which they run. Because existing applications can be made PAMD compliant with little modification, the development time and costs of adding functionality to them can be reduced dramatically. As PAMD bears the burden of communicating with plug-ins, application and plug-in developers can develop their own products independently and easily use each other's products. This technical note also describes PAMD's interfaces, how applications and plug-ins interact with them, and the advantages of using PAMD. Also included are several scenarios that explain the architecture and how it can be implemented, and suggestions for extensions that enhance it.
DTIC
Plugs; Communicating; Architecture (Computers); Mobile Communication Systems

20020083057 Titan Systems, Inc., Vienna, VA USA
Systems Level Design Language (SLDL) Project ***Final Report, 29 Jan. 1999-2 Jan 2002***
Barton, David L.; Jan. 2002; 14p; In English
Contract(s)/Grant(s): F33615-98-C-1350; Proj-6096
Report No.(s): AD-A406207; AFRL-IF-WP-TM-2002-1562; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of the Systems Level Design Language (SLDL) Program was to provide a new mechanism for systems design that will allow a number of models, created in different design domains (or specialties), to share information and to create a unified systems design environment. The resulting language can represent large system descriptions and assist system developers to handle the complexity inherent in designing and understanding such systems. As commercial tools are developed to interact with and use the SLDL language specification, currently known as Rosetta, system developers will be better able to catch design flaws much earlier in the design process, resulting in significant savings in rework and associated development cost. Although this contract funded only 2 years of a planned 3 years effort, it succeeded in providing the momentum which produced results that could be picked up by other efforts. Dedicated efforts from the SLDL committee formed by the Electronic Design Automation (EDA) Industry Council and the language and tool developers resulted in continued progress heading toward an inevitable improvement in system level design capabilities applicable to both commercial and military systems.
DTIC
Systems Engineering; Momentum; Industries; Commerce; Language Programming

20020083076 Carnegie-Mellon Inst. of Research, Pittsburgh, PA USA
PAMD: Developing a Plug-In Architecture for Palm OS-Powered Devices Using Software Engineering ***Final Report***
Eguiluz, Herman; Govi, Venkat; Kim, You J.; Sia, Adrian; Aug. 2002; 49p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A405846; CMU/SEI-2002-TN-020; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This technical note describes a plug-in architecture for Palm Operating System devices developed by the authors, a team of graduate students from Carnegie Mellon's Master of Software Engineering program. The note highlights the architecture's three most important aspects: the product (a plug-in architecture) created from a software architecture point of view; the implementation details that made this a unique project; and the software engineering facets of the project. This note also shares lessons learned

and suggests possible avenues that could be pursued in the future to make plug-in architecture for mobile devices (PAMD) more universal.
DTIC
Software Engineering; Architecture (Computers); Computers

20020083077 Carnegie-Mellon Inst. of Research, Pittsburgh, PA USA
Use of Quality Attribute Workshops (QAWs) in Source Selection for a DoD system Acquisition: A Case Study ***Final Report***
Bergey, John K.; Wood, William G.; Jun. 2002; 59p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A405848; CMU/SEI-2002-TN-013; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The architecture of a software-intensive system is critical to its quality. For an acquisition organization within the Department of Defense (DoD), evaluating architectures as early as possible in an acquisition can have a favorable impact on the delivered system. This technical note is a case study of how a DoD organization used architecture analysis and evaluation in a major system acquisition, early on, to reduce program risk. The case study begins by describing the system, the motivation for including architecture evaluation in the acquisition, and the Quality Attribute Workshop (QAW) approach. Following this is a brief description of the system acquisition strategy. The case study then describes the set of events (and supporting artifacts) that were required to incorporate QAW architecture analysis and evaluation in the acquisition strategy. In addition, it describes the relationship of these events and artifacts to the source-selection process. Concluding the case study is a description of the accomplishments and lessons learned, along with sample sections from the request for proposal (RFP). These sections provide additional insight into the contractual language that was used to implement the architecture analysis and evaluation approach.
DTIC
Acquisition; Architecture (Computers); Qualitative Analysis

20020083338 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
Moving-Map Composers System Version 3.4P Acceptance Test Procedures Developed for the Finnish Air Force
Trenchard, Michael E.; Myrick, Stephanie A.; Lohrenz, Maura C.; Gendron, Marlin L.; Watkins, Jessica L.; Jul. 29, 2002; 32p; In English
Report No.(s): AD-A405745; NRL/MR/7440--02-8279; NAVAIR-PMA-265; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document provides detailed Acceptance Test Procedures (ATP) to be followed daring the final test and evaluation of the Naval Research Laboratory (NRL) Moving-Map Composer (MMC) version 3.4 P software, developed for the Finnish Air Force (FAF). The ATP will be performed on a FAF-owned Digital Alpha computer, currently located at NRL, during the Test Readiness Review (TRR) #1 and during installation and training in Finland.
DTIC
Acceptability; Air Defense; Computer Systems Programs; Systems Engineering

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see 82 Documentation and Information Science. For computer systems applied to specific applications, see the associated category.

20020080914 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Practical Computer Security through Cryptography
McNab, David, MRJ Technology Solutions, Inc., USA; Dec. 30, 1998; 1p; In English
Contract(s)/Grant(s): RTOP 509-10-61; No Copyright; Avail: Issuing Activity; Abstract Only

The core protocols upon which the Internet was built are insecure. Weak authentication and the lack of low level encryption services introduce vulnerabilities that propagate upwards in the network stack. Using statistics based on CERT/CC Internet security incident reports, the relative likelihood of attacks via these vulnerabilities is analyzed. The primary conclusion is that the standard UNIX BSD-based authentication system is by far the most commonly exploited weakness. Encryption of Sensitive password data and the adoption of cryptographically-based authentication protocols can greatly reduce these vulnerabilities. Basic cryptographic terminology and techniques are presented, with attention focused on the ways in which technology such as encryption and digital signatures can be used to protect against the most commonly exploited vulnerabilities. A survey of contemporary security software demonstrates that tools based on cryptographic techniques, such as Kerberos, ssh, and PGP, are

readily available and effectively close many of the most serious security holes. Nine practical recommendations for improving security are described.
Author
Computer Information Security; Cryptography; Vulnerability

20020081265 NASA Goddard Space Flight Center, Greenbelt, MD USA
Proton Single Event Effects (SEE) Testing of the Myrinet Crossbar Switch and Network Interface Card
Howard, James W., Jr., Jackson and Tull, Inc., USA; LaBel, Kenneth A., NASA Goddard Space Flight Center, USA; Carts, Martin A., Raytheon Information Technology and Scientific Services, USA; Stattel, Ronald, Raytheon Information Technology and Scientific Services, USA; Irwin, Timothy L., QSS Group, Inc., USA; [2002]; 9p; In English; 2002 IEEE Nuclear and Space Radiation Effects Conference (NSREC), 15-19 Jul. 2002, Phoenix, AZ, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

As part of the Remote Exploration and Experimentation Project (REE), work was performed to do a proton SEE (Single Event Effect) evaluation of the Myricom network protocol system (Myrinet). This testing included the evaluation of the Myrinet crossbar switch and the Network Interface Card (NIC). to this end, two crossbar switch devices and five components in the NIC were exposed to the proton beam at the University of California at Davis Crocker Nuclear Laboratory (CNL).
Author
Protocol (Computers); Proton Beams; Switching Circuits; Computer Networks

20020082876 Defence Science and Technology Organisation, Information Networks Div., Edinburgh, Australia
Loop Group Parakeet Virtual Cable Concept Demonstrator
Dowsett, T., Defence Science and Technology Organisation, Australia; McNeill, T. C., Defence Science and Technology Organisation, Australia; Reynolds, A. B., Defence Science and Technology Organisation, Australia; Blair, W. D., Defence Science and Technology Organisation, Australia; July 2002; 20p; In English
Report No.(s): DSTO-TN-0446; DODA-AR-012-066; Copyright; Avail: Issuing Activity

The Parakeet Virtual Cable (PVC) concept demonstrator uses the Ethernet Local Area Network (LAN) laid for the Battle Command Support System (BCSS) to connect the Parakeet DVT(DA) (voice terminal) to the Parakeet multiplexer. This currently requires pairs of PVC interface units to be installed for each DVT(DA). to reduce the cost of a PVC installation, the concept of a Loop Group Parakeet Virtual Cable (LGPVC) was proposed. This device was designed to replace the up to 30 PVC boxes and the multiplexer at the multiplexer side of a PVC installation. While the demonstrator is largely complete, testing has revealed an incomplete understanding of how to emulate the proprietary handshaking occurring between the circuit switch and the multiplexer. The LGPVC concept cannot yet be demonstrated.
Author
Local Area Networks; Management; Multiplexing; Voice Communication; Support Systems

20020083070 Naval War Coll., Joint Military Operations Dept., Newport, RI USA
U.S. Space Command's Role in Computer Network Defense: 2020 Vision or Hack Job? ***Final Report***
Stephenson, Scott A.; May 13, 2002; 24p; In English
Report No.(s): AD-A405816; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The UCP change that assigned responsibility for CND to U.S. Space Command (USSC) is a fundamentally flawed attempt to correct a perceived deficiency in Information Operations (IO) doctrine and organizational design. The CND mission has been defined too narrowly and rigidly and will result in the introduction of exploitable vulnerabilities in the Defense Information Infrastructure (DII) these DII vulnerabilities will be easily and quickly exploited by sophisticated adversaries in a manner that is imperceptible to those charged with protecting it. USSC will not and cannot be effective in improving the integration of CND into military planning and operations. On the contrary, it will likely slow development and fielding of new defensive capabilities, unnecessarily complicate inter-service and inter-agency coordination, and potentially weaken the U.S. military's information security posture.
DTIC
Information Systems; Computer Networks; Computer Information Security

20020083211 Naval Postgraduate School, Monterey, CA USA
A Distributed Password Scheme for Network Operating Systems
Roth, Christopher; Jun. 2002; 65p; In English; Original contains color images
Report No.(s): AD-A406263; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Password-based user identification and authentication in a network-based operating system generally relies upon a single file that contains user information and the encoded or hashed representations of each users' password. Operating system designers have resorted to various protection schemes to prevent unauthorized access to this single file, These techniques have proved vulnerable to various attacks, the result being unauthorized access to the targeted computer system. This paper proposes a model for a distributed password system in a network environment that eliminates the single password file as a target without introducing additional computational complexity or incorporating additional cost to the user with such items as tokens or biometrics. This application incorporates proven encryption techniques and a distributed architecture to enhance the reliability of an operating system's identification and authentication procedures. The paper provides an object-oriented model of this approach, along with an analysis of a possible implementation in a current operating system.
DTIC
Cryptography; Data Processing; Computer Networks; Computer Information Security

20020083225 National Inst. of Standards and Technology, Gaithersburg, MD USA
Computer Security Considerations in Federal Procurements: A Guide for Procurement Initiators, Contracting Officers and Computer Security Officials
Guttman, Barbara; Mar. 1992; 88p; In English
Report No.(s): AD-A405622; NIST-SP-800-4; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The Computer Security Act of 198' (Pub. L. 100-235) and Office of Management and Budget Circular A-130 mandate that U.S. Government agencies protect automated information and the resources used to process it (hardware, firmware, and software). OMB Circular A-130 specifically mandates that, as a part of protecting computer systems, agencies incorporate computer security in the system acquisition process. This NIST Special Publication provides guidance for federal procurement initiators, contracting officers, and computer security officials on including computer security in acquisitions. to accomplish this goal, computer security and federal information processing (FIP) procurement must be integrated. Computer security is the protection of the integrity availability and confidentiality of automated information and information and the resources used to enter, store, process, and communicate the information. Computer security shares properties with systems/software engineering including trustworthiness, system safety, and reliability. FIP procurement is the process of acquiring hardware, software, firmware, computer-related services and telecommunications. FIP procurement begins with the process of determining needs and ends with contract completion.
DTIC
Computer Information Security; Computer Systems Programs; Information Management; Procurement; Systems Engineering

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also 54 Man/System Technology and Life Support.

20020080970 NASA Goddard Space Flight Center, Greenbelt, MD USA
Kalman Filter Chemical Data Assimilation: A Case Study in January 1992
Lary, D. J., NASA Goddard Space Flight Center, USA; Khattatov, B., National Center for Atmospheric Research, USA; Atlas, Robert, NASA Goddard Space Flight Center, USA; Mussa, H., Cambridge Univ., UK; [February 2002]; ISSN 0148-0227; 10p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This paper describes a Kalman filter chemical data assimilation system and its use for analysing a vertical atmospheric profile during January 1992. The vertical profile was at an equivalent PV latitude (phi(sub e)) of 55 deg S and consisted of 21 potential temperature (theta) levels spaced equally in log(theta) between 400 K and 2000 K. This equivalent latitude was chosen as it was well observed during January 1992 by instruments on board the Upper Atmosphere Research Satellite (UARS).
Author
Kalman Filters; Atmospheric Composition; Atmospheric Models; Chemical Composition; Data Integration; Numerical Analysis

20020080991 Ross-Hime Designs, Inc., Minneapolis, MN USA
Robotic Hand
Spinoff 1993; 1993, pp. 103; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The Omni-Hand was developed by Ross-Hime Designs, Inc. for Marshall Space Flight Center (MSFC) under a Small Business Innovation Research (SBIR) contract. The multiple digit hand has an opposable thumb and a flexible wrist. Electric muscles called Minnacs power wrist joints and the interchangeable digits. Two hands have been delivered to NASA for evaluation for potential use on space missions and the unit is commercially available for applications like hazardous materials handling and manufacturing automation. Previous SBIR contracts resulted in the Omni-Wrist and Omni-Wrist II robotic systems, which are commercially available for spray painting, sealing, ultrasonic testing, as well as other uses.
Author
End Effectors; Manufacturing; Robotics; Automatic Control

20020083298 Knowledge Analysis Technologies, Boulder, CO USA
Carnegie Hall: An Intelligent Tutor for Command-Reasoning Practice Based on Latent Semantic Analysis ***Final Report, Jan.-Jun. 2001***
Lochbaum, Karen E.; Streeter, Lynn A.; Sep. 2002; 33p; In English
Contract(s)/Grant(s): DASW01-01-C-0011; Proj. A790
Report No.(s): AD-A406129; ARI-RN-2002-18; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Report developed under a Small Business Innovation Research Program 99.2 contract for topic OSDOO-CRO2. Scenario-based training techniques, e.g., U.S. Army Research Institute for the Behavioral and Social Sciences' (ARI's) "Think Like a Commander," exercise command cognitive readiness skills. These techniques currently depend on discussion with live mentors. Phase I demonstrated that such scenarios could be taught using a web-based interactive facilitator/mentor. The web-based facilitator asks questions relevant to one scenario, and students write short text responses. Using Latent Semantic Analysis' (LSA) understanding of natural language, the intelligent mentor/facilitator analyzes the essay's content and determines the student's weak areas for further questioning. The LSA-based prototype was constructed rapidly and greatly benefited from automatically training the system on a large amount of military text. It did not require the handcrafted knowledge models and rule-bases of conventional intelligent tutors.
DTIC
Semantics; Natural Language (Computers); Education; Prototypes

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20020082870 Defence Science and Technology Organisation, Surveillance Systems Div., Edinburgh, Australia
Fitting the Most Likely Curve through Noisy Data
Newsam, Garry N., Defence Science and Technology Organisation, Australia; Redding, Nicholas J., Defence Science and Technology Organisation, Australia; May 2002; 50p; In English
Report No.(s): DSTO-RR-0242; DODA-AR-012-066; Copyright; Avail: Issuing Activity
At present the preferred method for fitting a general curve through scattered data points in the plane is orthogonal distance regression, i.e., by minimising the sum of squares of the distances from each data point to its nearest neighbor on the curve. While generally producing good fits, in theory orthogonal distance regression can be. both biased and inconsistent: in practice this manifest itself in overfitting of convex curves or underfitting of corners. The paper postulates this occurs because orthogonal distance regression is based on all incomplete stochastic model of the problem. It therefore presents an extension of the standard model that takes into accounts both the noisy measurement of points on the curve and their underlying distribution along the curve. It then derives the likelihood function of a given curve being observed under this model. Although this cannot be evaluated exactly for anything other than the simplest curves, it lends itself naturally to asymptotic approximation. Orthogonal distance regression corresponds to a first order approximation to the maximum likelihood estimator in this model: the paper also derives a second order approximation, which turns out to be a simple modification of the least squares penalty that includes a contribution from the curvature at the closest point. Analytical and numerical examples are presented to demonstrate the improvement achieved using the higher order estimator.
Author
Asymptotic Methods; Curvature; Fitting; Mathematical Models; Maximum Likelihood Estimates

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20020081298 Defence Science and Technology Organisation, Intelligence, Surveillance and Reconnaissance Div., Fishermans Bend, Australia

Integrated Surveillance Model for the Assessment of Surveillance Architectures and Operations

Berry, Paul E., Defence Science and Technology Organisation, Australia; July 2002; 48p; In English

Report No.(s): DSTO-RR-0240; DODA-AR-012-371; Copyright; Avail: Issuing Activity

There exists a requirement to be able to assess the effectiveness of surveillance operations involving multiple assets for the purposes of appraising proposals for capability development through acquisition and upgrades, as well as operationally for evaluating and comparing proposed plans for execution. The provision of a model which supports this assessment capability while accounting for the capabilities of the sensors, the dynamics of the operation, the management of the sensor-derived information in endeavouring to satisfy the surveillance requirement and the various sources of uncertainty is the subject of this report.

Author

Armed Forces; Surveillance; Models

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

20020080913 Helsinki Univ., Dept. of Mathematics, Helsinki, Finland

Generalizations of the Beckenbach-Rado Theorem

Ekonen, Markku, Helsinki Univ., Finland; [2002]; ISSN 1239-6303; 50p; In English

Report No.(s): Rept-128; ISBN 951-41-0917-1; Copyright; Avail: Issuing Activity

The systematic study of subharmonic functions was initiated by F. Riesz, who defined them in 1926. The study was continued by Riesz himself, and Beckenbach, Evans, Frogman and Rado among others. On one hand, subharmonic functions emerge naturally from function theory and potential theory. On the other hand, they can be regarded as generalizations of convex functions of one real variable, since convex functions may be called subaffine.

Author

Functions (Mathematics); Real Variables; Theorems; Approximation

20020081013 NASA Goddard Space Flight Center, Greenbelt, MD USA

Reduced Vector Preisach Model

Patel, Umesh D., NASA Goddard Space Flight Center, USA; Torre, Edward Della, George Washington Univ., USA; Jun. 10, 2002; 4p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A new vector Preisach model, called the Reduced Vector Preisach model (RVPM), was developed for fast computations. This model, derived from the Simplified Vector Preisach model (SVPM), has individual components that like the SVPM are calculated independently using coupled selection rules for the state vector computation. However, the RVPM does not require the rotational correction. Therefore, it provides a practical alternative for computing the magnetic susceptibility using a differential approach. A vector version, using the framework of the DOK model, is implemented. Simulation results for the reduced vector Preisach model are also presented.

Author

Hysteresis; Magnetic Permeability; Mathematical Models

20020081119 NASA Goddard Space Flight Center, Greenbelt, MD USA

Covariance Propagation and Partial Eigendecomposition Filtering on the Continuum: The Cases of Advective Dynamics

Cohn, S., North Atlantic Treaty Organization; [2002]; 2p; In English; NATO Advanced Study Institute, 19 May - 1 Jun. 2002, Maratea, Italy; Sponsored by North Atlantic Treaty Organization, Unknown; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

As a motivation for this lecture, we begin by stating a paradox that challenges our fundamental understanding of covariance evolution (at least it challenged my own). Attempting to resolve this 'divergence paradox' leads us to introduce the continuum

fundamental solution operator for the dynamics under consideration, which will be advection dynamics in this lecture. This operator is the object that is approximated by the discrete 'tangent linear model. We then show how the fundamental solution operator can be used to describe the solution of the continuum covariance evolution equation. This description is complete enough to resolve fully the divergence paradox.
Author
Covariance; Advection; Analysis (Mathematics)

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see categories 71 through 77. For related instrumentation see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

20020080777 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands
Efficient Implementation of the Domain-Integrated Field Relations Method for Quasi-Static Magnetic Fields
deHoop, A. T.; Lager, I. E.; Mur, G.; Oct. 2000; 22p; In English
Report No.(s): PB2002-106046; ITS/EM-2000-26; Copyright; Avail: National Technical Information Service (NTIS)

An efficient implementation of the domain-integrated field relations approach to computing quasi-static magnetic fields is presented. It aims at combining the robustness of this method with a computationally efficient discretization technique. The magnetic field strength and the magnetic flux density are computed simultaneously. First-order Cartesian expansion functions, possibly associated with incomplete simplicial stars, are employed for the discretization of both field quantities. For demonstrating the efficiency and the robustness of the method, two two-dimensional field problems with known analytical solutions are solved. The method allows an accurate modeling of the field, even in the vicinity of points where singularities are present. The present implementation demonstrates the applicability of the domain-integrated field relations method for realistic configurations.
NTIS
Flux Density; Magnetic Flux; Magnetostatic Fields; Magnetic Domains

20020080907 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands
Computing Static Fields in 2.5-Dimensional Configurations Based on Reduced-Order Modeling
Remis, R. F.; vandenBerg, P. M.; Oct. 2000; 16p; In English
Report No.(s): PB2002-106042; ITS/EM-2000-25; Copyright; Avail: National Technical Information Service (NTIS)

In this paper we consider static fields in so-called 2.5-dimensional configurations. Such configurations consist of media that are two-dimensional (that is, invariant in one direction), while the sources that generate the field are three-dimensional. Usually, these types of problems are solved by applying a spatial Fourier transformation with respect to the invariance direction. The resulting equations are solved for several Fourier transform parameters and the three-dimensional static field is obtained using the inverse Fourier transform.
NTIS
Field Theory (Physics); Electric Fields; Static Characteristics

20020082878 NASA Goddard Space Flight Center, Greenbelt, MD USA
Calculation of Scattering Amplitude Without Partial Analysis, II, Inclusion of Exchange
Temkin, Aaron, NASA Goddard Space Flight Center, USA; Shertzer, J., Holy Cross Coll., USA; [2002]; 1p; In English; Division of Atomic, Molecular and Optical Physics Meeting of the American Physical Society, 28 May - 2 Jun. 2002, Williamsburg, VA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

There was a method for calculating the whole scattering amplitude, f(Omega(sub k)), directly. The idea was to calculate the complete wave function Psi numerically, and use it in an integral expression for f, which can be reduced to a 2 dimensional quadrature. The original application was for e-H scattering without exchange. There the Schrodinger reduces a 2-d partial differential equation (pde), which was solved using the finite element method (FEM). Here we extend the method to the exchange approximation. The S.E. can be reduced to a pair of coupled pde's, which are again solved by the FEM. The formal expression

for f(Omega(sub k)) consists two integrals, f+/- = f(sub d) +/- f(sub e); f(sub d) is formally the same integral as the no-exchange f. We have also succeeded in reducing f(sub e) to a 2-d integral. Results will be presented at the meeting.
Author
Scattering Amplitude; Wave Functions; Partial Differential Equations; Finite Element Method

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ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see 45 Environment Pollution. For aircraft noise see also 02 Aerodynamics and 07 Aircraft Propulsion Propulsion and Power.

