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NASA STI Program ... in Profile

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  Hanover, MD 21076-1320

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STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
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- Translations
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- Other U.S. Government agency and foreign patents and patent applications
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The NASA STI Program

The NASA Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

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NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (TRS) – the publicly available contents of the NASA Aeronautics and Space Database.

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The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at http://www.ntis.gov.

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The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at http://www.uspto.gov/patft/.

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Subject Term Index

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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.

20060013308 Arizona State Univ., Tempe, AZ USA, Pratt and Whitney Aircraft Group, East Hartford, CT, USA
Flight-Critical Data Integrity Assurance for Ground-Based COTS Components
Lee, Y. H.; Krodel, J.; Mar. 2006; 90 pp.; In English
Report No.(s): PB2006-109054; No Copyright; Avail.: CASI: A05, Hardcopy

Ground processing systems are likely to use commercial-off-the-shelf (COTS) software and hardware for maintaining flight critical data. Hence, the COTS ground processing systems must be trustworthy and secure in order to maintain the integrity of the data. This requires various approaches, including information protection, data integrity and access security. This report describes the results of our studies on the existing guidance governing the use of COTS components for safety-critical applications of ground-based systems, and the objectives of current guidance from the point of view of applicability and shortcomings. The use of hazard analysis and vulnerability analysis as a means for developing an effective risk mitigation strategy is provided and the relevance of the Rotorcraft Advisory Circular to a COTS components scenario is summarized. In order to address security and vulnerability concerns, several technologies such as encryption/decryption, authentication, access control, intrusion detection, etc., particularly in relation to application within a health and usage monitoring system (HUMS) context, are discussed. The report also includes two case studies involving COTS products to determine if they can be qualified by following existing software guidance, such as DO-178B and DO-278.
NTIS
Applications Programs (Computers); Commercial Off-the-Shelf Products

20060013315 Kentucky Univ., Lexington, KY USA
Baseline Modeling of the Owensboro Cable-Stayed Bridge Over the Ohio River
Hu, J. D.; Harik, I. E.; Smith, S. W.; Gagel, J.; Campbell, J. E.; Mar. 2006; 146 pp.; In English
Report No.(s): PB2006-110327; KTC-06-04/FRT116-02-1F; No Copyright; Avail.: National Technical Information Service (NTIS)

This report presents the baseline modeling of the Owensboro cable-stayed bridge which connects Owensboro, Kentucky and Rockport, Indiana over the Ohio River. The objective of this study is to establish the bridge baseline model via the dynamics-based technique and finite element method.
NTIS
Finite Element Method; Rivers

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 Thermodynamics.

20060013246 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics & Astronautics, Volume 38, Number 1, February 2006
Dewang, L.; Feb. 2006; 140 pp.; In Chinese
Report No.(s): PB2006-104466; Copyright; Avail.: National Technical Information Service (NTIS