20020080982 Swedish Defence Research Establishment, Div. of Systems Technology, Stockholm, Sweden
Acoustic Scattering from Submerged Elastic Objects
Karasalo, I.; Otto, K.; Dec. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-107232; FOI-R-0307-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Numerical studies of hydroacoustic scattering from submerged 3D elastic bodies have been performed. The underlying applications are identification of objects buried in the seabed and design of embedding polymer bodies for fiber-optic hydrophones. The first study concerns data from a sea trial for scattering from a buried concrete-filled tyre. The authors extend a previously reported analysis on the trial by using more realistic models of the tyre and the seabed. In the second study, the authors investigate the elastic wavefield inside a circular polymer disc immersed in water and excited by an incident plane wave. The authors compute the normal stress field inside the disc and the unit elongation of the polymer material along circular curves in the equatorial plane of the disc for some choices of polymer material. For the buried tyre, the results provide an improved understanding of the trial data. The analysis indicates that the effects of the seafloor roughness and sediment inhomogeneities on the data are smaller than previously believed, and that the tyre material is stiffer than homogeneous concrete, probably due to reinforcing steel bars. For the polymer disc, the results yield estimates of the sensitivity and bandwidth of hydrophones of the specified shape and material type.
NTIS
Acoustic Scattering; Elastic Bodies; Underwater Acoustics; Underwater Structures

20020080992 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Acoustic Test of Embedding Material for Fiber Optic Hydrophones ***Akustisk Utprovning av Ingjutningsmaterial foer Fiberoptiska Hydrofoner***
Olsson, A.; Kullander, F.; Dec. 2001; 94p; In Swedish
Report No.(s): PB2002-107234; FOI-R-0314-SE; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Fiber optic hydrophones, fiber laser hydrophones and planar hydrophones, have got several military applications for instance as towed array sonars for underwater surveillance or as sensors mounted on the hull of underwater vehicles. The optical fiber is embedded in a material which modifies the acoustical characteristics of the hydrophones. The purpose is to develop acoustic interfaces allowing for detection of low level signals ranging down to and below the so-called Sea State Zero level. Various materials with proper characteristics were tested but also new and innovative interfaces have been investigated, some of them with promising results. Geometrical design and proper choice of materials have been studied in previous work. The focus in this work has been to determine the frequency for a number of fiber laser hydrophones and planar hydrophones.
NTIS
Fiber Optics; Hydrophones; Sound Detecting and Ranging

20020082907 Defence Science and Technology Organisation, Maritime Operations Div., Fishermans Bend, Australia
Theory Pertaining to Comparison and Calibration in an Experiment to Measure Acoustic Reflection Coefficients
Blair, David G., Defence Science and Technology Organisation, Australia; March 2002; 100p; In English
Report No.(s): DSTO-TN-0417; DODA-012-280; Copyright; Avail: Issuing Activity

For the purpose of analyzing data to determine underwater acoustic reflection coefficients at low megahertz frequencies, relevant theory is developed. For a target that may be in the near field, the three-dimensional point spread function for image points close to the target, is derived for rather general arrays and waveforms. The model of the active system is extended to allow a coded signal, a spherical transmitter, and a transmitter not in the receiver array plane. Here and elsewhere, conditions of validity are carefully obtained. Conditions are derived under which a ball target (used for calibration in the experiment) behaves as a point

reflector. The image of a rectangular target, described by an angle-dependent reflection coefficient, is obtained. The preceding results lead to an 'integral relationship,' or 'energy conservation' relationship, proved for a point target and conjectured to hold generally. It is shown how this result would enable one to analyze the experiment to determine absolute reflection coefficients. Author

Calibrating; Underwater Acoustics; Low Frequencies; Wave Reflection

20020082983 Massachusetts Inst. of Tech., Cambridge, MA USA

Geoacoustic Inversion in Laterally Varying Shallow-Water Environments Using High-Resolution Wavenumber Estimation

Becker, Kyle M.; Feb. 2002; 174p; In English; Prepared in cooperation with Woods Hole Oceanographic Institution, MA

Contract(s)/Grant(s): N00014-96-1-0422; N00014-96-1-0441

Report No.(s): AD-A405910; MIT/WHOI-2002-03; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

An experimental method for extracting horizontal wavenumber spectra for point-source acoustic fields in laterally varying shallow water waveguides is discussed. The experiment was designed to provide input data for a perturbative inversion method for inferring the geoacoustic properties of the bottom. The input data are discrete values of horizontal wavenumbers that correspond the propagating modes in a shallow-water waveguide. Based on the asymptotic Hankel transform pair relationship between the complex pressure field and the depth-dependent Green's function, a high-resolution autoregressive (AR) spectral estimator is applied to extract wavenumber content. The estimator is characterized in terms of it performance on short-aperture noisy data. The estimator is then used on short-aperture synthetic acoustic data for extracting local horizontal wavenumber content for doing range-dependent geoacoustic inversion. Results are discussed in terms of discrete and continuous changes in the waveguide environment. The estimator is then applied to real data for a fixed receiver and towed source. For a source speed of 2 m/s, a shift was observed in the measured wavenumbers. Based on this observation, a method for measuring modal group velocity is presented from measurements of the shifted wavenumbers for a source towed out and back along the same track. DTIC

Waveguides; Shallow Water; Underwater Acoustics

20020083016 New Orleans Univ., LA USA

Wavelet Digital Signal Processing of Undersea Acoustic Data ***Final Report, May 1999-Sep. 2002***

Ioup, Juliette W.; Ioup, George E.; Wheatley, Joseph S.; Apr. 2002; 11p; In English; Original contains color images

Contract(s)/Grant(s): N00014-98-1-0828

Report No.(s): AD-A405774; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Chirplet signal reconstruction algorithms have been developed using MATLAB. A Flexible Chirplet Transform algorithm has been developed. Building and implementation of chirplet reconstruction algorithms have been completed successfully. Feature extraction and noise removal for low frequency acoustic chirp signals have been completed using scalar wavelet, wavelet packet, multiwavelet, and chirplet and Fourier techniques. Comparison of these methods has been performed, and the results have been analyzed. Adaptive wavelet transform algorithms via lifting have been developed and are currently being used to design specific wavelet transform for low frequency broadband simulated chirp signals. DTIC

Wavelet Analysis; Acoustic Properties; Broadband; Chirp Signals; Sound Waves

20020083072 Naval Postgraduate School, Monterey, CA USA

Comparison of Channel Equalization Filtering Techniques in Underwater Acoustic Communications

Kuchler, Ryan J.; Jun. 2002; 171p; In English; Original contains color images

Report No.(s): AD-A405833; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

In this thesis, underwater acoustic communications signal processing techniques which are used to equalize the distortional effects associated with the ocean as a communications channel, are investigated for a shallow water ocean environment. The majority of current signal processing techniques employ a Finite Impulse Response (FIR) filter. Three equalization filters were investigated and presented as alternatives; they were the passive time-reversed filter, the inverse filter, and the Infinite Impulse Response (IIR) filter. The main advantage of the passive time-reversed filter and the inverse filter is simplicity of design. Bit error rates for the time-reversed filter were consistently around 10(exp -1) and those for the inverse filter were greater than 10(exp -1). However, inability of the passive time-reversed filter to completely eliminate multipath components and the ill-conditioned nature offline inverse filter made it difficult to achieve Probability of Error results below 10(exp -1). Research into the development of an array receiver using a time-reversed filter should improve calculated bit error rates. Simulations of the IIR filter were conducted with limited success. The main advantage of an IIR filter is that fewer parameters are required in the design of the filter. However,

the potential for instability in the filter is a significant limitation. Probability of Error results were found to be on the order of those for current FIR filters at close ranges. Unfortunately, instability issues arose for receivers as range from the source increased. This research on the IIR filter is still in the embryonic stage whereas research using FIR filters is relatively highly developed. Further research is needed to address the issue of instability in IIR filters in order to make them effective signal processing technique employable in underwater acoustic communications.
DTIC
Underwater Acoustics; Fir Filters; Sound Transmission; Telecommunication; Signal Processing

20020083093 Department of the Navy, Washington, DC USA
Filigree Electrode Pattern Apparatus for Steering Parametric Mode Acoustic Beams
Benjamin, Kim C., Inventor; May 31, 2002; 22p; In English
Patent Info.: Filed 31 May 2002; US-Patent-Appl-SN-10161993
Report No.(s): AD-A406124; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
A piezoelectric embedded monolithic active surface for transmitting a directed acoustic beam comprising a monolithic active surface, a plurality of piezoelectric elements embedded on the surface forming an array comprising, a plurality of coupled frequency pairs comprising, a first primary frequency row extending in a frequency steered direction the first primary frequency row enabled to accept a first primary frequency signal, and a second primary frequency row extending in the frequency steered direction and located adjacent to the first primary frequency row the second primary frequency row enabled to accept a second primary frequency signal, wherein the plurality of coupled frequency pairs repeat in a delay-steered direction and wherein each of the coupled frequency pairs are enabled to accept a time delayed copy of the first and second primary frequency signals.
DTIC
Acoustic Emission; Beams (Radiation); Electrodes; Piezoelectricity; Continuum Mechanics

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ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20020080757 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Isospin-Forbidden B-Delayed Proton Emission
Ormand, W. E.; Nov. 23, 1999; 12p; In English
Report No.(s): DE2002-793850; UCRL-JC-136656; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The effects of isospin-symmetry breaking on proton emission following P-decay to the isobaric analog state are discussed in detail. of particular importance is the mixing with a dense background of lower isospin states, whose properties are not well known. The possibility of observing T=4 states in even-even, N=Z nuclei, which is viable if the decay proceeds via isospin-forbidden particle emission, is also discussed.
NTIS
Protons; Emission

20020081240 George Mason Univ., Inst. for Computational Sciences and Informatics, Fairfax, VA USA
Photophoresis of Micronsized Particles in the Free-Molecular Regime
Tehranian, Shahram, George Mason Univ., USA; Giovane, Frank, Naval Research Lab., USA; Blum, Jurgen, Naval Research Lab., USA; Xu, Yu-Lin, Florida Univ., USA; Gustafson, Bo A. S., Florida Univ., USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 81-94; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche
The photophoretic force in the free-molecular regime has been calculated for a spherical particle using the Lorenz-Mie solution to the electromagnetic field within the particle. The temperature distribution on the surface of the suspended particle is calculated using a finite difference method. The effect of the complex refractive index m=n+ik and the normalized size parameter defined as =2pialpha/lambda on the photophoretic force and particle velocity is also examined. We show that for a 1 solar constant illumination the photophoretic forces might be as high as 20 percent of the weight of the particles considered.
Author
Finite Difference Theory; Free Molecular Flow; Photophoresis; Microparticles

20020082872 NASA Goddard Space Flight Center, Greenbelt, MD USA

D-wave Resonances in Positronium Hydride

Drachman, Richard J., NASA Goddard Space Flight Center, USA; DiRienzi, Joseph, Notre Dame Univ., USA; [2002]; 1p; In English; Division of Atomic, Molecular and Optical Physics Meeting of the American Physical Society, 29 May - 1 Jun. 2002, Williamsburg, VA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We have recently reexamined the problem of calculating the positions and widths of the lowest-lying S- and P-state resonances in the Ps+H scattering system. The resonances are generated by bound Rydberg states in the closed rearranged channel (e(+)+H(-)), shifted somewhat by coupling with the open scattering channel. This picture had been successfully applied for S-waves, but more recent results showed unexpectedly large shifts in both P- and D-wave resonances. Our recalculation for the S- and P-waves showed that the series of resonances begins with the second Rydberg state, giving rise to an apparent large shift. Now we have extended the calculations to D states. Here we find the expected results: The 3D Rydberg state produces a resonance very close to the result of Yan and Ho, and inclusion of the 4D state gives a second resonance only slightly shifted.

Author

Positronium; Hydrides; Scattering; Resonance

20020082887 NASA Goddard Space Flight Center, Greenbelt, MD USA

Mass Polarization Effect in He-like Systems

Bhatia, A. K., NASA Goddard Space Flight Center, USA; Drachman, Richard J., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Division of Atomic, Molecular and Optical Physics Meeting of the American Physical Society, 28 May - 2 Jun. 2002, Williamsburg, VA, USA; Sponsored by American Physical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Eigenvalues for the ground state S and excited S and P states have been calculated for He-like systems, He, Li(+), Be(+2), and Ne(+8), using Hylleraas-type wave functions. These calculations have been carried out for a number of mass ratios R=mu/M=m(sub e)/(m(sub e)+M), where m(sub e) is the mass of the electron and M is the arbitrary mass of the nucleus. The eigenvalues are fitted to a 5th degree polynomial in R giving the mass polarization term (Delta (sub 1) x Delta (sub 2) and higher order corrections. The mass polarization term obtained from the fitting procedure agrees very well with the first-order result obtained directly. For example, in He we find E=E(sub 0)+Sigma(sup 5)(sub n=1)R(sup n)C(sub n), where E(sub 0)=-5.807448754 Ry and C(sub 1)=0.318138927 which agrees very well with the directly obtained first-order value 0.318138966083 and the result 0.318372 obtained by Yamanaka, using wave functions of the configuration-interaction form. We have carried out a similar calculation for the bound state of H(-).

Author

Eigenvalues; Ground State; Polarization (Charge Separation); Excitation; Helium; Lithium; Beryllium; Neon

20020083081 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

Structure-Scavenging Abilities of Cyclodextrin-Based Polyurethanes ***Final Report, Oct. 2000-Oct 2001***

Young, Sandra K.; Vajda, Peter L.; Napadensky, Eugene; Crawford, Dawn M.; Sloan, James M.; Jul. 2002; 40p; In English

Report No.(s): AD-A406085; ARL-TR-2776; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cyclodextrins are ring-shaped molecules containing an apolar cavity with a diameter 4-8 A wide and approximately 8 A deep. Because of the hydrophilic nature of the surface, the materials are readily dispersed in water. However, hydrophobic groups on the inner surface of the nanoporous molecules attract hydrophobic organics that bind noncovalently to the apolar cavity. Recently, polycyclodextrins have been developed as binders for energetic materials and as sorbants for biological materials, and exhibit potential for development as sorbant materials for water filtration. Studies using these polymers have been reported in the literature and show that the polycyclodextrins are very effective scavengers of organic contaminants in water. Our work expands on the use of cyclodextrins in polymers through the synthesis of several organic cyclodextrin-based polymers. These filtering materials have been shown to scavenge several different kinds of contaminants up to parts per million concentrations from water. Some neutron work has been done to try to ascertain the nature of capture of these contaminants.

DTIC

Water Treatment; Hydrophobicity; Absorbents; Organic Compounds; Polymers

20020083212 Naval Postgraduate School, Monterey, CA USA

Nonlinear Oscillations of a Triatomic Molecule

Wilson, Sean O.; Jun. 2002; 73p; In English; Original contains color images

Report No.(s): AD-A406258; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Due to nonlinearity in the coupling, one of the vibrational modes of a straight symmetric triatomic molecule can be unstable for amplitudes greater than a threshold value, The instability is due to the mode parametrically exciting another mode. The threshold amplitude decreases if the difference of the frequency of the two modes is reduced. We consider the simplest case of a symmetric rectilinear molecule where the coupling has a cubic nonlinearity in addition to a linear restoring force. Approximate analytical results are in good agreement with numerical simulations of the exact equations of motion, although in some cases the actual behavior fundamentally deviates from the perturbative theory. Two physical demonstrations of the instability are described, where the apparatus are a system of gliders coupled by springs and magnets on an air track. Possible quantum mechanical implications are discussed. This work is a fundamental generalization of the parametric instability of two linearly coupled nonlinear oscillators that was reported in a previous investigation.
DTIC
Polyatomic Molecules; Nonlinear Systems; Oscillations; Coupling; Triatomic Molecules

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OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20020080755 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Report on EUVL Mask Substrate Development: Low-Expansion Substrate Finishing II
Tong, W. M.; Taylor, J. S.; Hector, S. D.; Shell, M.; Dec. 08, 1999; 39p; In English
Report No.(s): DE2002-793704; UCRL-ID-136113-PT-2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report is a continuation of our assessment of the finishing of low thermal expansion material wafers obtained through three different commercial pathways. This quarter we have patterned and printed a ULE wafer (Rode1 1) and saw no difference between its images and those from silicon wafer substrates. This further demonstrated that ULE can be used as the EUVL mask substrate material. We have also evaluated substrates produced by three vendors: Hoya, General Optics, and Rodel. Consistent with our results reported last quarter, surface roughness of the bare substrates from all three companies does not depend on the position. For Hoya, the wafers it produced had a low roughness than those from last quarter. However, the cleanliness of the wafers needs to be improved. For General Optics, the wafer roughness has increased, and it was only able to deliver one wafer this quarter. General optics will be replaced by Schott ML next quarter. For Rodel, one of its wafers (Rode1 1) that had been cleaned in-house showed excellent finishing and was selected to be patterned. We also observed that the sleeks on the substrates were smoothed by the ML coating. The other two Rode1 wafers (Rode1 2 and Rode1 4) had too many defects and the roughness values derived from AFM are not reliable.
NTIS
Masking; Substrates; Surface Finishing

20020080756 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Quarterly Report for High NA Optics Development: Q3-1999 International Sematech Project LITH 112
Taylor, J. S.; Oct. 08, 1999; 8p; In English
Report No.(s): DE2002-793706; UCRL-ID-136139; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This quarterly report provides a status update for each of the milestones for the International Sematech project on the development of high-NA optics for a small-field EUVL exposure tool. The optical design has been completed, which employs two aspheric mirrors yielding diffraction-limited imaging within a 600 urn x 200 urn field with a numerical aperture of 0.3 and a 5x reduction. Preliminary aerial image calculations show good resolution of 30nm features with partially coherent illumination. Contracts have been awarded for the fabrication and multilayer coating of the mirror elements and a detailed specification package has been generated for one of the mirror substrates (Ml). Metrology instrumentation is being assembled and fabrication has been initiated on Ml. Key progress includes the design and fabrication of kinematic mounting fixtures that enable the vendor to perform interferometry in a geometry compatible with PO Box fixturing. The first substrate is proceeding according to schedule, with delivery expected in December 1999.
NTIS
Optics; Mirrors

20020080786 Japan Broadcasting Corp., Display and Optical Devices Div., Tokyo, Japan

Cathodoluminescence Properties of Blue-Emitting SRGa2S4:Ce Thin-Films Grown by Low-Temperature Process

Tanaka, Katsu, Japan Broadcasting Corp., Japan; Okamoto, Shinji, Japan Broadcasting Corp., Japan; Kominami, Hiroko, Shizuoka Univ., Japan; Nakanishi, Yoichiro, Shizuoka Univ., Japan; Du, Xiaolong, Chiba Univ., Japan; Yoshikawa, Akihiko, Chiba Univ., Japan; August 2002; ISSN 0027-657X; 14p; In English; Copyright; Avail: Issuing Activity

The cathodoluminescence (CL) properties of Ce-activated strontium thiogallate (SRGa2S4:Ce) thin-films have been investigated aiming towards phosphor screen application in an emissive display under low to medium accelerating voltage (less than 5kV) excitation. The SRGa2S4:Ce thin-films were grown by multi-source deposition using a molecular beam epitaxy system. The growth temperature of the CL phosphor thin-films was 472.5C, which is the lowest value ever achieved. Several related properties were observed, including the CL spectra, luminance, luminous efficacy, and surface morphology of the thin-films. A luminance of 1000 cd/sq m and an efficacy of 1 lm/W were obtained at an accelerating voltage of 5 kV with a current density of 60 Mualpaha/sq cm. The light-out-coupling efficiency (Eta(sub out)) of the film was 0.0531. In spite of this small Eta(sub out) of the thin-films compared to that of powder phosphors, the luminance and efficacy were comparable to the conventional ZnS:Ag, Cl powder phosphor. The average grain size of the films was 0.14 micron x 0.04 micron. The high luminance and luminous efficacy of the films with their sub-micron grain size is useful to realize high resolution emissive displays.

Author

Cathodoluminescence; Thin Films; Strontium; Display Devices; Phosphors; Low Temperature

20020080792 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden

Free Optical Communication: Pilot Study ***FRI Optisk Kommunikation en Foerstudie***

Ekdahl, A.; Knuthammar, B.; Dec. 1999; 21p; In Swedish

Report No.(s): PB2002-107067; FOA-R-99-01296-504-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Free optical communication has potential to transmit information with a capacity of several tenths of Gb/s at long distances and can be an important complement to traditional communication. Several military applications can be used with transmitting lobes with a fraction of milliradian and antennas with only a couple of cm in dimension.

NTIS

Lasers; Optical Communication

20020080846 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden

Testbed for Materials and Components for Sensor Protection Against Sensors ***Testuppstaellning foer Material och Komponenter till skydd mot laser***

Svensson, S.; Ericson, B.; Lopes, C.; Eriksson, A.; Dec. 1999; 24p; In Swedish

Report No.(s): PB2002-107048; FOA-R-99-01326-612-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The international research on optical limiters is mainly aimed at EOCCM and is financed by military sources. The ultimate goal is to provide eyes and electroptical sensors with protection against damage caused by pulsed laser radiation. One of the most promising techniques is to utilize non-linear optical materials that can react on high irradiances and limit the transmitted energy. During later years a standardized method for material tests has been employed. By exposing the material to laser pulses at different energy levels it is possible to measure the potential of the material for use in optical limiters.

NTIS

Laser Beams; Eye Protection; Protective Clothing

20020080872 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden

Introduction to Laser Protection ***Skydd mot Laser-En Introduktion***

Karilis, H.; Svensson, S.; Nov. 2001; In Swedish; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-107220; FOI-R-0266-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report gives an introduction to the field of laser protection. The history and physics of the laser is briefly described. Some examples of hazardous, mainly military, laser systems and the damages they may cause are presented. The international convention, prohibiting eye-damaging lasers, is discussed. Different kinds of protection devices are described, primarily from the research at FOI.

NTIS

Eye Protection; Laser Damage; Laser Weapons; Injuries

20020080954 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Micromirror Arrays for Adaptive Optics
Carr, E. J.; Aug. 07, 2000; 4p; In English
Report No.(s): DE2002-793692; UCRL-ID-140057; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The long-range goal of this project is to develop the optical and mechanical design of a micromirror array for adaptive optics that will meet the following criteria: flat mirror surface (l/20), high fill factor (95%), large stroke (5-10mm), and pixel size 200mm. This will be accomplished by optimizing the mirror surface and actuators independently and then combining them using bonding technologies that are currently being developed.
NTIS
Adaptive Optics; Mechanical Engineering; Mirrors; Imaging Techniques

20020080960 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Photon Beam Diagnostics for VISA FEL
Murokh, A.; Pellegrini, C.; Rosenzweig, J.; Frigola, P.; Musumeci, P.; Nov. 05, 1999; 5p; In English
Report No.(s): DE2002-793553; UCRL-JC-136457; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The VISA (Visible to Infrared SASE Amplifier) project is designed to be a SASE-FEL driven to saturation in the sub-micron wavelength region. Its goal is to test various aspects of the existing Spontaneous Emission, theory of Self-Amplified as well as numerical codes. Measurements include: angular and spectral distribution of the FEL light at the exit and inside of the undulator; electron beam micro-bunching using CTR; single-shot time resolved measurements of the pulse profile, using auto-correlation technique and FROG algorithm. The diagnostics are designed to provide maximum information on the physics of the SASE-FEL process, to ensure a close comparison of the experimental results with theory and simulations.
NTIS
Photon Beams; Free Electron Lasers; Electron Energy; Amplifiers; Light (Visible Radiation)

20020080965 PLX, Inc., Deer Park, NY USA
Hollow Retroreflectors
Spinoff; 1993, pp. 128; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.
A hollow retroreflector is a mirror-like instrument that reflects light and other radiations back to the source. After developing a hollow retroreflector for NASA's Apollo-Soyuz mission, PLX, Inc. continued to expand the technology and develop a variety of retroreflector systems. The Lateral Transfer Hollow Retroreflector maintains precise separation, at any wavelength, of incoming and existing beams regardless of their orientation. It can be used as an instrument or as a component of an optical system. In the laboratory, it offers a new efficient means of beam positioning. In other applications, it connects laser resonators, aligns telescope mirrors and is useful in general boresighting and alignment.
Author
Mirrors; Retroreflectors; Light Sources; NASA Space Programs

20020081238 NASA Glenn Research Center, Cleveland, OH USA
Thermal Analysis of an Broadband Light Source
Golliher, Eric, NASA Glenn Research Center, USA; Proceedings of the 11th Thermal and Fluids Analysis Workshop; July 2002, pp. 51-55; In English; Also announced as 20020081233; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche
Thermal Synthesizer System (TSS) was used to perform a thermal assessment of a proposed broadband light source. The device uses MEMS (Microelectromechanical Systems) technology to form structural and thermal components of the package. Silicon and Silicon Nitride are the primary structural materials. The Tungsten filament will radiate as a blackbody at 2650 C. The analysis shows that the detector located near the bottom of the device will be sufficiently cooled without any special effort, despite the close proximity to the filament. Also, the transparent Silicon Nitride window will remain below maximum temperature limits.
Author
Light Sources; Microelectromechanical Systems; Thermal Analysis; Cooling

20020082897 NASA Goddard Space Flight Center, Greenbelt, MD USA
CCKT Calculation of e-H Total Cross Sections
Bhatia, Aaron K., NASA Goddard Space Flight Center, USA; Schneider, B. I., National Science Foundation, USA; Temkin, A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Division of Atomic, Molecular and Optical Physics Meeting of the American Physical Society, 28 May - 2 Jun. 2002, Williamsburg, VA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We are in the process of carrying out calculations of e-H total cross sections using the 'complex-correlation Kohn-T' (CCKT) method. In a later paper, we described the methodology more completely, but confined calculations to the elastic scattering region, with definitive, precision results for S-wave phase shifts. Here we extend the calculations to the (low) continuum (1 much less than k(exp 2) much less than 3) using a Green's function formulation. This avoids having to solve integro-differential equations; rather we evaluate indefinite integrals involving appropriate Green's functions and the (complex) optical potential to find the scattering function u(r). From the asymptotic form of u(r) we extract a T(sub L) which is a complex number. From T(sub L), elastic sigma(sub L)(elastic) = 4pi(2L+1)((absolute value of T(sub L))(exp 2)), and total sigma (sub L)(total) = 4pi/k(2L+1)Im(T(sub L)) cross sections follow.

Author

Cross Sections; Green'S Functions; Integral Equations; Differential Equations; Scattering Functions

20020082911 NASA Goddard Space Flight Center, Greenbelt, MD USA

Evaluation of a "CMOS" Imager for Shadow Mask Hard X-ray Telescope

Desai, Upendra D., NASA Goddard Space Flight Center, USA; Orwig, Larry E., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 200th Meeting of the American Astronomical Society, 2-6 Jun. 2002, Albuquerquen, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We have developed a hard x-ray coder that provides high angular resolution imaging capability using a coarse position sensitive image plane detector. The coder consists of two Fresnel zone plates. (FZP) Two such 'FZP's generate Moire fringe patterns whose frequency and orientation define the arrival direction of a beam with respect to telescope axis. The image plane detector needs to resolve the Moire fringe pattern. Pixilated detectors can be used as an image plane detector. The recently available 'CMOS' imager could provide a very low power large area image plane detector for hard x-rays. We have looked into a unit made by Rad-Icon Imaging Corp. The Shadow-Box 1024 x-ray camera is a high resolution 1024xl024 pixel detector of 50x50 mm area. It is a very low power, stand alone camera. We present some preliminary results of our investigation of evaluation of such camera.

Author

X Ray Telescopes; CMOS; Imaging Techniques; Optical Scanners

20020083170 Illinois Univ. at Urbana-Champaign, Urbana, IL USA

Distributed Optoelectronic Processing of Multidimensional Digital Imaging ***Final Report, 1 Apr. 1999-31 Mar. 2002***

Brady, David J.; Aug. 05, 2002; 20p; In English; Prepared in cooperation with Duke Univ., Durham, NC

Contract(s)/Grant(s): F49620-99-1-0229; Proj-2305

Report No.(s): AD-A406120; AFRL-SR-AR-TR-02-0291; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Radical improvements in electronic sensor and processor capabilities in the past decade have destabilized basic definitions of imaging in general and three-dimensional imaging in particular. Conventionally, imaging refers to analog focal or holographic systems that integrate information acquisition and processing. Increasingly aggressive digital processing, however, diminishes the processing role in the sensor head. Particularly in sensor arrays, there is often no need for a well-formed 'image' in analog space. The divide between digital and analog systems is particularly pronounced for multidimensional imaging. Holographic and stereoscopic sensors record the illusion of 3D scenes, but do not in fact construct 3D models. Tomographic and other 3D scene analysis schemes create true 3D digital models from sensor array data. In most cases, however, users do not demand and cannot process full 3D models.

DTIC

Data Processing; Digital Systems; Imaging Techniques; Systems Engineering; Three Dimensional Models

20020083185 Pennsylvania Univ., Dept. of Electrical and Systems Engineering, Philadelphia, PA USA

Biologically Motivated Representational Schemes for Mapping Polarization Information into Visual Information ***Final Report, 15 Jul. 2001-14 Apr. 2002***

Engheta, Nader; Pugh, Edward N., Jr.; Jul. 12, 2002; 14p; In English

Contract(s)/Grant(s): F49620-01-1-0470; AF Proj. 2313

Report No.(s): AD-A405896; AFRL-SR-AR-TR-02-0243; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Polarization is an important feature of electromagnetic waves, and it can provide useful information about the observed scene and objects. Without appropriate instruments human eyes cannot effectively sense the polarization of light. However, it is well known that eyes of certain animal species are sensitive to light's polarization. In this project, we explore the possibility of utilizing coherent motion of tiny dots superimposed on an image as means of representing and displaying polarization information on the image, while maintaining other features of conventional images. Our results show that image segments possessing coherently

moving dots pop out in contrast with the rest of the image with randomly moving dots, and have demonstrated that coherent motion can be exploited in providing visual cues for polarization contents. The direction of motion of the dots in each segment of the image can be related to the preferred axis of polarization in that segment, and the degree of coherence can be used for representing the degree of linear polarization. In this report, first a brief background on the polarization vision will be given, and then our efforts on mapping polarization information onto visual cues using coherently moving dots will be presented.
DTIC
Vision; Polarization (Waves); Visual Signals

20020083254 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA
Smart Structures for Control of Optical Surfaces
Sobers, D. M., Jr; Mar. 2002; 173p; In English
Contract(s)/Grant(s): AF Proj. 02185
Report No.(s): AD-A405969; AFIT/GA/ENY/02-2; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
The development of lightweight, large-aperture optics is of vital importance to the Department of Defense and the US Air Force for advancing remote sensing applications and improving current capabilities. Synthetic polymer optics offer weight and flexibility advantages over current generation glass mirrors, but require active control to maintain tight surface figure tolerances. This research explores the feasibility of using imbedded piezoelectric materials to control optical surfaces. Membrane-based and stiff piezo-controlled mirrors were constructed to develop and validate control techniques. Test results verified that surface control on the order of tens of wavelengths is possible using these systems.
DTIC
Smart Structures; Adaptive Optics; Smart Materials; Membrane Structures; Polyvinyl Fluoride; Mirrors; Flexibility

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20020083346 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Herriott Cell Interferometry for Millimeter-Scale Plasma Measurements
Antonsen, Erik L.; Burton, Rodney L.; Spanjers, Gregory G.; Engelman, Scott F.; Jul. 03, 2002; 21p; In English; Prepared in collaboration with Illinois Univ., at Urbana-Champaign
Report No.(s): AD-A405831; AFRL-PR-ED-TP-2002-175; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A Herriott Cell consists of two concave mirrors positioned on opposite sides of plasma so as to create multiple laser paths through the plasma. Added to a traditional interferometry diagnostic, the Herriott Cell multiplies the effective path length through the medium and thereby increases instrument resolution. Previous work validated the use of Herriott Cells in interferometer applications where the numerous mirror reflections will significantly degrade the phase front quality. The previous work used a planar configuration where collimated beams were retro-reflected across the exit plane of a plasma thruster. The current work extends the Herriott Cell capability to a point configuration. In this geometry the multi-pass beams converge near a single point within the plasma, useful for performing density measurements in very small scale length plasmas. Ray tracing analysis is used to illustrate example measurement geometries attainable with the instrument. It is shown that the configuration results in two convergence points for the laser paths, which somewhat complicates the interpretation of the experimental data. The diagnostic capability is demonstrated with measurements of the electron and neutral densities in the plasma exhaust of a Micro Pulsed Plasma Thruster. The measurements are validated with similar, lower resolution measurements, obtained using a single-pass interferometer.
DTIC
Plasma Diagnostics; Density Measurement; Electron Plasma; Interferometers

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

20020080724 NASA Ames Research Center, Moffett Field, CA USA
Heats of Formation and Bond Energies in Group III Compounds
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Allendorf, Mark D., Sandia National Labs., USA; Melius, Carl F., Sandia National Labs., USA; [1999]; 1p; In English
Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

We present heats of formation and bond energies for Group-III compounds obtained from calculations of molecular ground-state I electronic energies. Data for compounds of the form MXn are presented, where M = B, Al, Ga, and In, X = He H, Cl, and CH3, and n = 1-3. Energies for the B, Al, and Ga compounds are obtained from G2 predictions, while those for the In compounds are obtained from CCSD(T)/CBS calculations; these are the most accurate calculations for indium-containing compounds published to date. In most cases, the calculated thermochemistry is in good agreement with published values derived from experiments for those species that have well-established heats of formation. Bond energies obtained from the heats of formation follow the expected trend (Cl much greater than CH3 approx. H). However, the CH3M-(CH3)2 bond energies obtained for trimethylgallium and trimethylindium are considerably stronger (greater than 15 kcal/mol) than currently accepted values.
Author
Energy of Formation; Indium Compounds; Methyl Compounds; Temperature Effects

20020080725 NASA Ames Research Center, Moffett Field, CA USA
Accurate In Bond Energies
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; [1999]; 1p; In English
Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

InXn atomization energies are computed for n = 1-3 and X = H, Cl, and CH3. The geometries and frequencies are determined using density functional theory. The atomization energies are computed at the coupled cluster level of theory. The complete basis set limit is obtained by extrapolation. The scalar relativistic effect is computed using the Douglas-Kroll approach. While the heats of formation for InH, InCl and InCl3 are in good agreement with experiment, the current results show that the experimental value for In(CH3)3 must be wrong.
Author
Indium; Joints (Junctions); Relativistic Effects; Atomizing

20020080753 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Crystallization Behavior of M97 Series Silicone Cushions
Chien, A.; DeTeresa, S.; Cohenour, R.; Schnieder, J.; LeMay, J.; Sep. 07, 2000; 11p; In English
Report No.(s): DE2002-793698; UCRL-ID-140376; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

M97 series siloxanes are poly(dimethyl-diphenyl) siloxanes that are reinforced through a mixture of precipitated and fumed silica fillers which are blended in through the addition of a short chain polydimethylsiloxane processing aid. M97 silicones exhibit crystallization at 80 deg C by thermal (modulated differential scanning calorimetry) and mechanical (dynamic mechanical analysis) techniques. Isothermal dynamic mechanical analysis experiments illustrated that crystallization occurred over a 1.8 hour period in silica filled systems and 2.8 hours in unfilled systems. The onset of crystallization typically occurred after a 30 minute incubation/nucleation period. Gradiation caused the crystallization rate to decrease proportionally with dosage, but did not decrease the amount of crystallization that ultimately occurred. Irradiation in vacuum resulted in slower overall crystallization rates compared to air irradiation due to increased crosslinking of the polymer matrix under vacuum. Modulated differential scanning calorimetry contrasted the crystallization and melting behavior of pure PDMS versus the M97 base polymer and helped determine which component of the composite was the origin of the crystallization phenomena.
NTIS
Crystallization; Silicones

20020080850 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Phonon Drag Dislocations at High Pressures
Wolfer, W. G.; Oct. 19, 1999; 20p; In English
Report No.(s): DE2002-793838; UCRL-ID-136221; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Phonon drag on dislocations is the dominant process which determines the flow stress of metals at elevated temperatures and at very high plastic deformation rates. The dependence of the phonon drag on pressure or density is derived using a Mie-Grueneisen equation of state. The phonon drag is shown to increase nearly linearly with temperature but to decrease with density or pressure. Numerical results are presented for its variation for shock-loaded copper and aluminum. In these cases, density and temperature increase simultaneously, resulting in a more modest net increase in the dislocation drag coefficient. Nevertheless, phonon drag increases by more than an order of magnitude during shock deformations which approach melting. Since the dependencies of elastic modulii and of the phonon drag coefficient on pressure and temperature are fundamentally different, the effect of pressure on the constitutive law for plastic deformation can not simply be accounted for by its effect on the elastic shear modulus.
NTIS
Phonons; Dislocations (Materials)

20020080958 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Theoretical Study of Si and N Adsorption on the Si-terminated SiC (001) Surface
Pizzagalli, L.; Catellani, A.; Galli, G.; Gygi, F.; Baratoff, A.; Oct. 26, 1999; 9p; In English
Report No.(s): DE2002-793566; UCRL-JC-136232; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We report the results of first principles molecular dynamics simulations of the adsorption of Si and N atoms on a Si-terminated p(2x 1) SiC(OO1) surface. In particular, we discuss different structural models for the Si-rich (3x2) surface, and the adsorption of I/8, I/2 and 1 monolayer nitrogen on the p(2 x 1) surface. Our simulations show that a SiC(OOl)-p(2 x 1) surface covered by a nitrogen monolayer is an inert substrate which inhibits growth.
NTIS
Adsorption; Nitrogen; Silicon Carbides; Molecular Dynamics; Computerized Simulation; Mathematical Models

20020080959 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Structural Models of Amorphous Carbon and its Surfaces by Tight-Binding Molecular Dynamics
Haerle, R.; Baldereschi, A.; Galli, G.; Oct. 26, 1999; 13p; In English
Report No.(s): DE2002-793565; UCRL-JC-136231; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We use liner-scaling tight-binding molecular dynamics to generate three structural models of bulk amorphous carbon with different atomic density. Amorphous carbon surfaces are then obtained by imposing tensile strain on these computer generated networks until fracture occurs. Our results show that for a given density, the formation energy of surfaces obtained with different tensile strains differ by only a few 10-l eV/atom and their structural properties are qualitatively similar. The presence of sp sites at the surface is observed at all densities, but with different values of the concentration. The surface thicknesses obtained in our simulations agree with experimental data. Furthermore we find that surface roughness increases with the amount of graphitic component in the bulk sample. The same trends of the macro-scopic properties are obtained when using a two-center tight-binding Hamiltonian, an environmental dependent one, and first principles calculations.
NTIS
Amorphous Materials; Carbon; Molecular Dynamics; Mathematical Models; Surface Geometry

20020083013 Pennsylvania State Univ., University Park, PA USA
The Effect of Technique on the Measurement of the Electromechanical Material Properties in Piezoelectric Single Crystals ***Final Report, 1 Jul. 2000-31 Dec. 2002***
Trolier-McKinstry, Susan; Hackenberger, Wes; Ewart, Lynn; Aug. 23, 2002; 9p; In English
Contract(s)/Grant(s): N00014-00-1-0826
Report No.(s): AD-A405767; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This program enabled a comparison of the electromechanical measurements on high strain piezoelectric single crystal materials between groups at Alfred University, TRS Ceramics, the Royal Military College of Canada, the Naval Undersea Warfare Center, and Penn State University. This work focused on the measurement of field-induced polarization and strain in single crystal PZN-PT and PMN-PT under nominally stress free conditions. The objective of this work was to assess the effect of measurement technique on the observed behavior of these two single crystals. The research enabled a test of the applicability of a protocol for the derivation of small and large signal dielectric constants from the polarization versus field curves and the small and large signal piezoelectric coefficients from the strain versus field curves. Two PZN-PT compositions (4.5% PT and 8% PT), and two PMN-PT

compositions (30% PT and 25-28% PT) were characterized. It was found that the different groups showed generally very good agreement in the measured properties.
DTIC
Single Crystals; Piezoelectric Crystals; Electromechanics; Ceramics

20020083203 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Solid State Research ***Quarterly Report, 1 Feb.-30 Apr. 2002***
Shaver, David C.; May 15, 2002; 66p; In English
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A406333; 2002:2; ESC-TR-2001-082; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report covers in detail the research work of the Solid State Division at Lincoln Laboratory for the period 1 February-30 April 2002. The topics covered are Quantum Electronics, Electrooptical Materials and Devices, Submicrometer Technology, Biosensor and Molecular Technologies, Advanced Imaging Technology, Analog Device Technology, and Advanced Silicon Technology. Funding is provided by several DoD organization including the Air Force, Army, DARPA, MDA, Navy, NSA, and OSD-and also by the DOE, NASA, and NIST.
DTIC
Quantum Electronics; Electro-Optics; Solid State Physics

20020083283 Wayne State Univ., Detroit, MI USA
Augmented Student Participation in Theoretical Investigation of Point Defects and Defect Complexes in Low-Temperature-Grown GaAs ***Final Report, 15 Jun. 1997-14 Jun 2001***
Morgan, Caroline G.; Jun. 14, 2001; 46p; In English
Contract(s)/Grant(s): F49620-97-1-0479; AF Proj. 3484
Report No.(s): AD-A405900; AFRL-SR-AR-TR-02-0233; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This AASERT grant is a supplementary grant which has provided funding for additional student involvement in the work supported by AFOSR grant Number 49620-96-1-0162, 'Theoretical Investigation of Point Defects and Defect Complexes in Low-Temperature-Grown GaAs'. The major aim of this research has been a theoretical investigation of: (1) important point defects and defect complexes in low-temperature-grown (LT) GaAs, and (2) the microscopic processes occurring at the surface during growth of GaAs films, which determine how much excess arsenic will be incorporated into the material.
DTIC
Gallium Arsenides; Point Defects; Semiconductors (Materials)

20020083319 Scientific Research Associates, Inc., Glastonbury, CT USA
Physics and Modeling of Compound SemiConductor Devices with Semi-Insulating and Native-Oxide Layers ***Final Report, 1 Jan. 1998-31 Dec. 2000***
Grubin, H. L.; Dec. 31, 2000; 20p; In English; Original contains color images
Contract(s)/Grant(s): F49620-98-C-0001
Report No.(s): AD-A405684; R02-9142-F; AFRL-SR-AR-TR-02-0232; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In looking at the literature the two primary sources for two-dimensional calculations that were found were Chin et. at and Poncet. Both of these investigators essentially solve the same set of governing equations. Chin solved a similar problem to that addressed above, but the computational domain was limited to the oxide only. No calculation was performed in either the virgin material or the mask. Poncet's problem is somewhat different and he does solve the governing equations in two separate regions. However he does not solve the governing equations in the virgin material and in the masks. Thus neither of the investigators concerns themselves with the coupled interface problem between the oxide and virgin material that was attempted in our study. The study in that sense is much more ambitious. It has demonstrated that the pedestal and the cap do have an influence on the physics of the computation and they can have a significant effect on the shape of the oxide sub-region.
DTIC
Insulation; Oxides; Semiconductor Devices; Physics; Mathematical Models

20020083325 New Mexico Univ., Center for High Technology Materials, Albuquerque, NM USA
Radiation Sensitivity of Unique Memory Devices ***Final Report, 1 Oct. 2000-15 Jul. 2001***
Devine, Roderick A.; Jan. 24, 2002; 18p; In English
Contract(s)/Grant(s): F29601-00-C-0245; Proj-2305

Report No.(s): AD-A405716; Rept-318111FT; AFRL-VS-TR-2002-1009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Working protonated gate MOSFET transistor memories with gate lengths down to 5 microns and gate oxide thicknesses down to 20 nm have been produced using standard Si-based technological steps. Hysteresis in the source-drain current-versus-gate voltage as large as - 11 V was measured in 40 nm gate oxide transistors. The sensitivity of the memory to X rays was measured using an ARACOR source up to total accumulated doses of 2 Mrad (SiO2). No variation in the hysteresis voltage (which would correspond to a loss of protons) was ascertained, nor was there measurable data loss (by deviation of the current/voltage characteristic which would result if the protons redistributed themselves in the gate oxide). A buildup of fixed oxide charge in the gate oxide due to irradiation was measured and it was characteristic of that expected in an unhardened oxide.

DTIC

Computer Storage Devices; Radiation Effects; Field Effect Transistors; Radiation Damage

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PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.

20020080726 NASA Ames Research Center, Moffett Field, CA USA

Practical Aspects of Stabilized FEM Discretizations of Nonlinear Conservation Law Systems with Convex Extension

Barth, Timothy, NASA Ames Research Center, USA; [1999]; 1p; In English; FEM Circus, 16-17 Apr. 1999, PA, USA

Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

This talk considers simplified finite element discretization techniques for first-order systems of conservation laws equipped with a convex (entropy) extension. Using newly developed techniques in entropy symmetrization theory, simplified forms of the Galerkin least-squares (GLS) and the discontinuous Galerkin (DG) finite element method have been developed and analyzed. The use of symmetrization variables yields numerical schemes which inherit global entropy stability properties of the POE system. Central to the development of the simplified GLS and DG methods is the Degenerative Scaling Theorem which characterizes right symmetrizes of an arbitrary first-order hyperbolic system in terms of scaled eigenvectors of the corresponding flux Jacobean matrices. A constructive proof is provided for the Eigenvalue Scaling Theorem with detailed consideration given to the Euler, Navier-Stokes, and magnetohydrodynamic (MHD) equations. Linear and nonlinear energy stability is proven for the simplified GLS and DG methods. Spatial convergence properties of the simplified GLS and DO methods are numerical evaluated via the computation of Ringleb flow on a sequence of successively refined triangulations. Finally, we consider a posteriori error estimates for the GLS and DG demoralization assuming error functionals related to the integrated lift and drag of a body. Sample calculations in 20 are shown to validate the theory and implementation.

Author

Stability; Magnetohydrodynamics; Galerkin Method; Finite Element Method; Error Analysis; Eigenvectors; Aerodynamic Drag

20020080754 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Quantum-Classical Correspondence in Nonrelativistic Electrodynamics

Ritchie, A. B.; Weatherford, C. A.; Oct. 14, 1999; 12p; In English

Report No.(s): DE2002-793702; UCRL-ID-136074; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A form of classical electrodynamic field exists which gives exact agreement with the operator field of quantum electrodynamics (QED) for the Lamb shift of a harmonically bound point electron. Here it is pointed out that this form of classical theory with its physically acceptable interpretation is the result of an unconventional resolution of a mathematically ambiguous term in classical field theory. Finally a quantum-classical correspondence principle is shown to exist in the sense that the classical field and expectation value of the QED operator field are identical if retardation is neglected in the latter.

NTIS

Quantum Electrodynamics; Classical Mechanics

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula.

20020080812 NASA Goddard Space Flight Center, Greenbelt, MD USA
Promoting Real-Time Science in the Classroom using Wireless PDA Technology
Matusow, David, NASA Goddard Space Flight Center, USA; Sparmo, Joe, NASA Goddard Space Flight Center, USA; Weidow, Dave, Odyssey School, USA; Mar. 18, 2002; 11p; In English; MICCA 2002, 30 Mar. 2002, Baltimore, MD, USA; Sponsored by Maryland Instructional Computers Coordinators Association, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The year is 2004, NASA has landed and deployed a fleet of rovers on the surface of Mars to continue the exploration of that planet and prepare the way for human visitors. Middle school students at Milton Elementary have been following the mission through the media and Internet as part of Mr. Johnson's Earth and space sciences class. The kids have been working in teams to track the rovers as they move across the surface of Mars on a scale model of the landing site they built from sand and rocks using pictures and video downloaded from the Internet. They also built their own version of a rover that can be driven around the model. The time is 3:36pm. Jim and a couple of his fellow students from class are sitting in the cafeteria waiting for a student council meeting to begin. Mary and several others are on the bus riding home. Kathy is in her father's car waiting to leave the parking lot. On Mars, Rover-3 has just stopped and issued an alert to ground control at NASA's Jet Propulsion Laboratory (JPL). Back at Milton Elementary chimes can be heard going off in the cafeteria, on the school bus, and in Kathy's car. The students are familiar with the drill and each brings up the Mars mission status display on their hand-held PDA device. They've been using their PDAs (those Palm devices that seem to be everywhere today) to obtain real-time position information for each of the rovers throughout the mission. The mission status display tells them that Rover-3 has stopped on the edge of a small gully and isn't quite sure what to do. The students begin considering the options amongst themselves. Should the rover just drive through the gully? If it does, what happens if it gets stuck? Maybe it should turnaround and look for away around the gully? Trough questions. Real questions. Real problems. The students know they will need to be prepared to discuss the options and conduct their own simulations using the models they built in Mr. Johnson's class tomorrow. Much the same way engineers and scientists will be working to solve the problem at NASA. It's a couple of days later, NASA has made a decision on what to do and has issued new commands for Rover-3 to execute at 9:15am Milton Elementary time. Interestingly, NASA's solution to the problem differs from the one favored by the students. 9:16am, chimes can be heard going off throughout Milton Elementary.
Author
Aerodynamics; Deployment; Earth Sciences; Ground Based Control; Mars Exploration; Mars Surface; Real Time Operation; Roving Vehicles; Scale Models

20020080994 NASA Goddard Space Flight Center, Greenbelt, MD USA
Science Fairs and Observational Science: A Case History from Earth Orbit
Lowman, Paul D., Jr., NASA Goddard Space Flight Center, USA; May 13, 2002; 34p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Having judged dozens of science fairs over the years, I am repeatedly disturbed by the ground rules under which students must prepare their entries. They are almost invariably required to follow the "scientific method," involving formulating a hypothesis, a test of the hypothesis, and then a project in which this test is carried out. As a research scientist for over 40 years, I consider this approach to science fairs fundamentally unsound. It is not only too restrictive, but actually avoids the most important (and difficult) part of scientific research: recognizing a scientific problem in the first place. A well-known example is one of the problems that, by his own account, stimulated Einstein's theory of special relativity: the obvious fact that when an electric current is induced in a conductor by a magnetic field , it makes no difference whether the field or the conductor is actually (so to speak) moving. There is in other words no such thing as absolute motion. Physics was transformed by Einstein's recognition of a problem. Most competent scientists can solve problems after they have been recognized and a hypothesis properly formulated, but the ability to find problems in the first Place is much rarer. Getting down to specifics, the "scientific method" under which almost all students must operate is actually the experimental method, involving controlled variables, one of which, ideally, is changed at a time. However, there is another type of science that can be called observational science. As it happens, almost all the space research I have carried out since 1959 has been this type, not experimental science.
Author
Case Histories; Earth Orbits; Magnetic Fields; Electric Current; Conductors

20020081341 Louisiana Board of Regents, Baton Rouge, LA USA

Louisiana NASA EPSCoR Preparation Grant ***Final Report, 15 Aug. 1999 - 14 Aug. 2002***

Wefel, John P., Louisiana State Univ., USA; Savoie, E. Joseph, Louisiana Board of Regents, USA; [2002]; 24p; In English

Contract(s)/Grant(s): NCC5-393; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In August, 1999, the National Aeronautics and Space Administration issued a Cooperative Agreement (CA) to the State of Louisiana, through the Louisiana Board of Regents (BOB), for the performance of scientific research and graduate fellowships under the NASA Experimental Program to Stimulate Competitive Research (EPSCoR) -- Preparation Grant. Originally constructed as a one year program, with an optional one year continuation, this federal-state partnership culminated on 14 August 2002, including a successful continuation proposal and a no cost extension. The total value of the project reached $450K in NASA funding, matched by state funds and institutional contributions. The purpose of the Preparation Grant program was to develop and nurture strong research ties between the state and NASA field centers and Enterprises, in order to prepare for the upcoming full competition for NASA EPSCoR.

Author

Education; Students; Universities; Research and Development

20020082912 NASA Goddard Space Flight Center, Greenbelt, MD USA

Using the Process and Excitement of Science and Technology to Empower Teachers and Engage their Students

Crannell, Carol Jo, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 200th Meeting of the American Astronomical Society, 2-6 Jun. 2002, Albuquerque, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Students United with NASA Becoming Enthusiastic About Math and Science (SUNBEAMS) is a Partnership between NASA Goddard Space Flight Center (GSFC) and the District of Columbia Public Schools (DCPS). It empowers teachers and inspires students with the process and excitement of science and technology. SUNBEAMS is being developed as a model urban intervention program for sixth grade teachers and their students. The teachers come to Goddard for five weeks during the summer. They partner with Goddard mentors and work much the same way that summer students do. In addition, the teachers are responsible for developing lesson plans that they pilot at their schools and post on the SUNBEAMS web site. During the school year, each teacher brings one class to Goddard for a full week of total immersion in math and science.

Author

Education; Science; Mathematics; NASA Programs

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20020080748 General Accounting Office, Washington, DC USA

Bureau of Reclamation: Opportunities Exist to Improve Managerial Cost Information and Cost Recovery

Sep. 2002; 42p; In English

Report No.(s): PB2002-109163; GAO-02-973; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In previous work at the Department of the Interiors (Interior) Bureau of Reclamation (Bureau), the General Accounting Office (GAO) identified reimbursable project costs that were not being recovered by the Bureau. Based on this and other work that GAO has performed at the Bureau, GAO investigators reviewed the Bureaus managerial cost accounting and cost recovery practices. The objectives were to determine whether the Bureau (1) identifies and distributes for management purposes all the costs it incurs in operating its projects and administering its programs, and (2) ensures that recoverable costs are identified and recovered from customers.

NTIS

Management; Distributing; Reclamation

20020080760 Department of Energy, Washington, DC USA

Project Management Plan Solution Stabilization

Sato, P. K.; Aug. 31, 1999; 23p; In English

Report No.(s): DE2002-797671; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This plan presents the overall objectives, description, justification, and planning for the Plutonium Finishing Plant (PFP) Solutions Stabilization subproject. The intent of this plan is to describe how this project will be managed and integrated with other

facility stabilization and deactivation activities. This plan supplements the overall integrated plan presented in the 'Integrated Project Management Plan' (IPMP) for the Plutonium Finishing Plant Stabilization and Deactivation Project.
NTIS
Project Management; Management Planning; Deactivation

20020080819 General Accounting Office, Washington, DC USA
Program Evaluation: Strategies for Assessing How Information Dissemination Contributes to Agency Goals
Sep. 2002; 46p
Report No.(s): PB2003-100279; GAO-02-923; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Federal agencies are increasingly expected to focus on achieving results and to demonstrate, in annual performance reports and budget requests, how their activities will help achieve agency or governmentwide goals. We have noted that agencies have had difficulty explaining in their performance reports how their programs and activities represent strategies for achieving their annual performance goals. Agencies use information dissemination programs as one of several tools to achieve various social or environmental goals. In programs in which agencies do not act directly to achieve their goals, but inform and persuade others to act to achieve a desired outcome, it would seem all the more important to assure decision makers that this strategy is credible and likely to succeed. Various agencies, however, fail to show how disseminating information has contributed, or will contribute, to achieving their outcome-oriented goals. To assist agency efforts to evaluate and improve the effectiveness of such programs, we examined evaluations of five federal information dissemination program cases: Environmental Protection Agency (EPA) Compliance Assistance, the Eisenhower Professional Development Program, the Expanded Food and Nutrition Education Program (EFNEP), the National Tobacco Control Program, and the National Youth Anti-Drug Media Campaign. We identified useful evaluation strategies that other agencies might adopt.
NTIS
Information Dissemination; Management Analysis; Governments

20020080881 General Accounting Office, Washington, DC USA
Inspectors General: Office Consolidation and Related Issues
Aug. 2002; 88p
Report No.(s): PB2002-109148; GAO-02-575; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This report provides information about how certain changes might affect the federal offices of inspectors general (IG). There are currently 57 IGs subject to the IG Act of 1978, as amended, or similar statutory provisions, with 29 IGs who are appointed by the President and confirmed by the Senate, and 28 IGs who are appointed by their agency heads in designated federal entities (DFE IGs). Among other duties, the IGs are responsible for (1) conducting and supervising audits and investigations; (2) promoting economy, efficiency, and effectiveness; and (3) preventing and detecting fraud and abuse in their agencies programs and operations. Specifically, the objectives were to survey the IGs to obtain their views on how independence, quality of work, and use of resources might be affected by (1) converting DFE IGs from appointment by their agency heads to appointment by the President with Senate confirmation (conversion) and (2) consolidating IG offices by moving smaller DFE IG offices into larger Presidential IG offices (consolidation).
NTIS
USA; Quality Control; Personnel Management; Personnel; Inspection; Investigation

20020080882 General Accounting Office, Washington, DC USA
Contract Reform: DOE Has Made Progress, but Actions Needed to Ensure Initiatives Have Improved Results
Sep. 2002; 50p
Report No.(s): PB2002-109147; GAO-02-798; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Department of Energy (DOE), the largest civilian-contracting agency in the federal government, relies primarily on contractors to operate its sites and carry out its diverse missions, such as maintaining the nuclear weapons stockpile, cleaning up radioactive and hazardous wastes, and performing research. to carry out these missions, DOE often contracts for designing, constructing, and operating multimillion-dollar, one-of-a-kind facilities. For fiscal year 2001, DOE spent about 90 percent of its total annual budget, or $18.2 billion, on contracts. of that amount, DOE spent about $16.2 billion on contracts to manage or operate 28 DOE sites. DOE's contracting activities are governed by federal law and regulations, including the Federal Acquisition Regulation and the Department of Energy Acquisition Regulation (DEAR). Although federal law generally requires federal

agencies to use competition in selecting a contractor, until the mid-1990s, DOE contracts for the management and operation of its sites generally fit within an exception that allowed for the use of noncompetitive procedures.
NTIS
Contract Management; Contractors; USA; Energy Policy

20020080904 Delta Data Systems, Inc., Picayune, MS USA
Resources Management System
Spinoff 1993; 1993, pp. 66; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Delta Data Systems, Inc. was originally formed by NASA and industry engineers to produce a line of products that evolved from ELAS, a NASA-developed computer program. The company has built on that experience, using ELAS as the basis for other remote sensing products. One of these is AGIS, a computer package for geographic and land information systems. AGIS simultaneously processes remotely sensed and map data. The software is designed to operate on a low cost microcomputer, putting resource management tools within reach of small operators.
Author
Data Systems; Remote Sensing; Resources Management; Computer Programs

20020080919 Cornell Univ., Dept. of Animal Science, Ithaca, NY USA
Software Products
Spinoff 1993; 1993, pp. 120-121; In English; Original contains color illustrations; ISBN 0-16-042100-4; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

MAST is a decision support system to help in the management of dairy herds. Data is collected on dairy herds around the country and processed at regional centers. One center is Cornell University, where Dr. Lawrence Jones and his team developed MAST. The system draws conclusions from the data and summarizes it graphically. CLIPS, which is embedded in MAST, gives the system the ability to make decisions without user interaction. With this technique, dairy managers can identify herd problems quickly, resulting in improved animal health and higher milk quality. CLIPS (C Language Integrated Production System) was developed by NASA's Johnson Space Center. It is a shell for developing expert systems designed to permit research, development and delivery on conventional computers.
Author
Decision Support Systems; Software Engineering; Artificial Intelligence; Data Processing

20020080977 General Accounting Office, Washington, DC USA
Clinical Research: NIH Has Implemented Key Provisions of the Clinical Research Enhancement Act
Sep. 2002; 36p
Report No.(s): PB2002-109157; GAO-02-965; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As the National Institute of Health's (NIH) overall budget has grown, more attention has focused on its support of clinical research. For many years there have been concerns that clinical research proposals are viewed less favorably than basic research during the peer review process at NIH and that clinical research has not received its fair share of NIH funding. Also at issue have been the declining numbers of physician-investigators and the challenges they face, such as inadequate clinical research training and high debt from educational loans. In November 2000 the Clinical Research Enhancement Act (CREA) was enacted to address some of these concerns. The act directed NIH to consider recommendations from earlier studies for enhancing clinical research and to support and expand its resources for clinical research in general and in specific ways. The act also mandated that we evaluate NIHs implementation of its provisions. to that end, we determined whether and how NIH has (1) increased its funding of clinical research and expanded its clinical research activities, (2) improved its review of clinical research proposals, (3) supported general clinical research centers (GCRC)7 and expanded their activities, (4) established new clinical research career development and training programs, and (5) implemented a loan repayment program for extramural clinical investigators.
NTIS
Research Management; Clinical Medicine; Research Projects

20020081107 NASA Glenn Research Center, Cleveland, OH USA
Deregulation Impact in Negotiating a New Electrical Contract Between NASA Glenn Research Center at Lewis Field and FirstEnergy Corp., Cleveland, Ohio, USA
Quach, Quyen T., NASA Glenn Research Center, USA; Zala, Laszlo F., NASA Glenn Research Center, USA; August 2002; 14p; In English; Energy Efficiency and Environmental Protection Conference and Exhibition, 13-15 Jun. 2001, Sopron, Hungary;

Sponsored by Association of Energy Engineers, USA
Contract(s)/Grant(s): RTOP 772-20-02-02
Report No.(s): NASA-TM-2002-211367; E-13189; NAS 1.15:13189; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The governor of the State of Ohio signed amended substitute Senate bill 3 on July 6, 1999, requiring Ohio's electric industry to change from a monopoly environment to a competitive electric environment for generation services. The start date for competitive retail generation services was set for January 1, 2001. This new deregulation law allowed all Ohioans to choose the supplier of generation service, but the transmission and distribution would remain regulated. It also required electric utilities to unbundle the three main components (generation, transmission, and distribution) and make other changes designed to produce a competitive electric generation market. While deregulation was taking shape, the NASA Glenn Research Center electrical contract with FirstEnergy Corp. of Cleveland, Ohio, was to expire on September 7, 1999. Glenn strategically evaluated and incorporated the impacts of electric deregulation in the negotiations. Glenn and FirstEnergy spent over a year in negotiations until the Glenn utility team and the FirstEnergy negotiating team came to an agreement in the fall of 2000, and a new contract became effective on January 1, 2001.

Author

Research Facilities; Utilities; Electric Power

20020082930 NASA Goddard Space Flight Center, Greenbelt, MD USA

Starting A New Project: Thoughts from NGST

Mather, John C., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Hubble Science Legacy Conference, 5 Apr. 2002, Chicago, IL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Some key elements of the history of NGST (Next Generation Space Telescope) that made a new mission possible will be reviewed, from the very beginnings to the present moment in the middle of selecting a prime contractor. A few forecasts of the possible discoveries will be made that may precede the launch of a new UV telescope, in hopes of inspiring sufficiently ambitious goals that they will still be exciting in 15 or 20 years. We will also discuss the enabling technology for NGST and my thoughts on enabling technology for a UV telescope Flint: they are not all about detectors and Mirrors!

Author

Ultraviolet Telescopes; Next Generation Space Telescope Project

20020083037 NASA, Washington, DC USA

National Directory of NASA Space Grant Contacts

2002; 177p; In English

Report No.(s): NASA/EP-2002-09-359-HQ; NAS 1.19:09-359-HQ; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Congress enacted the National Space Grant College and Fellowship Program (also known as Space Grant). NASA's Space Grant Program funds education, research, and public service programs in all 50 States, the District of Columbia, and the Commonwealth of Puerto Rico through 52 university-based Space Grant consortia. These consortia form a network of colleges and universities, industry partners, State and local Government agencies, other Federal agencies, museum and science centers, and nonprofit organizations, all with interests in aerospace education, research, and training. Space Grant programs emphasize the diversity of human resources, the participation of students in research, and the communication of the benefits of science and technology to the general public. Each year approximately one-third of the NASA Space Grant funds support scholarships and fellowships for USA students at the undergraduate and graduate levels. Typically, at least 20 percent of these awards go to students from underrepresented groups, and at least 40 percent go to women. Most Space Grant student awards include a mentored research experience with university faculty or NASA scientists or engineers. Space Grant consortia also fund curriculum enhancement and faculty development programs. Consortia members administer precollege and public service education programs in their States. The 52 consortia typically leverage NASA funds with matching contributions from State, local, and other university sources, which more than double the NASA funding. For more information, consult the Space Grant Web site at http://education.nasa.gov/spacegrant/

Author

Research and Development; Directories; Earth Sciences; Economics; Education; NASA Programs; Space Programs

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

20020080820 General Accounting Office, Washington, DC USA
Information Management: Update on Implementation of the 1996 Electronic Freedom of Information Act Amendments
Aug. 2002; 108p
Report No.(s): PB2003-100267; GAO-02-493; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The 1966 Freedom of Information Act (FOIA) established the public's right of access to government information, on the basis of openness and accountability. The 1996 Electronic Freedom of Information Act (e-FOIA) Amendments extended these principles to include electronic access to information. Under the act, the Department of Justice provides implementing guidance to agencies. In addition, agencies report annually to Justice on their FOIA operations. GAO (General Accounting Office) was asked to determine, among other things, (1) agencies' progress in improving their timeliness in responding to requests for information and (2) the actions Justice has taken on previous GAO recommendations (GAO-01-378, Mar. 16, 2001) to improve data quality in annual reports and on-line availability of government information.
NTIS
USA; Law (Jurisprudence); Information Dissemination; Records Management

20020080998 NASA Goddard Space Flight Center, Greenbelt, MD USA
Internet Data Delivery for Future Space Missions
Rash, James, NASA Goddard Space Flight Center, USA; Casasanta, Ralph, Computer Science Corp., USA; Hogie, Keith, Computer Science Corp., USA; [2002]; 8p; In English; ESTO Technology Conference, 11-13 Jun. 2002, Pasadena, CA, USA
Contract(s)/Grant(s): NASA Order S-43981-G; GS-35F-4381G; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Ongoing work at National Aeronautics and Space Administration Goddard Space Flight Center (NASA/GSFC), seeks to apply standard Internet applications and protocols to meet the technology challenge of future satellite missions. Internet protocols and technologies are under study as a future means to provide seamless dynamic communication among heterogeneous instruments, spacecraft, ground stations, constellations of spacecraft, and science investigators. The primary objective is to design and demonstrate in the laboratory the automated end-to-end transport of files in a simulated dynamic space environment using off-the-shelf, low-cost, commodity-level standard applications and protocols. The demonstrated functions and capabilities will become increasingly significant in the years to come as both earth and space science missions fly more sensors and as the need increases for more network-oriented mission operations. Another element of increasing significance will be the increased cost effectiveness of designing, building, integrating, and operating instruments and spacecraft that will come to the fore as more missions take up the approach of using commodity-level standard communications technologies. This paper describes how an IP (Internet Protocol)-based communication architecture can support all existing operations concepts and how it will enable some new and complex communication and science concepts. The authors identify specific end-to-end data flows from the instruments to the control centers and scientists, and then describe how each data flow can be supported using standard Internet protocols and applications. The scenarios include normal data downlink and command uplink as well as recovery scenarios for both onboard and ground failures. The scenarios are based on an Earth orbiting spacecraft with downlink data rates from 300 Kbps to 4 Mbps. Included examples are based on designs currently being investigated for potential use by the Global Precipitation Measurement (GPM) mission.
Author
Data Transfer (Computers); Data Flow Analysis; Internets; Protocol (Computers); Spacecraft Communication

20020081027 NASA Goddard Space Flight Center, Greenbelt, MD USA
Implementation of CCSDS Lossless Data Compression in HDF
Yeh, Pen-Shu, NASA Goddard Space Flight Center, USA; Xia-Serafino, Wei, Global Science and Technology, Inc., USA; Miles, Lowell, New Mexico Univ., USA; Kobler, Ben, NASA Goddard Space Flight Center, USA; Menasce, Daniel, George Mason Univ., USA; [2002]; 4p; In English; NASA ESTO Conference 2002, 11-13 Jun. 2002, Pasadena, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Earth Science Data and Information System (ESDIS) handles over one terabyte (10(exp 12) bytes) of data daily and is using the Hierarchical Data Format (EDF) for data archiving and distribution. This report provides the progress and status of our

effort to alleviate bandwidth and storage burdens by first performing compression studies on various science data products and later integrating the selected compression scheme into HDF.
Author
Data Compression; Data Integration; Data Systems; Information Systems

20020081036 NASA Goddard Space Flight Center, Greenbelt, MD USA
MDP: Reliable File Transfer for Space Missions
Rash, James, NASA Goddard Space Flight Center, USA; Criscuolo, Ed, Computer Sciences Corp., USA; Hogie, Keith, Computer Sciences Corp., USA; Parise, Ron, Computer Sciences Corp., USA; [2002]; 7p; In English; ESTO Technology Conference, 11-13 Jun. 2002, Pasadena, CA, USA
Contract(s)/Grant(s): GS-35F-4381G; NASA Order S-43981-G; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper presents work being done at NASA/GSFC by the Operating Missions as Nodes on the Internet (OMNI) project to demonstrate the application of the Multicast Dissemination Protocol (MDP) to space missions to reliably transfer files. This work builds on previous work by the OMNI project to apply Internet communication technologies to space communication. The goal of this effort is to provide an inexpensive, reliable, standard, and interoperable mechanism for transferring files in the space communication environment. Limited bandwidth, noise, delay, intermittent connectivity, link asymmetry, and one-way links are all possible issues for space missions. Although these are link-layer issues, they can have a profound effect on the performance of transport and application level protocols. MDP, a UDP-based reliable file transfer protocol, was designed for multicast environments which have to address these same issues, and it has done so successfully. Developed by the Naval Research Lab in the mid 1990's, MDP is now in daily use by both the US Post Office and the DoD. This paper describes the use of MDP to provide automated end-to-end data flow for space missions. It examines the results of a parametric study of MDP in a simulated space link environment and discusses the results in terms of their implications for space missions. Lessons learned are addressed, which suggest minor enhancements to the MDP user interface to add specific features for space mission requirements, such as dynamic control of data rate, and a checkpoint/resume capability. These are features that are provided for in the protocol, but are not implemented in the sample MDP application that was provided. A brief look is also taken at the status of standardization. A version of MDP known as NORM (Neck Oriented Reliable Multicast) is in the process of becoming an IETF standard.
Author
Space Missions; Mission Planning; Dynamic Control; Information Flow; Protocol (Computers)

20020081283 NASA Goddard Space Flight Center, Greenbelt, MD USA
LWS/SET End-to-End Data System
Giffin, Geoff, Superhighway Systems; Sherman, Barry, NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

This paper describes the concept for the End-to-End Data System that will support NASA's Living With a Star Space Environment Testbed missions. NASA has initiated the Living With a Star (LWS) Program to develop a better scientific understanding to address the aspects of the connected Sun-Earth system that affect life and society. A principal goal of the program is to bridge the gap.between science, engineering, and user application communities. The Space Environment Testbed (SET) Project is one element of LWS. The Project will enable future science, operational, and commercial objectives in space and atmospheric environments by improving engineering approaches to the accommodation and/or mitigation of the effects of solar variability on technological systems. The End-to-end data system allows investigators to access the SET control center, command their experiments, and receive data from their experiments back at their home facility, using the Internet. The logical functioning of major components of the end-to-end data system are described, including the GSFC Payload Operations Control Center (POCC), SET Payloads, the GSFC SET Simulation Lab, SET Experiment PI Facilities, and Host Systems. Host Spacecraft Operations Control Centers (SOCC) and the Host Spacecraft are essential links in the end-to-end data system, but are not directly under the control of the SET Project. Formal interfaces will be established between these entities and elements of the SET Project. The paper describes data flow through the system, from PI facilities connecting to the SET operations center via the Internet, communications to SET carriers and experiments via host systems, to telemetry returns to investigators from their flight experiments. It also outlines the techniques that will be used to meet mission requirements, while holding development and operational costs to a minimum. Additional information is included in the original extended abstract.
Author
End-to-End Data Systems; Solar Physics; Information Flow; Telemetry; Mission Planning

20020082989 Naval Postgraduate School, Monterey, CA USA
XML as a Data Exchange Medium for DoD Legacy Databases
Pradeep, Kris; Jun. 2002; 123p; In English
Report No.(s): AD-A405953; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This thesis addresses the issue of interoperability in DoD (Department of Defense) legacy system databases and evaluates XML as a tool for transferring message data between varied systems. With the demands for increased communication, the dire requirement for a common mode of information transfer is greatly realized. Many legacy systems have developed their own unique interfaces. XML is one solution which can help ease the transition to a common interface. This thesis is a part of a larger team effort. In contributing to this larger effort, a software program was developed to generate select messages in their native and XML formats.
DTIC
Data Bases; Interoperability; Armed Forces (USA); Document Markup Languages

20020083340 Secretary of the Air Force, Washington, DC USA
Air Force Manual 33-122, Communications and Information, Computer Systems Manuals
Nov. 16, 2001; 5p; In English
Report No.(s): AD-A405747; AFI33-122; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
This Air Force instruction (AFI) implements Air Force Policy Directive (AFPD) 33-1, Command, Control, Communications, and Computer (C4) Systems; and prescribes the publication, printing, and distribution of Air Force computer systems manuals (AFCSM). It applies to all Air Force military and civilian personnel and Air Force contractors who develop, use, operate, or maintain Air Force computer systems.
DTIC
Command and Control; User Manuals (Computer Programs); Computer Systems Programs; Defense Program

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes: aviation law; space law and policy; international law; international cooperation; and patent policy

20020080790 Swedish Defence Research Establishment, Stockholm, Sweden
International Security *Annual Report, 1999 Internationell Saekerhet 1999*
Toernqvist, S.; Andersson, G.; Nylen, T.; Feb. 2000; 40p; In Swedish
Report No.(s): PB2002-107078; FOA-R-00-01393-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report presents a summary of studies, results and usefulness to the MFA within the FOA research area International Security. The activities have been directed towards support to disarmament negotiations, export controls and verification within the N, B and C areas. Nuclear weapons: FOA continues to prepare a national data center (NDC). This includes seismic detection, collection of xenom gas, and filtering of radio nucleids. Support has been given to Comprehensive Test Ban Treaty (CTBT) and the coming FMCT treaties and other disarmaments limitations. Support has also been given directly to CTBT. Biological weapons: support has been given to the negotiations on a verification protocol to the biological and toxine weapons convention, the Australia Group and export control issues. Staff has also been trained for this purpose. Chemical weapons: support has been given to the Australia Group and export control issues. In addition, the verification laboratory has continued under the convention on chemical weapons. Support has also been given to the work of UNSCOM.
NTIS
Security; International Law

20020080824 General Accounting Office, Washington, DC USA
World Trade Organization: Early Decisions Are Vital to Progress in Ongoing Negotiations
Sep. 2002; 64p; In English
Report No.(s): PB2002-109160; GAO-02-879; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The Ranking Minority Member of the Senate Committee on Finance, the Chairman of the House Committee on Ways and Means, and the Chairman of the House Ways and Means Subcommittee on Trade asked the General Accounting Office (GAO) to: (1) analyze the factors that contributed to the Doha ministerial conferences successful launch of new WTO negotiations, (2) analyze the key interim deadlines for the most sensitive issues, from the present time through the next ministerial conference in

2003, and (3) evaluate the most significant challenges facing the WTO in the overall negotiations. This report presents GAO's analysis of these issues.
NTIS
International Trade; Congressional Reports; Real Time Operation; Conferences

20020080836 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm Sweden
Patterns of International Collaboration within the Defence Industry in Sweden ***Internationella Samarbetsmoenster hos foersvarsindustrin i Sverige***
Axelson, M.; Lindgren, F.; Nov. 2001; 46p; In Swedish
Report No.(s): PB2002-106816; FOI-R-0225-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The defense industry in Sweden is to a large extent internationalized in terms of foreign ownership and through export. The degree of international integration is however substantially lower in terms of participation in concrete collaborations. It is important to monitor how the defense industry in Sweden will act in relation to the ongoing European as well as the emerging transatlantic restructuring. From a Swedish perspective it would be detrimental if the increased transatlantic collaboration were to focus around a few very large companies. Besides establishing relations with the large European companies, it is therefore also desirable to create direct links with US defense companies. These efforts aim partly at creating better access to important technologies, partly at improving international market opportunities. The report proposes different measures to facilitate deepened cross-border corporate relations within the defense sector, including further intergovernmental collaboration to remove remaining obstacles for cross-border industrial collaboration. Sweden should work for increased scope for market logic on the defense market and actively participate in initiatives to create common standards and interfaces. Furthermore, the report proposes government loans/venture capital to facilitate the creation of influential industrial actors within strong Swedish technology areas.
NTIS
International Cooperation; Defense Industry; Sweden

20020083199 Naval Postgraduate School, Monterey, CA USA
Issues and Concerns in International Co-Development Efforts
Virlan, Serkan; Jun. 2002; 65p; In English
Report No.(s): AD-A406357; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
After the collapse of Iron Curtain, all nations tried to adapt to the new environment. They could either develop and produce their own weapons systems as before and bear all the associated burden. Or, they could co-operate in various phases of the project, sharing expenses, expertise, technology while creating a market even before the first prototype is built. In this thesis I address the issues and concerns which emerged in projects realized and on going; MEADS (medium Extended Air Defense System), JSF (Joint Strike Fighter), Eurofighter and FLA (Future Large Aircraft). I will consider whether entering cooperative projects is a useful approach, and if it can be implemented as a solution for Armed Forces modernization. In general this thesis will consider lessons learned from the example projects and apply those lessons to understanding the future environment for international defense cooperation.
DTIC
Air Defense; Fighter Aircraft

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in Space Sciences see categories 89 through 93.

20020080842 NASA Goddard Space Flight Center, Greenbelt, MD USA
Radiation Hardness Assurance for Space Systems
Poivey, Christian, NASA Goddard Space Flight Center, USA; [2002]; 29p; In English; IEEE NSREC 2002 Short Course, Jul. 2002, Phoenix, AZ, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The space radiation environment can lead to extremely harsh operating conditions for on-board electronic box and systems. The characteristics of the radiation environment are highly dependent on the type of mission (date, duration and orbit). Radiation accelerates the aging of the electronic parts and material and can lead to a degradation of electrical performance; it can also create transient phenomena on parts. Such damage at the part level can induce damage or functional failure at electronic box, subsystem,

and system levels. A rigorous methodology is needed to ensure that the radiation environment does not compromise the functionality and performance of the electronics during the system life. This methodology is called hardness assurance. It consists of those activities undertaken to ensure that the electronic piece parts placed in the space system perform to their design specifications after exposure to the space environment. It deals with system requirements, environmental definitions, part selection, part testing, shielding and radiation tolerant design. All these elements should play together in order to produce a system tolerant to.the radiation environment. An overview of the different steps of a space system hardness assurance program is given in section 2. In order to define the mission radiation specifications and compare these requirements to radiation test data, a detailed knowledge of the space environment and the corresponding electronic device failure mechanisms is required. The presentation by J. Mazur deals with the Earth space radiation environment as well as the internal environment of a spacecraft. The presentation by J. Schwank deals with ionization effects, and the presentation by T. Weatherford deals with Single particle Event Phenomena (SEP) in semiconductor devices and microcircuits. These three presentations provide more detailed background to complement the sections 3 and 4. Part selection and categorization are discussed in section 5. Section 6 presents the organization of the hardness assurance within a project. Section 7 discusses emerging radiation hardness assurance issues.
Author
Aerospace Environments; Aerospace Systems; Radiation Shielding; Extraterrestrial Radiation; Spacecraft Components

20020080876 NASA Goddard Space Flight Center, Greenbelt, MD USA
Guidance, Navigation and Control Innovations at the NASA Goddard Space Flight Center
Ericsson, Aprille Joy, NASA Goddard Space Flight Center, USA; [2002]; 13p; In English; 5th International Conference on Dynamics and Control of Systems and Structures in Space, 13-20 Jul. 2002, Cambridge, UK; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This presentation discusses NASA's role in sponsoring on-going research projects involving innovations in spacecraft guidance, navigation and control systems. Topics covered include: partnerships, ESE Spaceborne Missions, spacecraft systems supported and designed by NASA Goddard Flight Center, NASA's changing mission, Large Aperture Sensing Spectrum, Distributed Spacecraft Systems, LANDSAT-7/ Earth Observer-1 Co-observing Program, and Laser Interferometer Space Antenna program.
CASI
Research and Development; NASA Space Programs; Spacecraft Guidance; Spacecraft Control

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ASTRONOMY

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20020080796 NASA Goddard Space Flight Center, Greenbelt, MD USA
Chandra and XMM Observations of the ADC Source 0921-630
Kallman, T. R., NASA Goddard Space Flight Center, USA; Angelini, L., NASA Goddard Space Flight Center, USA; Boroson, B., Harvard-Smithsonian Center for Astrophysics, USA; Cottam, J., NASA Goddard Space Flight Center, USA; [2002]; 42p; In English
Report No.(s): astro-ph/0209010-v1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We analyze observations of the low mass X-ray binary 2S0921-63 obtained with the gratings and CCDs on Chandra and XMM. This object is a high inclination system showing evidence for an accretion disk corona (ADC). Such a corona has the potential to constrain the properties of the heated accretion disk in this system, and other LMXBs by extension. We find evidence for line emission which is generally consistent with that found by previous experiments, although we are able to detect more lines. For the first time in this source, we find that the iron K line has multiple components. We set limits on the line widths and velocity offsets, and we fit the spectra to photoionization models and discuss the implications for accretion disk corona models. For the first time in any ADC source we use these fits, together with density constraints based on the O VII line ratio, in order to constrain the flux in the medium-ionization region of the ADC. Under various assumptions about the source luminosity this constrains the location of the emitting region. These estimates, together with estimates for the emission measure, favor a scenario in which the intrinsic luminosity of the source is comparable to what we observe.
Author
Coronas; Ionization; Accretion Disks; Position (Location); X Ray Binaries

20020080799 NASA Goddard Space Flight Center, Greenbelt, MD USA

Hydrodynamic Models of Line-Driven Accretion Disk Winds III: Local Ionization Equilibrium

Pereyra, Nicolas Antonio, Pittsburgh Univ., USA; Kallman, Timothy R., NASA Goddard Space Flight Center, USA; [2002]; 44p; In English

Contract(s)/Grant(s): NSF AST-00-71193; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We present time-dependent numerical hydrodynamic models of line-driven accretion disk winds in cataclysmic variable systems and calculate wind mass-loss rates and terminal velocities. The models are 2.5-dimensional, include an energy balance condition with radiative heating and cooling processes, and includes local ionization equilibrium introducing time dependence and spatial dependence on the line radiation force parameters. The radiation field is assumed to originate in an optically thick accretion disk. Wind ion populations are calculated under the assumption that local ionization equilibrium is determined by photoionization and radiative recombination, similar to a photoionized nebula. We find a steady wind flowing from the accretion disk. Radiative heating tends to maintain the temperature in the higher density wind regions near the disk surface, rather than cooling adiabatically. For a disk luminosity L (sub disk) = solar luminosity, white dwarf mass M(sub wd) = 0.6 solar mass, and white dwarf radii R(sub wd) = 0.01 solar radius, we obtain a wind mass-loss rate of M(sub wind) = 4 x 10(exp -12) solar mass yr(exp -1) and a terminal velocity of approximately 3000 km per second. These results confirm the general velocity and density structures found in our earlier constant ionization equilibrium adiabatic CV wind models. Further we establish here 2.5D numerical models that can be extended to QSO/AGN winds where the local ionization equilibrium will play a crucial role in the overall dynamics.

Author

Accretion Disks; Cataclysmic Variables; Stellar Winds; Hydrodynamics; Mathematical Models; Equilibrium Flow; Ionization

20020080832 NASA Goddard Space Flight Center, Greenbelt, MD USA

Complementarity of NGST, ALMA, and far IR Space Observatories

Mather, John C., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 2nd Workshop on New Concepts for Far-IR/Submillimeter Space Astronomy, 7-8 Mar. 2002, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Next Generation Space Telescope (NGST) and the Atacama Large Millimeter Array (ALMA) will both start operations long before a new far IR observatory in space can be launched. What will be unknown even after they are operational, and what will a far IR space observatory be able to add? I will compare the telescope design concepts and capabilities and the advertised scientific programs for the projects and attempt to forecast the research topics that will be at the forefront in 2010.

Author

Infrared Space Observatory (ISO); Next Generation Space Telescope Project; Far Infrared Radiation; Millimeter Waves

20020080834 NASA Goddard Space Flight Center, Greenbelt, MD USA

Ecological Niches for Space Missions in the Far-Infrared

Benford, D. J., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 2nd Workshop on New Concepts for Far-IR/Submillimeter Space Astronomy, 7-8 Mar. 2002, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The far-infrared and submillimeter region (30 micron-750 micron) has perhaps the greatest potential of all wavelengths for advancement in astronomy. When viewed in terms of the cosmic backgrounds, the far-IR is extremely important: half of the total luminosity in the Universe is emitted at rest wavelengths approximately 80-100 microns. At the highest known galaxy redshifts, this energy is redshifted to approximately 600 microns. Existing and planned missions have a broad range of capabilities defined in terms of their spectral coverage, spectral resolution, angular resolution, survey speed, and sensitivity. In this parameter space, the opportunity for future far-IR and submillimeter missions with great discovery potential is evident. Such missions will answer fundamental questions about the history of energy release in the Universe, the formation and evolution of galaxies, and formation of stellar and protoplanetary systems. We discuss the parameter space that can be filled by a few well-chosen space missions, specifically a submillimeter all-sky survey and a far-IR to submillimeter observatory.

Author

Space Missions; Ecology; Sky Surveys (Astronomy); Far Infrared Radiation; Protoplanets

20020080931 NASA Goddard Space Flight Center, Greenbelt, MD USA

Automation of Coordinated Planning Between Observatories: The Visual Observation Layout Tool (VOLT)

Maks, Lori, NASA Goddard Space Flight Center, USA; Koratkar, Anuradha, Space Telescope Science Inst., USA; Kerbel, Uri, Aquilent, Inc., USA; Pell, Vince, Aquilent, Inc., USA; [2002]; 11p; In English; SPIE 2002, 22-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Fulfilling the promise of the era of great observatories, NASA now has more than three space-based astronomical telescopes operating in different wavebands. This situation provides astronomers with the unique opportunity of simultaneously observing a target in multiple wavebands with these observatories. Currently scheduling multiple observatories simultaneously, for coordinated observations, is highly inefficient. Coordinated observations require painstaking manual collaboration among the observatory staff at each observatory. Because they are time-consuming and expensive to schedule, observatories often limit the number of coordinated observations that can be conducted. In order to exploit new paradigms for observatory operation, the Advanced Architectures and Automation Branch of NASA's Goddard Space Flight Center has developed a tool called the Visual Observation Layout Tool (VOLT). The main objective of VOLT is to provide a visual tool to automate the planning of coordinated observations by multiple astronomical observatories. Four of NASA's space-based astronomical observatories - the Hubble Space Telescope (HST), Far Ultraviolet Spectroscopic Explorer (FUSE), Rossi X-ray Timing Explorer (RXTE) and Chandra - are enthusiastically pursuing the use of VOLT. This paper will focus on the purpose for developing VOLT, as well as the lessons learned during the infusion of VOLT into the planning and scheduling operations of these observatories.
Author
Scheduling; Applications Programs (Computers); Coordination; Data Acquisition; Astronomical Observatories

20020081122 NASA Goddard Space Flight Center, Greenbelt, MD USA
Spectroscopic Analyses of the "Blue Hook" Stars in Omega Centauri: A Test of the Late Hot Flasher Scenario
Moehler, S., Erlangen-Nuernberg Univ., Germany; Sweigart, Allan V., NASA Goddard Space Flight Center, USA; Landsman, W. B., Science Systems and Applications, Inc., USA; Dreizler, S., Tuebingen Univ., Germany; [2002]; 8p; In English
Contract(s)/Grant(s): NRA-99-01-ATP-039; DLR-50-OR-96029-ZA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
(Omega) Cen contains the largest population of very hot horizontal branch (HB) stars known in a globular cluster. Recent UV observations (Whitney et al. 1998; D'Cruz et al. 2000) show a significant population of hot stars below the zero-age horizontal branch ("blue hook" stars), which cannot be explained by canonical stellar evolution. Stars which suffer unusually large mass loss on the red giant branch and thus experience the helium core flash while descending the white dwarf cooling curve could populate this region. Theory predicts that these "late hot flashers" should show higher temperatures than the hottest canonical HB stars and should have helium- and carbon-rich atmospheres. We obtained and analysed medium resolution spectra of a sample of blue hook stars to derive their atmospheric parameters. The blue hook stars are indeed both hotter (T(sub eff)>35,000 K) and more helium-rich than classical extreme HB stars. In addition we find indications for a large enhancement of the carbon abundance relative to the cluster abundance.
Author
Spectroscopic Analysis; Horizontal Branch Stars; Hot Stars; Blue Stars; Stellar Evolution; Globular Clusters; Red Giant Stars

20020081261 Pennsylvania State Univ., Dept. of Statistics, University Park, PA USA
The Statistical Consulting Center for Astronomy (SCCA) ***Final Report***
Akritas, Michael, Pennsylvania State Univ., USA; Aug. 16, 2001; 2p; In English
Contract(s)/Grant(s): NAG5-6737; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The process by which raw astronomical data acquisition is transformed into scientifically meaningful results and interpretation typically involves many statistical steps. Traditional astronomy limits itself to a narrow range of old and familiar statistical methods: means and standard deviations; least-squares methods like chi(sup 2) minimization; and simple nonparametric procedures such as the Kolmogorov-Smirnov tests. These tools are often inadequate for the complex problems and datasets under investigations, and recent years have witnessed an increased usage of maximum-likelihood, survival analysis, multivariate analysis, wavelet and advanced time-series methods. The Statistical Consulting Center for Astronomy (SCCA) assisted astronomers with the use of sophisticated tools, and to match these tools with specific problems. The SCCA operated with two professors of statistics and a professor of astronomy working together. Questions were received by e-mail, and were discussed in detail with the questioner. Summaries of those questions and answers leading to new approaches were posted on the Web (www.state.psu.edu/ mga/SCCA). In addition to serving individual astronomers, the SCCA established a Web site for general use that provides hypertext links to selected on-line public-domain statistical software and services. The StatCodes site (www.astro.psu.edu/statcodes) provides over 200 links in the areas of: Bayesian statistics; censored and truncated data; correlation and regression, density estimation and smoothing, general statistics packages and information; image analysis; interactive Web tools; multivariate analysis; multivariate clustering and classification; nonparametric analysis; software written by astronomers; spatial statistics; statistical distributions; time series analysis; and visualization tools. StatCodes has received a remarkable high and constant hit rate of 250 hits/week (over 10,000/year) since its inception in mid-1997. It is of interest to scientists both within and outside of astronomy. The most popular sections are multivariate techniques, image analysis, and time series analysis. Hundreds of copies of the ASURV, SLOPES and CENS-TAU codes developed by SCCA scientists were also downloaded from

the StatCodes site. In addition to formal SCCA duties, SCCA scientists continued a variety of related activities in astrostatistics, including refereeing of statistically oriented papers submitted to the Astrophysical Journal, talks in meetings including Feigelson's talk to science journalists entitled "The reemergence of astrostatistics" at the American Association for the Advancement of Science meeting, and published papers of astrostatistical content.
Author
Astronomy; Data Acquisition; Censored Data (Mathematics); Image Analysis; Maximum Likelihood Estimates; Multivariate Statistical Analysis; Statistical Distributions

20020081264 NASA Goddard Space Flight Center, Greenbelt, MD USA
Far Ultraviolet Astronomy
Sonneborn, George, NASA Goddard Space Flight Center, USA; [2002]; 5p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Far Ultraviolet Spectroscopic Explorer (FUSE) is studying a wide range of astronomical problems in the 905-1187 Angstrom wavelength region through the use of high resolution spectroscopy. The FUSE bandpass forms a nearly optimal complement to the spectral coverage provided by the Hubble Space Telescope (HST), which extends down to approximately 1170 Angstroms. The photoionization threshold of atomic hydrogen (911 Angstroms) sets a natural short-wavelength limit for the FUV. FUSE was launched in June 1999 from Cape Canaveral, Florida, on a Delta II rocket into a 768 km circular orbit. Scientific observations started later that year. This spectral region is extremely rich in spectral diagnostics of astrophysical gases over a wide range of temperatures (100 K to over 10 million K). Important strong spectral lines in this wavelength range include those of neutral hydrogen, deuterium, nitrogen, oxygen, and argon (H I, D I, N I, O I, and Ar I), molecular hydrogen (H2), five-times ionized oxygen (O VI), and several ionization states of sulfur (S III - S VI). These elements are essential for understanding the origin and evolution of the chemical elements, the formation of stars and our Solar System, and the structure of galaxies, including our Milky Way. FUSE is one of NASA's Explorer missions and a cooperative project of NASA and the space agencies of Canada and France. These missions are smaller, more scientifically focused missions than the larger observatories, like Hubble and Chandra. FUSE was designed, built and operated for NASA by the Department of Physics and Astronomy at Johns Hopkins University. Hundreds of astronomers world-wide are using FUSE for a wide range of scientific research. Some of the important scientific discoveries from the first two years of the mission are described.
Author
Far Ultraviolet Radiation; Far UV Spectroscopic Explorer; Ultraviolet Astronomy; Astrophysics; NASA Space Programs

20020082908 NASA Goddard Space Flight Center, Greenbelt, MD USA
A New Formation Mechanism for the Hottest Horizontal-Branch Stars
Sweigart, Allen V., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; New Horizons Globular Cluster Astronomy, 24-28 Jun. 2002, Padova, Italy; No Copyright; Avail: Issuing Activity; Abstract Only

Hot subluminous stars lying up to 0.7 mag below the extreme horizontal branch (EHB) are found in the ultraviolet color-magnitude diagrams (CMDs) of both omega Cen and NGC 2808. In order to investigate the origin of these subluminous stars, we have constructed a detailed set of evolutionary sequences that follow the evolution of low-mass stars continuously from the zero-age main sequence through the helium-core flash to the HB for a wide range in the mass loss along the red-giant branch (RGB). Stars with the largest mass loss evolve off the RGB to high effective temperatures before igniting helium in their cores. Our results indicate that the subluminous EHB stars, as well as the high temperature gap along the EHB of NGC 2808, can be explained if these stars undergo a late helium-core flash while descending the white-dwarf cooling curve. Under these conditions the convection zone produced by the main helium flash will penetrate into the stellar envelope, thereby mixing most, if not all, of the envelope hydrogen into the hot helium-burning interior, where it is rapidly consumed. This phenomenon is analogous to the 'born-again' scenario for producing hydrogen-deficient stars following a very late helium-shell flash. This 'flash mixing' of the envelope during a late helium-core flash greatly enhances the envelope helium and carbon abundances and, as a result, leads to a discontinuous increase in the HB effective temperature. We argue that the hot HB gap observed in NGC 2808 is associated with this theoretically predicted dichotomy in the RB properties. Using new helium- and carbon-rich stellar atmospheres, we show that the changes in the envelope abundances due to flash mixing will suppress the ultraviolet flux in the spectra of hot EHB stars. We suggest that such changes in the emergent spectral energy distribution are primarily responsible for explaining the hot subluminous EHB stars in omega Cen and NGC 2808. Moreover, we demonstrate that models without flash mixing lie, at most, only approximately 0.1 mag below the EHB, and hence fail to explain the observations.
Author
Horizontal Branch Stars; Color-Magnitude Diagram; Stellar Evolution; Helium; Ultraviolet Astronomy; Spectral Energy Distribution

20020082929 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Stellar Imager (SI): An Ultra-High Angular Resolution UV/Optical Observatory

Carpenter, Kenneth G., NASA Goddard Space Flight Center, USA; Schrijver, Carolus J., Lockheed Martin Advanced Technology Center, USA; [2002]; 1p; In English; Hubble Science Legacy, 2-5 Apr. 2002, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Stellar Imager (SI) is envisioned as a space-based, UV-optical interferometer composed of 10 or more one-meter class elements distributed with a maximum baseline of 0.5-km and providing a resolution of 60 micro-arcseconds at 1550 A. It will image stars and binaries with one hundred to one thousand resolution elements on their surface and enable long-term studies of stellar magnetic activity patterns and their evolution with time, for comparison with those on the sun. It will also sound their interiors through asteroseismology to image internal structure, differential rotation, and large-scale circulations. SI will enable us to understand the various effects of magnetic fields of stars, the dynamos that generate these fields, and the internal structure and dynamics of the stars in which these dynamos operate. The ultimate goal of the mission is to achieve the best-possible forecasting of solar activity as a driver of climate and space weather on times scales ranging from months up to decades, and an understanding of the impact of stellar magnetic activity on life in the Universe. The road to that goal will revolutionize our understanding of stars and stellar systems, the building blocks of the Universe. Fitting naturally within the NASA and ESA long-term time lines, SI complements defined missions, and with them will show us entire other solar systems, from the central star to their orbiting planets. In this paper we will describe the scientific goals of the mission, the performance requirements needed to address those goals, and the design concepts now under study.

Author

Interferometers; Astronomical Interferometry; Spaceborne Astronomy

20020082932 NASA Goddard Space Flight Center, Greenbelt, MD USA

Redshifts for a Sample of Radio-Selected Poor Clusters

Miller, Neal A., NASA Goddard Space Flight Center, USA; Ledlow, Michael J., Gemini Observatory, Chile; Owen, Frazer N., National Radio Astronomy Observatory, USA; Hill, John M., Arizona Univ., USA; Jun. 01, 2002; 18p; In English

Contract(s)/Grant(s): NAGW-2166; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Multifiber optical spectroscopy has been performed on galaxies in the vicinity of strong, nearby radio galaxies. These radio galaxies were selected from the, 3CR and B2 catalogs based on their exclusion from the Abell catalog, which is puzzling given the hypothesis that an external medium is required to confine the radio plasma of such galaxies. Velocities derived from the spectra were used to confirm the existence of groups and poor clusters in the fields of most of the radio galaxies. We find that all radio galaxies with classical Fanaroff-Riley type I morphologies prove to reside in clusters, whereas the other radio galaxies often appear to be recent galaxy-galaxy mergers in regions of low galaxy density. These findings confirm the earlier result that the existence of extended X-ray emission combined with a statistical excess of neighboring galaxies can be used to identify poor clusters associated with radio galaxies.

Author

Red Shift; Radio Galaxies; Emission; Galactic Clusters

20020083045 NASA Goddard Space Flight Center, Greenbelt, MD USA

Micromachined Tunable Fabry-Perot Filters for Infrared Astronomy

Barclay, Richard, NASA Goddard Space Flight Center, USA; Bier, Alexander, Global Science and Technology, Inc., USA; Chen, Tina, Global Science and Technology, Inc., USA; DiCamillo, Barbara, Global Science and Technology, Inc., USA; Deming, Drake, NASA Goddard Space Flight Center, USA; Greenhouse, Matthew, NASA Goddard Space Flight Center, USA; Henry, Ross, NASA Goddard Space Flight Center, USA; Hewagama, Tilak, Maryland Univ., USA; Jacobson, Mindy, NASA Goddard Space Flight Center, USA; Loughlin, James, NASA Goddard Space Flight Center, USA; [2002]; 3p; In English; SPIE International Society for Optical Engineering Conference, 22-28 Aug. 2002, Kona, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Micromachined Fabry-Perot tunable filters with a large clear aperture (12.5 to 40 mm) are being developed as an optical component for wide-field imaging 1:1 spectroscopy. This program applies silicon micromachining fabrication techniques to miniaturize Fabry-Perot filters for astronomical science instruments. The filter assembly consists of a stationary etalon plate mated to a plate in which the etalon is free to move along the optical axis on silicon springs attached to a stiff silicon support ring. The moving etalon is actuated electrostatically by electrode pairs on the fixed and moving etalons. To reduce mass, both etalons are fabricated by applying optical coatings to a thin freestanding silicon nitride film held flat in drumhead tension rather than to a thick

optical substrate. The design, electro-mechanical modeling, fabrication, and initial results will be discussed. The potential application of the miniature Fabry-Perot filters will be briefly discussed with emphasis on the detection of extra-solar planets.
Author
Optical Equipment; Tunable Filters; Infrared Astronomy; Micromachining; Imaging Techniques

20020083046 NASA Goddard Space Flight Center, Greenbelt, MD USA
Broadband Direct Detection Submillimeter Spectrometer with Multiplexed Superconducting Transition Edge Thermometer Bolometers
Benford, D. J., NASA Goddard Space Flight Center, USA; Ames, T. A., NASA Goddard Space Flight Center, USA; Chervenak, J. A., NASA Goddard Space Flight Center, USA; Moseley, S. H., NASA Goddard Space Flight Center, USA; Shafer, R. A., NASA Goddard Space Flight Center, USA; Staguhn, J. G., NASA Goddard Space Flight Center, USA; Voellmer, G. M., NASA Goddard Space Flight Center, USA; Pajot, F., Centre National de la Recherche Scientifique, France; Rioux, C., Centre National de la Recherche Scientifique, France; Phillips, T. G., California Inst. of Tech., USA; [2002]; 1p; In English; Thirteenth International Symposium on Space Teraherz Technology, 26-28 Mar. 2002, Cambridge, MA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We present performance results based on the first astronomical use of multiplexed superconducting bolometers as direct detectors (i.e., with cold electrons) for spectroscopy. The Fabry-Perot Interferometer Bolometer Research Experiment (FIBRE) is a broadband submillimeter spectrometer for the Caltech Submillimeter Observatory (CSO). FIBRE's detectors are superconducting transition edge sensor (TES) bolometers read out by a SQUID multiplexer. The Fabry-Perot uses a low resolution grating to order sort the incoming light. A linear bolometer array consisting of 16 elements detects this dispersed light, capturing 5 orders simultaneously from one position on the sky. With tuning of the Fabry-Perot over one free spectral range, a spectrum covering Delta lambda/lambda = 1/7 at a resolution of delta lambda/lambda = 1/1200 can be acquired. This spectral resolution is sufficient to resolve Doppler-broadened line emission from external galaxies. FIBRE has been operated in the 350 Am (850 GHz) band. These bands cover line emission from the important star formation tracers neutral carbon [CI] and carbon monoxide (CO).
Author
Fabry-Perot Interferometers; Bolometers; Submillimeter Waves; Multiplexing; Spectroscopy; Superconductivity

20020083228 NASA Goddard Space Flight Center, Greenbelt, MD USA
Scientific Goals and Opto-Mechanical Challenges of the Next Generation Space Telescope (NGST)
Mather, John C., NASA Goddard Space Flight Center, USA; Lawrence, Jon F., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; American Institute of Aeronautics and Astronautics Meeting, 24 Apr. 2002, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Next Generation Space Telescope will push the boundaries of astronomy far beyond anything, possible with an Earth-bound observatory, or even with the Hubble Space Telescope. I will outline the scientific objectives of the NGST and show how they fit into the NASA strategic plan for space astronomy. The NGST will not be the end of the line, and adaptive and active structures will enable even more powerful space observatories, capable of seeing even closer to the dawn of time, and of measuring the light from planets around other stars.
Author
Mechanical Devices; Spaceborne Astronomy; Next Generation Space Telescope Project; Optics

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20020080721 NASA Ames Research Center, Moffett Field, CA USA
Reprocessing in Luminous Disks
Bell, K. Robbins, NASA Ames Research Center, USA; [1999]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We develop and investigate a procedure that accounts for disk reprocessing of photons that originate in the disk itself. Surface temperatures and simple, black body spectral energy distributions (SEDs) of protostellar disks are calculated. In disks that flare with radius, reprocessing of stellar photons results in temperature profiles considerably shallower than r(sup -3/4). Including the disk as a radiation source (as in the case of actively secreting disks) along with the stellar source further flattens the temperature

profile. Disks that flare strongly near the star and then smoothly curve over and become shadowed at some distance (”decreasing curvature” disks) exhibit nearly power-law temperature profiles which result in power-law infrared SEDs with slopes in agreement with typical observations of young stellar objects. Disk models in which the photospheric thickness is controlled by the local opacity and in which the temperature decreases with radius naturally show this shape. Uniformly flaring models do not match observations as well; progressively stronger reprocessing at larger radii leads to SEDs that flatten toward the infrared or even have a second peak at the wavelength corresponding (through the Wien law) to the temperature of the outer edge of the disk. In FU Orionis outbursting systems, the dominant source of energy is the disk itself. The details of the reprocessing depend sensitively on the assumed disk shape and emitted temperature profile. The thermal instability outburst models of Bell Lin reproduce trends in the observed SEDs of Fuors with T varies as r(sup -3/4) in the inner disk (r approx. less than 0.25au corresponding to lambda approx. less than 10 microns) and T varies as r(sup -1/2) in the outer disk. Surface irradiation during outburst and quiescence is compared in the region of planet formation (1 - 10 au). The contrast between the two phases is diminished by the importance of the reprocessing of photons from the relatively high mass flux outer disk (dot-M = 10(exp -5) solar mass/yr) which is present during both outburst and quiescence.
Author
Accretion Disks; Emittance; Flare Stars; Infrared Radiation; Photons; Temperature Profiles

20020080723 NASA Ames Research Center, Moffett Field, CA USA
Disk Dispersal Around Young Stars
Hollenbach, David, NASA Ames Research Center, USA; Yorke, Harold W., Jet Propulsion Lab., California Inst. of Tech., USA; Johnstone, Doug, Canadian Inst. for Theoretical Astrophysics, Canada; [1999]; 1p; In English
Contract(s)/Grant(s): RTOP 344-04-10-02; No Copyright; Avail: Issuing Activity; Abstract Only

We review the evidence pertaining to the lifetimes of planet-forming disks and discuss possible disk dispersal mechanisms: 1) viscous accretion of material onto the central source, 2) close stellar encounters, 3) stellar winds, and 4) by ultraviolet radiation. We focus on 3) and 4) and describe the quasi-steady state appearance and the overall evolution of disks under the influence of winds and radiation from the central star and of radiation from external OB stars. Viscous accretion likely dominates disk dispersal in the, inner disk (r approx. less than A 10 AU), while photoevaporation is the principal process of disk dispersal outside of r approximately greater than 10 AU. Disk dispersed timescales are compared and discussed in relation to theoretical estimates for planet formation timescales. Photoevaporation may explain the large differences in the hydrogen content of the giant planets in the solar system. The commonly held belief that our early sun’s stellar wind dispersed the solar nebula is called into question.
Author
Accretion Disks; B Stars; Gas Giant Planets; O Stars; Planetary Evolution; Solar System; Stellar Winds

20020080727 NASA Ames Research Center, Moffett Field, CA USA
Photodissociation Regions in the Interstellar Medium of Galaxies
Hollenbach, David J., NASA Ames Research Center, USA; Tielens, A. G. G. M., Kapteyn Astronomical Lab., Netherlands; [1999]; 1p; In English
Contract(s)/Grant(s): RTOP 344-04-10-02; No Copyright; Avail: Issuing Activity; Abstract Only

The interstellar medium of galaxies is the reservoir out of which stars are born and into which stars inject newly created elements as they age. The physical properties of the interstellar medium are governed in part by the radiation emitted by these stars. Far-ultraviolet (6 eV less than h(nu) less than 13.6 eV) photons from massive stars dominate the heating and influence the chemistry of the neutral atomic gas and much of the molecular gas in galaxies. Predominantly neutral regions of the interstellar medium in which the heating and chemistry are regulated by far ultraviolet photons are termed Photo-Dissociation Regions (PDRs). These regions are the origin of most of the non-stellar infrared (IR) and the millimeter and submillimeter CO emission from galaxies. The importance of PDRs has become increasingly apparent with advances in IR and submillimeter astronomy. The IR emission from PDRs includes fine structure lines of C, C+, and O; rovibrational lines of H2, rotational lines of CO; broad middle features of polycyclic aromatic hydrocarbons; and a luminous underlying IR continuum from interstellar dust. The transition of H to H2 and C+ to CO occurs within PDRs. Comparison of observations with theoretical models of PDRs enables one to determine the density and temperature structure, the elemental abundances, the level of ionization, and the radiation field. PDR models have been applied to interstellar clouds near massive stars, planetary nebulae, red giant outflows, photoevaporating planetary disks around newly formed stars, diffuse clouds, the neutral intercloud medium, and molecular clouds in the interstellar radiation field-in summary, much of the interstellar medium in galaxies. Theoretical PDR models explain the observed correlations of the [CII] 158 microns with the COJ = 1-0 emission, the COJ = 1-0 luminosity with the interstellar molecular mass, and the [CII] 158 microns plus [OI] 63 microns luminosity with the IR continuum luminosity. On a more global scale, MR models predict the existence of two stable neutral phases of the interstellar medium, elucidate the formation and destruction of star-forming

molecular clouds, and suggest radiation-induced feedback mechanisms that may regulate star formation rates and the column density of gas through giant molecular clouds.
Author
Interstellar Matter; Interstellar Radiation; Mathematical Models; Scale Models; Infrared Astronomy; Galaxies

20020080737 NASA Goddard Space Flight Center, Greenbelt, MD USA
Coronal Element Abundances of the Post-Common Envelope Binary V471 Tauri with ASCA
Still, Martin, NASA Goddard Space Flight Center, USA; Hussain, Gaitee, Harvard-Smithsonian Center for Astrophysics, USA; [2002]; 10p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We report on ASCA observations of the coronally active companion star in the post-common envelope binary V471 Tau. While it would be prudent to check the following results with grating spectroscopy, we find that a single-temperature plasma model does not fit the data. Two temperature models with variable abundances indicate that Fe is underabundant compared to the Hyades photospheric mean, whereas, the high first ionization potential element Ne is overabundant. This is indicative of the inverse first ionization effect, believed to result from the fractionation of ionized material by the magnetic field in the upper atmosphere of the star. Evolutionary calculations indicate that there should be no peculiar abundances on the companion star resulting from the common envelope epoch. Indeed, we find no evidence for peculiar abundances, although uncertainties are high.
Author
Abundance; Companion Stars; Coronas; Stellar Atmospheres; Taurus Constellation; Astrophysics

20020080744 NASA Goddard Space Flight Center, Greenbelt, MD USA
Abundances of Planetary Nebula NGC 5315
Pottasch, S. R., Kapteyn Astronomical Lab., Netherlands; Beintema, D. A., Kapteyn Astronomical Lab., Netherlands; Koorneef, J., Kapteyn Astronomical Lab., Netherlands; Salas, J. Bernard, Kapteyn Astronomical Lab., Netherlands; Feibelman, W. A., NASA Goddard Space Flight Center, USA; [2002]; 20p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The ISO and IUE spectra of the elliptical nebula NGC 5315 is presented. These spectra axe combined with the spectra in the visual wavelength region to obtain a complete, extinction corrected, spectrum. The chemical composition of the nebulae is then calculated and compared to previous determinations. The HST Nicmos observations of the nebula in 3 emission lines are also presented. These observations are used to determine the helium abundance as a function of position in the nebula. A discussion is given of possible evolutionary effects.
Author
Planetary Nebulae; Emission Spectra; Abundance; IUE; Chemical Composition

20020080798 NASA Goddard Space Flight Center, Greenbelt, MD USA
Astrophysics at the Highest Energy Frontiers
Stecker, F. W., NASA Goddard Space Flight Center, USA; [2002]; 50p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

I discuss recent advances being made in the physics and astrophysics of cosmic rays and cosmic gamma-rays at the highest observed energies as well as the related physics and astrophysics of very high energy cosmic neutrinos. I also discuss the connections between these topics.
Author
Astrophysics; Gamma Ray Bursts; Energy Spectra; Cosmology

20020080810 NASA Goddard Space Flight Center, Greenbelt, MD USA
Energetic Particle Abundances as Probes of an Interplanetary Shock Wave
Reames, D. V., NASA Goddard Space Flight Center, USA; Tylka, A. J., Naval Research Lab., USA; [2002]; 9p; In English
Contract(s)/Grant(s): DPR-S13791G; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We examine the unique abundance variations of Fe/O and He/H in solar energetic particles from a W09 event of 2001 April 10, that have leaked through the flank of an interplanetary shock launched from W04 on April 9. Shock waves from both events reach the Wind spacecraft on April 11. During the second event, both Fe/O and He/H begin at low values and rise to maxima near the time of passage of the shock waves, indicating greater scattering for the species with the highest rigidity at a given velocity. Strong modulation of Fe/O suggests preferential scattering and trapping of Fe by the wave spectrum near and behind the intermediate shock. A significant factor may be the residual proton-generated waves from the very hard proton spectrum

accelerated by the early shock wave prior to the onset of the second event. Thus, ion abundances from the later event probe the residual wave spectrum at the earlier shock.
Author
Iron Oxides; Helium Hydrogen Atmospheres; Solar Physics; Solar Energy; Energetic Particles

20020080811 NASA Goddard Space Flight Center, Greenbelt, MD USA
Optical Spectrum of the Compact Planetary Nebula IC 5117
Hyung, Siek, Korea Astronomy Observatory, Korea, Republic of; Aller, Lawrence H., California Univ., USA; Feibelman, Walter A., NASA Goddard Space Flight Center, USA; Lee, Seong-Jae, Chungnam National Univ., Korea, Republic of; December 2001; 36p; In English
Contract(s)/Grant(s): KRF-2000-015-DP0445; Star-01-2-500-00; KOSEF-2000-1-113-001-5; STScI-AR-06372-01-95A; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High resolution spectroscopic data of the very compact planetary nebula IC 5117 are obtained in the optical wavelengths, 3700A - 10050A, with the Hamilton Echelle Spectrograph at Lick Observatory, and which have been analyzed along with the International Ultraviolet Explorer (IUE) UV archive data. Although a diagnostic diagram shows significant density and temperature fluctuations, our analysis indicates that the nebular gas may be represented by a homogeneous shell of extremely high density gas, N(sub epsilon) approx. 90 000 /cu cm. The average electron temperatures, e.g. indicated by the [OIII] diagnostics, are around 12 000 K. We construct a photoionization model to represent most of the observed line intensities, and the physical condition of this compact nebulosity. Based on the semi-empirical ionization correction approach, and model indications, we derived the elemental abundances: He, C, N, O, Ne, and Ar appear to be normal or marginally depleted compared to the average planetary nebula, while the remaining elements, S, Cl, and K appear to be enhanced. IC 5117 is perhaps a very young compact planetary nebula, slightly more evolved than the other well-known compact planetary nebula IC 4997. The central stellar temperature is likely to be around 120 000 K, evolved from a C-rich AGB progenitor.
Author
Planetary Nebulae; Data Acquisition; Photoionization; Ionization; High Resolution; Light (Visible Radiation)

20020080833 NASA Goddard Space Flight Center, Greenbelt, MD USA
Probing Galaxy Formation and Submillimeter Surveys
Dwek, Eli, NASA Goddard Space Flight Center, USA; Arendt, Richard G., Science Systems and Applications, Inc., USA; Benford, Dominic J., NASA Goddard Space Flight Center, USA; Moseley, Harvey S., NASA Goddard Space Flight Center, USA; Shafer, Richard A., NASA Goddard Space Flight Center, USA; Staguhn, Johannes G., Science Systems and Applications, Inc., USA; [2002]; 1p; In English; 2nd Workshop on New Concepts for Far-IR Submillimeter Space Astronomy, 7-8 Mar. 2002, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Multiwavelength observations of galaxies have revealed that a significant fraction of the their stellar or accretion luminosity is absorbed and reradiated by dust at far-infrared (FIR) and submillimeter (submm) wavelengths. Submillimeter (850 micron) surveys conducted by the SCUBA instrument on the JCMT have detected a population of high redshift (z approximately equal to 1-4) ultraluminous infrared galaxies, that dominate the luminosity densities at those redshifts. Their cumulative contribution to the cosmic infrared background (CIB) detected by the COBE satellite is comparable to the observations, suggesting that at 850 microns the CIB is resolved into its constituent sources. This suggests that the early universe was much more dust enshrouded than the present one. FIR and submm surveys can therefore address fundamental questions regarding the early processes of galaxy formation and their evolution in number and luminosity over cosmic history. The scientific information that can be obtained from such surveys depend on a number of parameters, the most important of which are the diameter of the telescope and the wavelengths of the survey. We summarize the effect of these parameters on the scientific return from such surveys.
Author
Galactic Evolution; Submillimeter Waves; Sky Surveys (Astronomy); Far Infrared Radiation; Telescopes

20020080863 NASA Goddard Space Flight Center, Greenbelt, MD USA
An ISO and IUE Study of Planetary Nebula NGC 2440
Salas, J. Bernard, Space Research Organization Netherlands, Netherlands; Pottasch, S. R., Kapteyn Astronomical Lab., Netherlands; Feibelman, W. A., NASA Goddard Space Flight Center, USA; Wesselius, P. R., Space Research Organization Netherlands, Netherlands; Mar. 22, 2002; 9p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The infrared and ultraviolet spectra of planetary nebula NGC 2440 is presented. The observations were made respectively by the Infrared Space Observatory (ISO) and International Ultraviolet Explorer (IUE) These data, in conjunction with published optical observations have been used to derive electron temperature and density. A trend of electron temperature with ionization

potential is found. In particular the electron temperature increases from 11000 to 18000 K with increasing IBM. The electron density has a constant value of 4500/cu cm in agreement with previous determination. The chemical abundance has been derived for the following elements; helium, carbon, nitrogen, oxygen, neon, sulfur and argon. The ionization correction factor turns out to be very small (almost unnecessary) for all species except sulfur.
Author
Planetary Nebulae; Ultraviolet Spectra; Infrared Spectra; Electron Density (Concentration)

20020080894 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Laser Guide Star Based Astrophysics at Lick Observatory
Max, C.; Gavel, D.; Friedman, H.; Olivier, S.; Macintosh, B.; Mar. 10, 2000; 11p; In English
Report No.(s): DE2002-793551; UCRL-ID-138008; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The resolution of ground-based telescopes is typically limited to 1 second of arc because of the blurring effects of atmospheric turbulence. Adaptive optics (AO) technology senses and corrects for the optical distortions due to turbulence hundreds of times per second using high-speed sensors, computers, deformable mirror, and laser technology. The goal of this project is to make AO systems widely useful astronomical tools providing resolutions up to an order of magnitude better than current, ground-based telescopes. Astronomers at the University of California Lick Observatory at Mt. Hamilton now routinely use the LLNL developed AO system for high resolution imaging of astrophysical objects. We report here on the instrument development progress and on the science observations made with this system during this 3-year ERI project.
NTIS
Adaptive Optics; Astrophysics; Laser Guide Stars; Imaging Techniques; Laser Applications

20020081041 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Activity Cycles in Solar-Type Stars SHOW105 ***Final Report, 1 Oct. 2000 - 30 Sep. 2002***
Harnden, F. R., Jr., Smithsonian Astrophysical Observatory, USA; October 2002; 1p; In English
Contract(s)/Grant(s): NAG5-10004; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Last year, we requested a one-year no cost extension because only one of four scheduled observations of HD 81809 had been conducted (in Apr. 2001). Our program consists of periodic snapshot observations (every 6 months) of HD 81809. As a G-type star (G2V, at a distance of 31.2 pc) it serves as a ”solar analog” and has a known chromospheric CaII cycle with a period of 8.2 yr. Three A-01 observations were conducted, in Apr. 2001, Nov. 2001 and June 2002. Although the Apr. 2001 observation was contaminated by proton flaring and thus is of low quality, the other two observation are of excellent quality.
Derived from text
Activity Cycles (Biology); G Stars; Astrophysics; Sun; Solar Activity

20020081286 California Inst. of Tech., Submillimeter Observatory, Pasadena, CA USA
From Massive Protostars to a Giant H II Region: Submillimeter Imaging of the Galactic Mini-Starbursts W43
Motte, F., California Inst. of Tech., USA; Schilke, P., Max-Planck-Inst. fuer Radioastronomie, Germany; Lis, D. C., California Inst. of Tech., USA; [2002]; 22p; In English
Contract(s)/Grant(s): NSF AST-99-80846
Report No.(s): Rept-2002-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We have carried out a submillimeter continuum and spectroscopic study of the W43 main complex, a massive star-forming region, which harbors a giant H II region. The maps reveal a filamentary structure containing approximately 50 fragments with masses of 40 - 4,000 solar mass and typical diameters of 0.25 pc. Their large sizes, large non-thermal velocities (delta v approximately 5 km s(exp -1)), and high densities (n(sub h2) approximately 10(exp 6) cm(exp -3)) suggest that they are protoclusters and excellent sites to form massive stars. Follow-up observations are necessary, but we have already identified three protoclusters to be very good candidates for containing very young massive protostars. The starburst cluster, that excites the giant H II region has a large impact on the molecular complex. However, it remains unclear if this first episode of star formation is triggering the formation of new massive stars, through ionization shocks crossing the closeby molecular clouds. W43 is thus an ideal laboratory to investigate massive star formation from the protostellar phase to that of giant H II regions. Moreover, the very active star-forming complex W43 may be considered a Galactic mini-starburst region that could be used as a miniature model of starburst galaxies.
Author
H II Regions; Star Formation; Stellar Structure; Stellar Composition; Starburst Galaxies; Galactic Structure

20020081340 NASA Goddard Space Flight Center, Greenbelt, MD USA

The X-ray Reflectors in the Nucleus of the Seyfert Galaxy NGC 1068

Colbert, Edward J. M., NASA Goddard Space Flight Center, USA; Weaver, Kimberly A., NASA Goddard Space Flight Center, USA; Krolik, Julian H., Johns Hopkins Univ., USA; Mulchaey, John S., Carnegie Institution of Washington, USA; Mushotzky, Richard F., NASA Goddard Space Flight Center, USA; [2002]; 40p; In English

Report No.(s): astro-ph/0208158-Vol-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Based on observations of the Seyfert nucleus in NGC 1068 with ASCA, RXTE and BeppoSAX, we report the discovery of a flare (increase in flux by a factor of approximately 1.6) in the 6.7 keV Fe K line component between observations obtained four months apart, with no significant change in the other (6.21, 6.4, and 6.97 keV) Fe Kalpha line components. During this time, the continuum flux decreased by approximately 20%. The RXTE spectrum requires an Fe K absorption edge near 8.6 keV (Fe XXIII-XXV). The spectral data indicate that the 2-10 keV continuum emission is dominated (approximately 2/3 of the luminosity) by reflection from a previously unidentified region of warm, ionized gas located approximately or less than 0.2 pc from the AGN. The remaining approximately 1/3 of the observed X-ray emission is reflected from optically thick, neutral gas. The coronal gas in the inner Narrow-Line Region (NLR) and/or the cold gas at the inner surface of the obscuring 'torus' are possible cold reflectors. The inferred properties of the warm reflector are: size (diameter) approximately or less than 0.2 pc, gas density n approximately or greater than 10(exp 5.5)/cu cm, ionization parameter xi is approximately 10(exp 3.5) erg cm s(exp -1), and covering fraction 0.003 (L(sub 0)/ 10(exp 43.5) erg s(exp -1)(exp -1) less than (omega/4pi) less than 0.024 (L(sub 0)/ 10(exp 43.5) erg s(exp -1) (exp -1) where L(sub 0) is the intrinsic 2-10 keV X-ray luminosity of the AGN. We suggest that the warm reflector gas is the source of the (variable) 6.7 keV Fe line emission, and the 6.97 keV Fe line emission. The 6.7 keV line flare is assumed to be due to an increase in the emissivity of the warm reflector gas from a decrease (by 20-30%) in L(sub 0). The properties of the warm reflector are most consistent with an intrinsically X-ray weak AGN with L(sub 0) approximately equals 10(exp 43.0) erg s(exp -1). The optical and UV emission that scatters from the warm reflector into our line of sight is required to suffer strong extinction, which can be reconciled if the line-of-sight skims the outer surface of the torus. Thermal bremsstrahlung radio emission from the warm reflector may be detectable in VLBA radio maps of the NGC 1068 nucleus.

Author

Active Galaxies; Active Galactic Nuclei; Emission Spectra; Spectrum Analysis; K Lines; Reflectors

20020081349 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Stellar Imager (SI) Mission Concept

Carpenter, Kenneth G., NASA Goddard Space Flight Center, USA; Schrijver, Carolus J., Lockheed Martin Advanced Technology Center, USA; Lyon, Richard G., NASA Goddard Space Flight Center, USA; Mundy, Lee G., Maryland Univ., USA; Allen, Ronald J., Space Telescope Science Inst., USA; Armstrong, Thomas, Naval Research Lab., USA; Danchi, William C., NASA Goddard Space Flight Center, USA; Karovska, Margarita, Harvard-Smithsonian Center for Astrophysics, USA; Marzouk, Joe, Sigma Space Corp., USA; Mazzuca, Lisa M., NASA Goddard Space Flight Center, USA; Jul. 25, 2002; 10p; In English; SPIE's Astronomical Telescope and Instrumentation, 22-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA

Contract(s)/Grant(s): NAG5-9952; NRA-01-01-SARA-059; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Stellar Imager (SI) is envisioned as a space-based, UV-optical interferometer composed of 10 or more one-meter class elements distributed with a maximum baseline of 0.5 km. It is designed to image stars and binaries with sufficient resolution to enable long-term studies of stellar magnetic activity patterns, for comparison with those on the sun. It will also support asteroseismology (acoustic imaging) to probe stellar internal structure, differential rotation, and large-scale circulations. SI will enable us to understand the various effects of the magnetic fields of stars, the dynamos that generate these fields, and the internal structure and dynamics of the stars. The ultimate goal of the mission is to achieve the best-possible forecasting of solar activity as a driver of climate and space weather on time scales ranging from months up to decades, and an understanding of the impact of stellar magnetic activity on life in the Universe. In this paper we describe the scientific goals of the mission, the performance requirements needed to address these goals, the "enabling technology" development efforts being pursued, and the design concepts now under study for the full mission and a possible pathfinder mission.

Author

Stellar Structure; Optical Measuring Instruments; Interferometers; Ultraviolet Imagery; Stellar Magnetic Fields; Stellar Activity; Acoustic Imaging

20020082895 NASA Goddard Space Flight Center, Greenbelt, MD USA

Circumstellar jets and disk of DL Tau and CW Tau observed with HST/STIS and the GSFC Fabry-Perot imager

Grady, Carol, NASA Goddard Space Flight Center, USA; Woodgate, Bruce, NASA Goddard Space Flight Center, USA; Kimble, Randy, NASA Goddard Space Flight Center, USA; Palunas, Povilas, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 200th Meeting of the American Astronomical Society, 2-6 Jun. 2002, Albuquerque, NM, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The pre-main sequence T Tauri stars DL Tau and CW Tau were observed with Hubble Space Telescope/Space Telescope Imaging Spectrograph (HST/STIS) and the Goddard Fabry-Perot Imager at the Apache Point 3.5-m telescope in their coronagraphic modes. The STIS observation of DL Tau shows a circumstellar disk with a dark ring, and the jet with structure along the length, and a faint counter-jet. On CW Tau, STIS shows a jet with a bright blob about 4 arcsec away, and the Fabry-Perot shows the jet extended in both directions in [SII] to 60 and 90 arcsec from the star.

Author

Pre-Main Sequence Stars; T Tauri Stars; Fabry-Perot Spectrometers; Hubble Space Telescope; Protoplanetary Disks

20020082928 NASA Goddard Space Flight Center, Greenbelt, MD USA

Resolving Eta Carinae and It's Ejecta

Gull Theodore R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Hubble Science Legacy, 2-5 Apr. 2002, Chicago, IL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Imaging spectroscopy of Eta Carinae and the Homunculus has led to considerable new insight on the excitation mechanisms, the elemental abundances, and the physical properties of ejecta from Eta Carinae. With HST/STIS we have been able to resolve the central source into many substructures.

Author

Supermassive Stars; Stellar Structure; Ejecta

20020082931 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Evolution of Interstellar Dust

Dwek, Dr. Eliahu, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Origins 2002 Conference, 26-29 May 2002, Jackson Hole, WY, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The abundance, composition and site distribution of interstellar dust is determined by a large number of physical processes in the sources and the Interstellar Medium (ISM). In this talk, we will give an overview of the evolutionary processes that determine the physical properties of dust in the ISM.

Author

Cosmic Dust; Evolution (Development)

20020082942 Colorado Univ., Joint Inst. for Lab. Astrophysics, Boulder, CO USA

Event Rate for LISA Gravitational Wave Signals from Black Hole-Massive Black Hole Coalescences ***Final Report, 1 Jan. 1997 - 31 Mar. 1999***

Bender, Peter L., Colorado Univ., USA; Sep. 17, 2002; 6p; In English

Contract(s)/Grant(s): NAG5-4095; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Earlier work under a previous grant had been mainly on investigating the event rate for coalescences of white dwarfs or neutron stars with massive black holes (MBHs) in galactic nuclei. Under the new grant, two studies were undertaken. One was an approximate extension of the earlier study to stellar mass black holes as the lighter object, with masses in the range of roughly 3 to 20 solar mass rather than about 1 solar mass. The other was an improved estimate of the confusion noise due to galactic binaries against which the signals from BH-MBH coalescences would have to be detected. In the earlier work, the mass of the white dwarfs (WDs) and neutron stars (NSs) was assumed to be about the same as that of the evolved stars in the density cusp around the galactic center MBH. However, with the BH mass being substantially larger, the sinking down of pHs toward the center (mass segregation) became important, and was included in the model. A single representative mass of 7 solar mass was used. The other main difference involved what happened after the compact object got scattered in close enough to the MBH to start losing appreciable energy and angular momentum by gravitational radiation. For WDs or NSs, it had been found in most cases that the object would be perturbed considerably by other stars in the cusp before much energy had been lost. Thus the angular momentum would either increase enough so that gravitational radiation would be cut off, or would decrease enough so that the WD or NS would plunge into the MBH in just a few revolutions. The latter event would mean that the signal-to noise ratio would not have time to build

up, and the event would not be detectable. The ratio of gradual energy loss events to plunges was found to be roughly one to a few percent, and thus substantially decreased the expected rate of detectable events.
Derived from text
Coalescing; Gravitational Waves; Neutron Stars; Signal to Noise Ratios; Stellar Mass; Black Holes (Astronomy)

20020082949 NASA Goddard Space Flight Center, Greenbelt, MD USA
UV and Optical Detectors: Status and Prospects
Woodgate, Bruce, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Hubble Science Legacy Workshop, 2-5 Apr. 2002, Chicago, IL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

UV and visible detectors - status and prospects. The status and prospects for UV and visible detectors for space astrophysics missions will be described, based on the findings of the NASA working group roadmap report, hopefully updated.
Author
Ultraviolet Detectors; Space Missions

20020082960 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Stellar Imager (SI) Mission Concept: Imaging the Surfaces and Interiors of Other Stars
Carpenter, Kenneth G., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Center for Astrophysics, 26 Mar. 2002, Cambridge, MS, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Stellar Imager (SI) is envisioned as a space-based, uv-optical interferometer composed of 10 or more one-meter class elements distributed with a maximum. baseline of 0.5-km and providing a resolution of 60 micro-arcseconds at 1550 A. It will image stars and binaries with one hundred to one thousand resolution elements on their surface and enable long-term studies of stellar magnetic activity patterns and their evolution with time, for comparison with those on the sun. It will also sound their interiors through asteroseismology to image internal structure, differential rotation, and large-scale circulations. SI will enable us to understand the various effects of magnetic fields of stars, the dynamos that generate these fields, and the internal structure and dynamic the stars in which these dynamos operate. The ultimate goal of the mission is to achieve the best-possible forecasting of solar activity as a driver of climate and space weather on times scales ranging from months up to decades, and an understanding of the impact of stellar magnetic activity on life in the universe. The road to that goal will revolutionize our understanding of stars and stellar systems, the building blocks of the universe. Fitting naturally within the NASA and ESA long-term time lines, SI complements defined missions, and with them will show us entire other solar systems, from the central star to their orbiting planets. in this paper we describe the scientific goals of the mission, the performance requirements needed to address those goals, and the design concepts now under study.
Author
Interferometers; Spaceborne Astronomy; Stellar Structure

20020083030 NASA Goddard Space Flight Center, Greenbelt, MD USA
New Interstellar Dust Models Consistent with Interstellar Extinction, Emission and Abundances Constraints
Zubko, V., NASA Goddard Space Flight Center, USA; Dwek, E., NASA Goddard Space Flight Center, USA; Arendt, R. G., NASA Goddard Space Flight Center, USA; December 2001; 1p; In English; Astrophysics of Life Conference, Baltimore, MD, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We present new interstellar dust models that are consistent with both, the FUV to near-IR extinction and infrared (IR) emission measurements from the diffuse interstellar medium. The models are characterized by different dust compositions and abundances. The problem we solve consists of determining the size distribution of the various dust components of the model. This problem is a typical ill-posed inversion problem which we solve using the regularization approach. We reproduce the Li Draine (2001, ApJ, 554, 778) results, however their model requires an excessive amount of interstellar silicon (48 ppM of hydrogen compared to the 36 ppM available for an ISM of solar composition) to be locked up in dust. We found that dust models consisting of PAHs, amorphous silicate, graphite, and composite grains made up from silicates, organic refractory, and water ice, provide an improved fit to the extinction and IR emission measurements, while still requiring a subsolar amount of silicon to be in the dust. This research was supported by NASA Astrophysical Theory Program NRA 99-OSS-01.
Author
Cosmic Dust; Interstellar Matter; Size Distribution; Infrared Radiation; Extinction; Amorphous Materials

20020083043 NASA Goddard Space Flight Center, Greenbelt, MD USA

Eta Carinae and the Homunculus: A Physics Laboratory

Gull, Theodore R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Department Seminar, 30 May 2002, Lund, Sweden; No Copyright; Avail: Issuing Activity; Abstract Only

The Luminous Blue Variable, Eta Carinae, and its ejecta, thrown out since the 1840s, are proving to be a very challenging system to explain. The is greater than 100 solar mass central source (which is likely a binary system) is very complex with P-Cygni lines throughout the spectrum. Superimposed upon the stellar spectrum are many thousands of narrow absorption lines. Indeed we have found twenty different velocities between -140km/s and -580km/s with many lower levels well elevated above the ground states of numerous ions.

Author

Stellar Spectra; Cygnus Constellation; Ejecta; Line Spectra; Ground State

20020083063 NASA Goddard Space Flight Center, Greenbelt, MD USA

Circumstellar Ti-II and V-II around Eta Carinae

Gull, Theodore R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Eta Carinae Conference/Workshop, 11-13 Jul. 2002, Mount Rainier, WA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We have used the STIS in E230H mode (R~130,000) on the Central source. We find hundreds of narrow absorption lines in about 20 velocity systems with velocities ranging from -140 km/s to -585 km/s. The prominent systems are the -140 km/s and the -513 km/s systems. The -140 km/s system has characteristically broad absorption profiles and is dominated by Fe II, Cr II absorptions. The -513 km/s system has very narrow absorption profiles and is dominated by Fe I, V II and Ti II. Both systems have many lines with lower levels being well above the ground state. Moreover, the lower levels are separated by spin energies and we suspect there is population inversion. This indicates that the species are being pumped by stellar radiation. More will be described in the presentation.

Author

Ground State; Line Spectra; Stellar Radiation

20020083153 NASA Goddard Space Flight Center, Greenbelt, MD USA

Multiwavelength Luminosity Functions of Galaxies

Gardner, Jonathan, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Origins 2002: The Heavy Element Trail from Galaxies to Habitable Worlds Conference, 26-30 May 2002, Jackson Hole, WY, USA; No Copyright; Avail: Issuing Activity; Abstract Only

I have developed a technique for measuring multi-variate luminosity functions of galaxies. Multivariate or multi-wavelength luminosity functions will reveal the interplay between star formation, chemical evolution, and absorption and re-emission of dust within evolving galaxy populations. by using principle component analysis to reduce the dimensionality of the problem, I optimally extract the relevant photometric information from large galaxy catalogs. As a demonstration of the technique, I derive the multiwavelength luminosity function for the galaxies in the released SDSS catalog, and show that the results are consistent with those obtained by traditional methods. This technique will be applicable to catalogs of galaxies from datasets obtained by the SIRTF and GALEX missions.

Author

Galaxies; Star Formation; Photometry; Space Missions; Stellar Luminosity

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20020080713 NASA, Washington, DC USA

Introduction to Mars Sample Handling Workshop Series: Overview of Mars Sample Hazard Analysis

Rummel, John D., NASA, USA; Mars Sample Handling Protocol Workshop Series; December 2001, pp. 63-76; In English; Also announced as 20020080712; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Samples returned from Mars should be contained and treated as though potentially hazardous until proven otherwise If sample containment cannot be verified en route to Earth, the sample and spacecraft should either be sterilized in space or not returned to Earth. Integrity of sample containment should be maintained through reentry and transfer to a receiving facility. Controlled

distribution of unsterilized materials should only occur if analyses determine the sample not to contain a biological hazard. Planetary protection measures adopted for the first sample return should not be relaxed for subsequent missions without thorough scientific review and concurrence by an appropriate independent body
Author
Mars Surface Samples; Conferences; Mars Sample Return Missions; Planetary Protection; Containment; Spacecraft Sterilization; Mission Planning; Hazardous Materials

20020080715 Washington Univ., Seattle, WA USA
Report of the NAS Life Detection Workshop
Baross, John, Washington Univ., USA; Mars Sample Handling Protocol Workshop Series; December 2001, pp. 85; In English; Also announced as 20020080712; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

As part of the charge to the recent NRC study of 'The Quarantine and Certification of Martian Samples,' the Committee on Planetary and Lunar Exploration (COMPLEX), was asked to evaluate what criteria must be satisfied before martian samples can be released from the SRF. The Study Committee was chaired by John Wood (Harvard University). John Baross summarized the Committees' progress to date. Since the Study Committee had just completed their deliberations at the time of Workshop 3 therefore no visual materials were used to describe this work. The final report of the COMPLEX Committee is in press at the time of the preparation of this report.
Author
Mars Surface Samples; Planetary Protection; Contamination; Criteria; Mars Sample Return Missions

20020080716 Search for Extraterrestrial Intelligence Inst., Mountain View, CA USA
[Summary of MSHP Workshop 1]
Race, Margaret S., Search for Extraterrestrial Intelligence Inst., USA; Kovacs, Gregory T. A., Stanford Univ., USA; Mars Sample Handling Protocol Workshop Series; December 2001, pp. 95-106; In English; Also announced as 20020080712; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

This presentation summarizes the results of Mars Sample Handling Protocol (MSHP) workshop 1. These sessions aimed to develop comprehensive protocols to assess that returned materials do not contain biological hazards and safeguard the purity of the samples from possible Earth contaminants.
CASI
Mars Surface Samples; Mars Sample Return Missions; Planetary Protection; Sampling; Life Detectors; Chemical Analysis; Hazardous Materials

20020080717 Search for Extraterrestrial Intelligence Inst., Mountain View, CA USA
[Summary of MSHP Workshop 2]
Race, Margaret S., Search for Extraterrestrial Intelligence Inst., USA; Kovacs, Gregory T. A., Stanford Univ., USA; Mars Sample Handling Protocol Workshop Series; December 2001, pp. 107-116; In English; Also announced as 20020080712; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

This presentation summarizes the results of Mars Sample Handling Protocol (MSHP) workshop 2. These sessions aimed to develop comprehensive protocols to assess that returned materials do not contain biological hazards and safeguard the purity of the samples from possible Earth contaminants.
CASI
Mars Surface Samples; Mars Sample Return Missions; Planetary Protection; Contamination; Biomarkers; Tests; Hazardous Materials

20020080718 NASA, Washington, DC USA
Introduction to Mars Sampling Handling Workshop Series. Workshop on Life Detection: Issues and Topics
Rummel, John D., NASA, USA; Mars Sample Handling Protocol Workshop Series; December 2001, pp. 117-119; In English; Also announced as 20020080712; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Before martian soil and rock samples can be distributed to the research community, the returned materials will initially be quarantined and examined in a proposed BSL-4 containment facility to assure that no putative martian microorganisms or attendant potential biohazards exist. During the initial quarantine, state-of-the-art life detection and biohazard testing of the

returned martian samples will be conducted. Life detection, as defined here in regard to Mars sample return missions, is the detection of living organisms and/or materials that have been derived from living organisms that may be present in the sample.
Author
Mars Surface Samples; Mars Sample Return Missions; Planetary Protection; Biomarkers; Extraterrestrial Life; Microorganisms

20020080732 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Crustal Thickness of Mars: Accuracy and Resolution
Smith, David E., NASA Goddard Space Flight Center, USA; Zuber, Maria T., Massachusetts Inst. of Tech., USA; [2002]; 2p; In English; Lunar and Planetary Science Conference, 11-15 Mar. 2002, Houston, TX, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Since the arrival of the Mars Global Surveyor (MGS) spacecraft at Mars and its entry into its mapping orbit in February 1999, the radio tracking and altimetry data from the mission have been part of the systematic mapping of the planet and used to develop very precise models of the gravity field and topography of Mars. Until the altimetry function of Mars Orbiter Laser Altimeter (MOLA) failed on June 30, 2001, the instrument had acquired close to 700 million measurements of the planet's radius, the majority of which have been used to develop a model of the topography with horizontal resolution of about 500 m and radial accuracy of better than 1 m. Concurrently, Doppler and range tracking of MGS by the Deep Space Network at X-band frequencies, with accuracies of about 50 microns/s and about 5 m respectively, have provided orbital knowledge of MGS to the few meter level and enabled the gravity perturbations of the spacecraft to be used to develop a improved gravity models of Mars. The recent models have horizontal resolutions of about 200 km, or degree 65, when expressed in spherical harmonics, and have accuracies of the order of a few mGals at the poles and about 10 mGals at the equator at the highest resolution.
Author
Mars Surface; Planetary Mapping; Laser Altimeters; Mars Global Surveyor; Planetary Crusts

20020081343 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Imaging Laser Altimeter for Lunar Scientific Exploration
Smith, David E., NASA Goddard Space Flight Center, USA; Zuber, M. T., NASA Goddard Space Flight Center, USA; Degnan, J. J., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration Conference, 12-14 Sep. 2002, Taos, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A new approach to laser altimetry is offered by the development of micro-lasers and pixilated detectors that enable very high resolution measurement of topography and relatively wide swath observations. An imaging altimeter with a 8x8 array detector working at a probability of less than a single photon/shot could map the Moon or similar sized body in approximately 2 years and provide 5 meter horizontal resolution topography and a 10 centimeter vertical accuracy. In addition, it would provide surface roughness and surface slopes on similar length scales of 5 meters and be able to address a range of problems for which topography or lunar shape is important at the decimeter level. This includes the topography of the polar regions, where ice is thought to have been identified, and also the cratering history of the Moon which could be assessed with a dataset of uniform quality and high resolution.
Author
Laser Altimeters; Imaging Techniques; Mapping; Lunar Surface; Lunar Exploration

20020082896 NASA Goddard Space Flight Center, Greenbelt, MD USA
Groundbased IO [O I] 6300A Observations during the Galileo I24 and I25 and Cassini Encounters
Oliverson, R. J., NASA Goddard Space Flight Center, USA; Morgenthaler, J. P., Wisconsin Univ., USA; Scherb, F., Wisconsin Univ., USA; Harris, W. M., Wisconsin Univ., USA; Smyth, W. H., Aerospace Engineering and Research Associates, Inc., USA; Lupie, O. L., Computer Science Corp., USA; [2002]; 1p; In English; Magnetospheres of the Outer Planets Conference, 29 Jul. - 2 Aug. 2002, Laurel, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We report on selected recent spectroscopic observations of Io [OI] 6300Angstrom emission, using the high-resolution (R approximately equal to 120,000) stellar spectrograph at the National Solar Observatory McMath-Pierce telescope. These data were obtained during the Galileo I24 (1999-Oct-11) and I25 (1999-Nov-26) encounters with Io and the Cassini Jupiter encounter (closest approach 2000-Dec-30). The exposure time for each spectrum was 15 minutes, with a 5.2 second x 5.2 second aperture centered on Io. We obtained 102 spectra for the I24 encounter during 1999 October 9-13, 82 spectra for the I25 encounter during 1999 November 24-28, 313 spectra during 2000 December 11-23, and 280 spectra during 2000 December 29-2001 January 21 for the Cassini Jupiter encounter. We showed in a recent paper (Oliversen et al. 2001, JGR, 106, 26183) that this emission allows us to use Io as a localized probe of the three-dimensional plasma torus structure. We will also present preliminary results on selected contemporaneous narrowband [SII]6731A torus images obtained at the McMath-Pierce west auxiliary telescope. We

took 136, 112, and 277 torus images during the Galileo I24, Galileo I25 and Cassini Jupiter encounters, respectively. Jupiter was imaged directly onto the CCD through a ND 4 filter and the reflected light was used for guiding. Both sides of the torus were imaged simultaneously when there were no Galilean satellites between 3-8 Jovian radii from Jupiter.
Author
Galileo Spacecraft; Telescopes; Cassini Mission; Io; Spectrographs; Stellar Spectra

20020083006 NASA Ames Research Center, Moffett Field, CA USA
Rovers for Mars Polar Exploration
Stoker, Carol, NASA Ames Research Center, USA; [1998]; 2p; In English; Conference on Mars Polar Processes, 18-22 Oct. 1998, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Mobility is a generic capability needed for Mars exploration. Requirements for mobility range from those to get observations of individual rocks all the way to getting high resolution observations of regional areas. Table 1 shows the required-range of mobility to achieve various tasks. The Pathfinder mission and field experiments simulating rover missions [1, 2, 3, 4, 5] provide guidance as to rover capabilities that can reasonably be expected in the next decade. Rover mobility can be accomplished in a variety of ways, the most common being wheels or tracks and legged-walkers. Wheeled vehicles can traverse over rocks smaller than 1/2 wheel diameter, and with path planning to avoid larger rocks, can traverse terrains comparable to those seen on Mars in the Viking and Pathfinder landing sites. Slopes of 45 deg can be easily negotiated by wheeled rovers. Walking vehicles can negotiate even more complex terrain but requires computation capability to select each leg placement. Extremely complex terrain was traversed by the Nomad II walker which descended into (and most of the way out of) an active volcanic caldera (Mount Spur, AK) in 1995, although a slope failure eventually resulted in broken legs. The traverse range of a rover is limited by its science objectives, performance capabilities, and operational lifetime. The speed of rover traverse is a relative minor factor. With a different communication system, and no stops for science experiments, Sojourner could probably have traveled a kilometer. But, achieving land speed records is not a major objective of a science mission. Achieving science objectives requires targeting particular objects and studying them in detail, and the associated operational requirements will likely limit rover traverse range significantly. Traversing from target to target requires relatively few command cycles provided the traverse is over a short enough distance that it can be adequately planned. An operational goal of 100 m traverse per command cycle, arriving at a predetermined target, seems achievable. Investigating science targets requiring manipulator or instrument placement and sample collection will likely take several command cycles per target. Mission simulations [6] have demonstrated that traverse dI stances of 100-300 m, with detailed investigation of 5-10 targets take 50-100 command cycles, not unlike the Pathfinder experience in spite of the use of larger, faster, more capable rovers. Significant advances in rover autonomy will be needed to improve this Situation and it is not clear how much improvement will be brought to flight programs in the next decade. Dust accumulation on solar panels degrades power over time and, without dust removal, rover operational lifetimes may be limited to 90 sols.
Derived from text
Roving Vehicles; Mars Exploration; Mobility; Trajectory Planning; Mars Pathfinder

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

20020080841 NASA Goddard Space Flight Center, Greenbelt, MD USA
A New Component of Solar Dynamics: North-South Diverging Flows Migrating toward the Equator with an 11 Year Period
Beck, J. G., Stanford Univ., USA; Gizon, L., Stanford Univ., USA; Duvall, Thomas L., Jr., NASA Goddard Space Flight Center, USA; [2002]; 8p; In English
Contract(s)/Grant(s): NAG5-8878; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Time-distance helioseismology analysis of dopplergrams provides maps of torsional oscillations and meridional flows. Meridional flow maps show a time-varying component that has a banded structure which matches the torsional oscillations with an equatorward migration over the solar cycle. The time-varying component of meridional flow consists of a flow diverging from the dominant latitude of magnetic activity. These maps are compared with other torsional oscillation maps and with magnetic flux maps, showing a strong correlation with active latitudes. These results demonstrate a strong link between the time-varying component of the meridional flow and the torsional oscillations.
Author
Solar Cycles; Magnetic Variations; Helioseismology; Magnetic Flux; Meridional Flow

20020080845 NASA Goddard Space Flight Center, Greenbelt, MD USA

Observational Aspects of the Solar Activity Cycle

Rabin, Douglas, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Observational Challenges for the Next Decade of Solar Magnetohydrodynamics, 16-18 Jan. 2002, Santa Barbara, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

I review recent space-borne and ground-based observations of cyclical solar phenomena, from the interior to the inner heliosphere. Two classes of observations will be stressed: those that bear on the generation and emergence of subsurface magnetic fields, and those that elucidate magnetic reorganization in the corona.

Author

Solar Prominences; Spaceborne Astronomy; Solar Activity; Magnetic Fields

20020080879 NASA Goddard Space Flight Center, Greenbelt, MD USA

Solar Flares, Type III Radio Bursts, Coronal Mass Ejections, and Energetic Particles

Cane, Hilary V., NASA Goddard Space Flight Center, USA; Erickson, W. C., Bruny Island Radio Spectrometer, Australia; Prestage, N. P., Culgoora Solar Observatory, Australia; Journal of Geophysical Research; 2002; ISSN048-0227; Volume 10, No. 0, pp. SHP-X-1 - SHP-X-17; In English

Contract(s)/Grant(s): NSF ATN-98-19798

Report No.(s): Paper-2001JA000320; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this correlative study between greater than 20 MeV solar proton events, coronal mass ejections (CMEs), flares, and radio bursts it is found that essentially all of the proton events are preceded by groups of type III bursts and all are preceded by CMEs. These type III bursts (that are a flare phenomenon) usually are long-lasting, intense bursts seen in the low-frequency observations made from space. They are caused by streams of electrons traveling from close to the solar surface out to 1 AU. In most events the type III emissions extend into, or originate at, the time when type II and type IV bursts are reported (some 5 to 10 minutes after the start of the associated soft X-ray flare) and have starting frequencies in the 500 to approximately 100 MHz range that often get lower as a function of time. These later type III emissions are often not reported by ground-based observers, probably because of undue attention to type II bursts. It is suggested to call them type III-1. Type III-1 bursts have previously been called shock accelerated (SA) events, but an examination of radio dynamic spectra over an extended frequency range shows that the type III-1 bursts usually start at frequencies above any type II burst that may be present. The bursts sometimes continue beyond the time when type II emission is seen and, furthermore, sometimes occur in the absence of any type II emission. Thus the causative electrons are unlikely to be shock accelerated and probably originate in the reconnection regions below fast CMEs. A search did not find any type III-1 bursts that were not associated with CMEs. The existence of low-frequency type III bursts proves that open field lines extend from within 0.5 radius of the Sun into the interplanetary medium (the bursts start above 100 MHz, and such emission originates within 0.5 solar radius of the solar surface). Thus it is not valid to assume that only closed field lines exist in the flaring regions associated with CMEs and some interplanetary particles originating in such flare regions might be expected in all solar particle events.

Author

Solar Flares; Type 3 Bursts; Coronal Mass Ejection; Energetic Particles; Electron Accelerators

20020080997 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Solar Model with g-Modes

Wolff, Charles L., NASA Goddard Space Flight Center, USA; [2002]; 38p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Good evidence is assembled showing that the Suit's core arid surface vary on time scales from a month to a decade arid that a number of scales are similar. The most plausible source for numerous long time scales and periodicities is long-lived global oscillations. This suggests g-modes (oscillations restored mainly by buoyancy) because they particularly affect the core and base of the convective envelope, which then indirectly modulates the surface. Also, standing g-modes have rotational properties that match many observed periodicities. But the standard solar model (SSM) has a static core and excites few if any g-modes. making new interior structures worth exploring. The model outlined here assumes two well mixed shells near 0.18 and 0.68 R, (13 = solar radius) where sound speed data shows sharp deviations from the SSM. Mixing is sustained by flows driven by the oscillations. The shells form a cavity that excludes g-modes from their main damping region below 0.1 R, assisting their net excitation and increasing their oscillation periods by at least a factor of two and probably much more. In terms of the solar luminosity L, the modes transport up through the cavity a power approx. 0.004 L as a lower limit and 0.11 L as all upper limit. The modes dissipate energy in the outer shell and cool the inner shell, asymmetrically in each case, and this stimulates occasional convective events whose response time is typically 0.8 years longer near the inner shell. Such events cool the core and reduce neutrino flux while heating

the envelope and increasing solar activity. This gives a physical basis for a well mixed Sun with low neutrino flux and basis for the observed anticorrelation and lag of neutrino behind surface activity.
Author
Acoustic Velocity; Buoyancy; Convection; Correlation; Excitation; Luminescence; Neutrinos; Oscillations; Solar Activity; Solar Radiation

20020081263 NASA Goddard Space Flight Center, Greenbelt, MD USA
Detection of Rotational Sequences for Global Oscillation Modes inside the Sun
Wolff, Charles L., NASA Goddard Space Flight Center, USA; [2002]; 14p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A very simple mathematical sequence is detected in a half century of thermal radio flux from the Sun. Since the only known physical cause of the sequence is global oscillations trapped in the nonconvecting solar interior, g-modes and probably r-modes are active. If so, their rotation frequencies are detected and some previously reported difference frequencies are confirmed with high confidence. All angular harmonics for 2 less than or = l less than or = 7 are detected as well as some others up to the limit l less than or = 14 resolvable by the observations (a Fourier spectrum of the 10.7 cm flux time series). The mean sidereal rotation of the nonconvecting interior is 428.2 nHz as averaged by g-modes and 429.8 nHz by the r-modes, indicating that g-mode energy is a bit more centrally concentrated. Helioseismology measures such rotation rates near 0.36R (R = solar radius), so the global modes would have about half their kinetic energy above and below that level. This, and the known log(r) energy dependence of most modes implies that these oscillations are significantly reflected near 0.18R, the same level at which sound speed measurements display a maximum departure from theoretical models.
Author
Heat Flux; Radio Emission; Helioseismology; Sun; Sequencing; Oscillations

20020081284 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Living With a Star CDAW on the Solar and Geospace Connections of Solar Energetic Particles
Thompson, Barbara J., NASA Goddard Space Flight Center, USA; Gopalswamy, Nat, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Conference on World Affairs, 8-12 Apr. 2002, USA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Living With a Star Program is sponsoring its first CDAW (Coordinated Data Analysis Workshop) to be held July 23-26, 2002 at a conference support location near the NASA Goddard Space Flight Center. This CDAW's topic is Solar Energetic Particle events. The topic was chosen due to the breadth of the impact of SEP's on the space environment and terrestrial climate. General goals of the LWS CDAW are a) Stimulate LWS Science on the near term, b) Facilitate cross-disciplinary interaction between the LWS scientific and space environment communities, c) Produce science products for all potential users, and d) Assist in the development of the LWS data system. The workshop will proceed similar to a previous CDAW held in 1999 on Interplanetary Type 11 Shocks. A list of target events has been compiled, which can be found at the workshop home page. The page lists all of the SEP events from 1996 January to 2001 December with energy is greater than 10 MeV particle intensities exceeding 10 PFU. Preparation for the workshop consists of identifying relevant data from a wide variety of sources (solar, interplanetary, magnetospheric and climatary), accumulating the data (frequently this consists of both raw data, processed data and plots to ease perusal during the workshop) and gathering the software tools. Participants in the workshop are expected to complete their contributions of data or models prior to arriving at the workshop. Most of the CDAW consists of joint analysis of this data; only a few introductory talks are given at the beginning of the workshop, with the rest of the time being devoted to producing scientific results. Additional symposia may be scheduled at a later date, which will allow a venue for scientific talks on the CDAW results and associated science. The poster will list the scientific goals of the workshop, as well as a scientific discussion of the data which has been accumulated thus far.
Author
Conferences; Solar Wind; Solar Corpuscular Radiation

20020081295 NASA Goddard Space Flight Center, Greenbelt, MD USA
Solar Supergranulation Revealed as a Superposition of Traveling Waves
Gizon, L., Stanford Univ., USA; Duvall, T. L., Jr., NASA Goddard Space Flight Center, USA; Schou, J., Stanford Univ., USA; [2002]; 3p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

40 years ago two new solar phenomena were described: supergranulation and the five-minute solar oscillations. While the oscillations have since been explained and exploited to determine the properties of the solar interior, the supergranulation has remained unexplained. The supergranules, appearing as convective-like cellular patterns of horizontal outward flow with a

characteristic diameter of 30 Mm and an apparent lifetime of 1 day, have puzzling properties, including their apparent superrotation and the minute temperature variations over the cells. Using a 60-day sequence of data from the MDI (Michelson-Doppler Imager) instrument onboard the SOHO (Solar and Heliospheric Observatory) spacecraft, we show that the supergranulation pattern is formed by a superposition of traveling waves with periods of 5-10 days. The wave power is anisotropic with excess power in the direction of rotation and toward the equator, leading to spurious rotation rates and north-south flows as derived from correlation analyses. These newly discovered waves could play an important role in maintaining differential rotation in the upper convection zone by transporting angular momentum towards the equator.
Author
Solar Granulation; Traveling Waves; Superrotation; Solar Activity

20020082877 NASA Goddard Space Flight Center, Greenbelt, MD USA
RHESSI Investigations of the Neupert Effect in Solar Flares
Dennis, Brian R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 200th Meeting of the American Astronomical Society, 2-6 Jun. 2002, Albuquerque, NM, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In many solar flares the time integral of the hard X-ray emission closely matches the temporal variation of the soft X-ray emission. This is known as the Neupert Effect and is believed to result when the same accelerated electrons that produce the bremsstrahlung hard X-rays also heat the plasma that produces the thermal bremsstrahlung soft X-rays. The Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) is uniquely capable of investigating this effect since is covers the soft (down to 3 keV) and hard X-ray energy ranges with keV energy resolution, arcsecond-class angular resolution, and sub-second time resolution. Several GOES M-class flares have already been detected that show this general effect, but the detailed time histories suggest that there must be other heating mechanisms besides the thermalization of accelerated electrons that are heating the soft X-ray emitting plasma, even during the impulsive phase. Spatially-resolved hard and soft X-ray observations of these flares are also being investigated to determine what fraction of the heating is produced by the accelerated electrons.
Author
Spectroscopy; Imaging Techniques; Plasmas (Physics); X Ray Spectra; Solar Flares

20020082882 NASA Goddard Space Flight Center, Greenbelt, MD USA
Building a Virtual Solar Observatory: I Look Around and There's a Petabyte Following Me
Gurman, J. B., NASA Goddard Space Flight Center, USA; Bogart, R., Stanford Univ., USA; Hill. F., National Optical Astronomy Observatories, USA; Martens, P., Montana State Univ., USA; [2002]; 1p; In English; 200th Meeting of the American Astronomical Society, 2-6 Jun. 2002, Albuquerque, NM, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The 2001 July NASA Senior Review of Sun-Earth Connections missions and data centers directed the Solar Data Analysis Center (SDAC) to proceed in studying and implementing a Virtual Solar Observatory (VSO) to ease the identification of and access to distributed archives of solar data. Any such design (cf. the National Virtual Observatory and NASA's Planetary Data System) consists of three elements: the distributed archives, a "broker" facility that translates metadata from all partner archives into a single standard for searches, and a user interface to allow searching, browsing, and download of data. Three groups are now engaged in a six-month study that will produce a candidate design and implementation roadmap for the VSO. We hope to proceed with the construction of a prototype VSO in US fiscal year 2003, with fuller deployment dependent on community reaction to and use of the capability. We therefore invite as broad as possible public comment and involvement, and invite interested parties to a "birds of a feather" session at this meeting. VSO is partnered with the European Grid of Solar Observations (EGSO), and if successful, we hope to be able to offer the VSO as the basis for the solar component of a Living With a Star data system.
Author
Solar Observatories; Data Management; Data Processing; Sun

20020082892 NASA Goddard Space Flight Center, Greenbelt, MD USA
Transverse Prominence Motions from 10,000-250,000 K
Kucera, T. A., NASA Goddard Space Flight Center, USA; Tovar, M., California State Univ., USA; DePontieu, B., Lockheed Martin Corp., USA; [2002]; 1p; In English; 200th Meeting of the American Astronomical Society, 2-6 Jun. 2002, Albuquerque, NM, USA; Sponsored by American Astronomical Society, USA
Contract(s)/Grant(s): NASW-00034; No Copyright; Avail: Issuing Activity; Abstract Only

We address the origin of prominence material by comparing high cadence (30-60 s) He I and O V EUV observations from SOHO/CDS wide slit movies, and also, for another prominence observation, observations from TRACE at 1216 Angstroms and

1600 Angstroms\and SVST in H\alpha. The EUV and UV observations regularly show small scale structures with plane-of-the-sky velocities of 20-80 kilometers per second. Many, although not all, of these motions are seen in multiple wavelength bands, representing temperatures ranging from 10,000 -- 100,000 K or 20,000 -- 250,000 K, depending on the data set. The H\alpha observations contain line shift information showing clearly that the associated UV prominence intensity motions do actually represent real mass motions, as opposed to temperature or density waves. The results indicate that the ”prominence-corona transition region” is not an outside layer to the prominence as a whole, but is rather associated with smaller scale structures all through the prominence.
Author
Solar Prominences; Extreme Ultraviolet Radiation; Stellar Motions; Temperature Dependence

20020082906 NASA Goddard Space Flight Center, Greenbelt, MD USA
Advances in Time-Distance Helioseismology
Duvall, Thomas L., Jr., NASA Goddard Space Flight Center, USA; Beck, John G., NASA Goddard Space Flight Center, USA; Gizon, Laurent, NASA Goddard Space Flight Center, USA; Kosovichev, Alexander F., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; American Astronomical Society Meeting, 2-6 Jun. 2002, Albuquerque, NM, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Time-distance helioseismology is a way to measure travel times between surface locations for waves traversing the solar interior. Coupling the travel with an extensive modeling effort has proven to be a powerful tool for measuring flows and other wave speed inhomogeneities in the solar interior. Problems receiving current attention include studying the time variation of the meridional circulation and torsional oscillation and active region emergence and evolution, current results on these topics will be presented.
Author
Helioseismology; Oscillations; Atmospheric Circulation; Time Dependence

20020082910 NASA Goddard Space Flight Center, Greenbelt, MD USA
SOHO/CDS Measurements of Coronal EUV Polarization above the Limb
Thomas, Roger J., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 200th Meeting of the American Astronomical Society, 2-6 Jun. 2002, Albuquerque, NM, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Attempts to measure polarization in coronal EUV emission above the solar limb have been made using the SOHO/CDS normal-incidence spectrometer which has a polarization sensitivity of about 50%, a property that causes variations in intensity response as a function of the spacecraft’s roll angle for polarized light. Such observations were made on the disk and up to 0.22 solar radii above the solar limb in a number of EUV lines during two special roll-maneuvers of the SOHO spacecraft. Measurements of intensity gradients were made above a modestly active equatorial region in 1997 and above a relatively cool polar region in 2001. Observed emission lines include He I 584A, He II 304A, 0 IV 555+610A, 0 V 630A, Mg IX 368A, Mg X 610+625A, and Si XI 303A, formed at temperatures that evenly cover the range in logT from 4.1 to 6.2. Near the disk, measured intensities of all lines fall off exponentially at different rates that can be used to determine the density scale-heights of the emitting plasma, since this emission is dominated by collisional excitation with an Ne-squared dependence. Assuming hydrostatic equilibrium, the intensity gradient for each line can then be converted into a ’scale-height temperature’, which is found to be closely related to the ionization temperature of each line over the wide range of lines and solar conditions observed. Beyond a certain distance, intensity gradients of the cooler lines switch over to a flatter exponential slope, suggesting that this radiation is dominated by resonance scattering which varies as Ne to the first power. Such radiation should also be linearly polarized in the plane containing the line-of-sight and the solar center, a signature that would strongly confirm this interpretation.
Author
Extreme Ultraviolet Radiation; Solar Limb; SOHO Mission; Solar Corona; Polarized Radiation

20020083029 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Solar Connections Observatory for Planetary Environments
Oliversen, Ronald J., NASA Goddard Space Flight Center, USA; Harris, Walter M., Wisconsin Univ., USA; [2002]; 1p; In English; American Geophysical Union 2002 Spring Meeting, 28-31 May 2002, Washington, DC, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA Sun-Earth Connection theme roadmap calls for comparative study of how the planets, comets, and local interstellar medium (LISM) interact with the Sun and respond to solar variability. Through such a study we advance our understanding of basic physical plasma and gas dynamic processes, thus increasing our predictive capabilities for the terrestrial,

planetary, and interplanetary environments where future remote and human exploration will occur. Because the other planets have lacked study initiatives comparable to the terrestrial ITM, LWS, and EOS programs, our understanding of the upper atmospheres and near space environments on these worlds is far less detailed than our knowledge of the Earth. to close this gap we propose a mission to study {\it all) of the solar interacting bodies in our planetary system out to the heliopause with a single remote sensing space observatory, the Solar Connections Observatory for Planetary Environments (SCOPE). SCOPE consists of a binocular EUV/FUV telescope operating from a remote, driftaway orbit that provides sub-arcsecond imaging and broadband medium resolution spectro-imaging over the 55-290 nm bandpass, and high (R>10^{5} resolution H Ly-α emission line profile measurements of small scale planetary and wide field diffuse solar system structures. A key to the SCOPE approach is to include Earth as a primary science target. From its remote vantage point SCOPE will be able to observe auroral emission to and beyond the rotational pole. The other planets and comets will be monitored in long duration campaigns centered when possible on solar opposition when interleaved terrestrial-planet observations can be used to directly compare the response of both worlds to the same solar wind stream and UV radiation field. Using a combination of observations and MHD models, SCOPE will isolate the different controlling parameters in each planet system and gain insight into the underlying physical processes that define the solar connection.

Author

Solar Terrestrial Interactions; Comets; Sun; Solar Wind; Planetary Environments; Imaging Techniques; Extreme Ultraviolet Radiation; Solar Observatories

20020083031 NASA Goddard Space Flight Center, Greenbelt, MD USA

Comparing Sunspot Area and Sunspot Number as Proxies for Long-term Solar Irradiance Variation

Jordan, Stuart D., NASA Goddard Space Flight Center, USA; Garcia, A. G., Coimbra Solar Observatory, Portugal; [2002]; 1p; In English; American Astronomical Society 200th Meeting, 2-6 Jun. 2002, Albuquerque, NM, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Because relevant observations from space began only in 1979 with Nimbus-7, it is impossible to correlate direct measurements of small changes in solar irradiance with terrestrial temperature over a number of solar cycles. Yet there is recent evidence that some feature of solar change over a cycle may have a larger influence on climate than would result from merely introducing the additional amount of heat delivered to Earth's atmosphere at solar minimum. It would be useful to check this possibility over several solar cycles. to do this, we would need a sufficiently reliable proxy for irradiance change that at least survives a test against the space observations. Sunspot area is a fairly straightforward parameter to measure, and is associated with the extent of magnetic activity known to correlate strongly with solar irradiance change. We have tested the use of sunspot area as a long-term proxy for solar irradiance change, using observations made at the Coimbra Solar Observatory, from which we obtain both statistically weighted sunspot numbers and sunspot areas over the period 1980-1992. These are both correlated with solar irradiance values measured from Nimbus-7 spacecraft over the same time period, to see if sunspot area offers affords a strong positive correlation and also a distinct advantage over sunspot number as a useful proxy that can then be compared with terrestrial temperature records. Preliminary results yield a positive correlation of 0.71 for sunspot area, but further tests are being conducted and will be reported.

Author

Solar Activity Effects; Sunspots; Solar Radiation; Irradiance; Light (Visible Radiation); Solar Cycles

20020083044 NASA Goddard Space Flight Center, Greenbelt, MD USA

SHARPI: Solar High Angular Resolution Photometric Imager

Rabin, D., NASA Goddard Space Flight Center, USA; Davila, J., NASA Goddard Space Flight Center, USA; Content, D., NASA Goddard Space Flight Center, USA; Keski-Kuha, R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; American Astronomical Society 200th Meeting, 2-6 Jun. 2002, Albuquerque, NM, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Observing the lower solar atmosphere with enough linear resolution (is less than 100 km) to study individual magnetic flux tubes and other features on scales comparable to the photon mean free path has proven to be a challenging and elusive goal. Space-borne instruments based on conventional heavy optics turned out to be too expensive, and adaptive optics on the ground made slow progress for many years. Nevertheless, the scientific case for high-resolution imaging and magnetography has only become more compelling over the last ten years. Today, ground-based adaptive optics is a promising approach for small fields of view at visible wavelengths. Space experiments will need to employ lightweight optics and low cost platforms. The Sunrise balloon experiment is one example. We describe a concept for a sounding rocket experiment that will achieve 0.1-arcsecond imaging using a lightweight, ultraprecise 55-cm mirror in the far ultraviolet (160 nm continuum, Lyman alpha, and possibly C IV 155 nm). The f/1.2 parabolic primary mirror is entering the final stages of production. The mirror is a ULE honeycomb design

with front and back face sheets. The front sheet will be figured to 6.3 nm rms with microroughness 1 nm or better. For the initial proof of concept, we describe a no-frills, high-cadence imager aboard a Black Brant sounding rocket. Development of lightweight UV/EUV optics at Goddard Space Flight Center has been supported by the Internal Research and Development program.
Author
Angular Resolution; Imaging Techniques; Photometry; Satellite-Borne Instruments; Adaptive Optics; Extreme Ultraviolet Radiation; High Resolution

20020083048 NASA Goddard Space Flight Center, Greenbelt, MD USA
Prominence Motions in the EUV and UV
Kucera, Therese A., NASA Goddard Space Flight Center, USA; Tovar, M., California State Univ., USA; dePontieu, B., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; SOHO-11/The Sun From Solar Minimum Through Solar Maximum Davos, 11-15 Mar. 2002, Switzerland; No Copyright; Avail: Issuing Activity; Abstract Only

We address the origin of prominence material by comparing high cadence (30-60 s) He I and O V EUV observations from SOHO/CDS wide slit movies, and also, for another prominence observation, observations from TRACE at 1216 A and 1600 A and SVST in H(alpha). The EUV and UV observations regularly show small scale structures with plane-of-the sky velocities of 20-80 km/s, and many, although not all, of these motions are seen in multiple wavelength bands, representing temperatures ranging from 10,000-100,000 K or 20,000 - 250,000 K, depending on the data set. The H(alpha) observations contain line shift information showing clearly that the UV prominence intensity motions do actually represent real mass motions, as opposed to temperature or density waves. The results also indicate that the ”prominence-corona transition region” is not an outside layer to the prominence as a whole, but is rather associated with smaller scale structures all through the prominence. More work is needed to determine what mechanism can explain these fast, multi-temperature prominence motions.
Author
Extreme Ultraviolet Radiation; Coronas

20020083052 NASA Goddard Space Flight Center, Greenbelt, MD USA
Toward a Virtual Solar Observatory: Starting Before the Petabytes Fall
Gurman, J. B., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; SOHO-11: From Solar Min to Max: Half a Solar Cycle, 10-16 Mar. 2002, Davos, Switzerland; No Copyright; Avail: Issuing Activity; Abstract Only

NASA is currently engaged in the study phase of a modest effort to establish a Virtual Solar Observatory (VSO). The VSO would serve ground- and space-based solar physics data sets from a distributed network of archives through a small number of interfaces to the scientific community. The basis of this approach, as of all planned virtual observatories, is the translation of metadata from the various sources via source-specific dictionaries so the user will not have to distinguish among keyword usages. A single Web interface should give access to all the distributed data. We present the current status of the VSO, its initial scope, and its relation to the European EGSO effort.
Author
Solar Observatories; Solar Physics; Data Management

20020083061 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Three-Dimensional EIT Wave
Thompson, B. J., NASA Goddard Space Flight Center, USA; Biesecker, D. A., NASA Goddard Space Flight Center, USA; Gilbert, H. R., NASA Goddard Space Flight Center, USA; Lawrence, G. R., NASA Goddard Space Flight Center, USA; Ofman, L., NASA Goddard Space Flight Center, USA; Wu, S. T., NASA Goddard Space Flight Center, USA; Warmuth, A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; First STEREO Workshop, 16-23 Mar. 2002, Paris, France; No Copyright; Avail: Issuing Activity; Abstract Only

An EIT wave is an impulsive disturbance which has been observed in the EUV, Soft X-ray and white light corona, with corresponding observations in the chromosphere. The effects of these disturbances can be observed across the entire solar disk of the Sun, and throughout the inner heliosphere as well. However, the picture is not complete; observations alone do not establish a complete understanding of the nature of this three-dimensional phenomenon. A number of associated phenomena have been documented, though in most cases causality has not determined. Additionally, it is unclear which factors govern the impulse’s ability to affect regions of the corona and heliosphere. We discuss the various observations and the models which provided links between the associated phenomena.
Author
Extreme Ultraviolet Radiation; Impulses; Coronas; Three Dimensional Flow

20020083067 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Energetic Importance of Accelerated Electrons in Solar Flares

Dennis, Brian R., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 34th Committee on Space Research Scientific Assembly, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

It has been claimed that a large fraction of the total energy released in a solar flare goes initially into accelerated electrons. These electrons generate the observed hard X-ray bremsstrahlung emission as they lose most of their energy by coulomb collisions in the lower corona and chromosphere to heat the plasma seen in soft X-rays. From several recent studies of the Neupert Effect - the empirical result that for many flares the time integral of the hard X-ray emission closely matches the temporal variation of the soft X-ray emission - it appears that the fraction of the released energy going into accelerated electrons is lower, on average, for smaller flares. Also, from relative timing differences, about 25% of all flares are inconsistent with the Neupert Effect. The Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) is uniquely capable of investigating the Neupert Effect since it covers soft X-rays down to 3 keV (when both attenuators are out of the field of view) and hard X-rays with keV energy resolution. It has arcsecond-class angular resolution and sub-second time resolution. Several M-class flares have already been detected by RHESSI and I will present their detailed time histories for different energy ranges. I will also present hard and soft X-ray images that reveal the spatial relation between the hot plasma and the accelerated electrons. The results are in general agreement with the Neupert Effect, but they also suggest that there must be other heating mechanisms besides the thermalization of accelerated electrons, even during the impulsive phase.

Author

Solar Flares; Electrons; X Rays; Emission; Bremsstrahlung; Coulomb Collisions

20020083234 NASA Goddard Space Flight Center, Greenbelt, MD USA

Solar UV Radiation and the Origin of Life On Earth

Heap, S. R., NASA Goddard Space Flight Center, USA; Lanz, T., NASA Goddard Space Flight Center, USA; Hubeny, I., NASA Goddard Space Flight Center, USA; Gaidos, E., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Origins 2002: The Heavy Element Trail from Galaxies to Habitable Worlds, 26-29 May 2002, Jackson Hole, WY, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We have embarked on a program aimed at understanding the atmosphere of the early Earth, because of its importance as a greenhouse, radiation shield and energy source for life. Here, we give a progress report on the first phase of this program to establish the UV radiation from the early Sun. We have obtained ultraviolet spectra (STIS, FUSE, EUVE) of carefully selected nearby, young solar-type stars, which act as surrogates for the early Sun We are making detailed non-LTE analyses of the spectra and constructing models of their photospheres + chromospheres. Once validated, these models will allow us to extrapolate our theoretical spectra to other metallicities and to unobserved spectral regions.

Author

Solar Radiation; Ultraviolet Radiation; Earth Atmosphere; Biological Evolution; Sun

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see 52 Aerospace Medicine. For theory see 73 Nuclear Physics.

20020080719 NASA Langley Research Center, Hampton, VA USA

A Generalized Weizsacker-Williams Method Applied to Pion Production in Proton-Proton Collisions

Ahern, Sean C., Wisconsin Univ., USA; Poyser, William J., Wisconsin Univ., USA; Norbury, John W., Wisconsin Univ., USA; Tripathi, R. K., NASA Langley Research Center, USA; September 2002; 13p; In English

Contract(s)/Grant(s): NCC1-354; RTOP 755-06-00-03

Report No.(s): NASA/TP-2002-211938; NAS 1.60:211938; L-18214; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new ”Generalized” Weizsacker-Williams method (GWWM) is used to calculate approximate cross sections for relativistic peripheral proton-proton collisions. Instead of a mass less photon mediator, the method allows for the mediator to have mass for short range interactions. This method generalizes the Weizsacker-Williams method (WWM) from Coulomb interactions to GWWM for strong interactions. An elastic proton-proton cross section is calculated using GWWM with experimental data for

the elastic p+p interaction, where the mass p+ is now the mediator. The resulting calculated cross sections is compared to existing data for the elastic proton-proton interaction. A good approximate fit is found between the data and the calculation.
Author
Pions; Particle Production

20020080734 NASA Goddard Space Flight Center, Greenbelt, MD USA
Diffuse X-ray Emission from M101
Kuntz, K. D., Maryland Univ. Baltimore County, USA; Snowden, S. L., NASA Goddard Space Flight Center, USA; Pence, W. D., NASA Goddard Space Flight Center, USA; Mukai, K., NASA Goddard Space Flight Center, USA; Sep. 19, 2002; 22p; In English
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The total 0.45-2.0 keV luminosity of M101 is 3.1 x 10(exp 39) ergs/s, of which 2.2 x 10(exp 39) ergs/s is due to diffuse emission. of the diffuse emission, no more than 6% can be due to unresolved point sources such as X-ray binaries, and approx. 11% is due to dwarf stars. The diffuse emission traces the spiral arms and is roughly correlated with the H alpha and FUV (far ultraviolet) emission. The radial distribution closely follows the optical profile. The bulk of the diffuse emission is characterized by a two thermal component spectrum with kT = 0.20,0.75 keV, and the ratios of the emission measures of the two components is roughly constant as a function of both radius and surface brightness. The softer component has a sufficiently large covering factor that the bulk of the emission is likely extra-planar. We find no evidence of an extended axisymmetric X-ray halo, suggesting that any such halo has a strength much smaller than current predictions.
Author
X Rays; X Ray Astronomy; Spiral Galaxies; Diffuse Radiation

20020081328 NASA Goddard Space Flight Center, Greenbelt, MD USA
Oscillations During Thermonuclear X-ray Bursts
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High amplitude, nearly coherent X-ray brightness oscillations during thermonuclear X-ray bursts were discovered with the Rossi X-ray Timing Explorer (RXTE) in early 1996. Spectral and timing evidence strongly supports the conclusion that these oscillations are caused by rotational modulation of the burst emission and that they reveal the spin frequency of neutron stars in low mass X-ray binaries, a long sought goal of X-ray astronomy. Studies carried out over the past year have led to the discovery of burst oscillations in four new sources, bringing to ten the number with confirmed burst oscillations. I review the status of our knowledge of these oscillations and indicate how they can be used to probe the physics of neutron stars. For a few burst oscillation sources it has been proposed that the strongest and most ubiquitous frequency is actually the first overtone of the spin frequency and hence that two nearly antipodal hot spots are present on the neutron star. This inference has important implications for both the physics of thermonuclear burning as well as the mass - radius relation for neutron stars, so its confirmation is crucial. I discuss recent attempts to confirm this hypothesis for 4U 1636-53, the source for which a signal at the putative fundamental (290Hz) has, been claimed.
Author
Brightness; Oscillations; Neutron Stars; Spectra; X Ray Binaries; X Rays

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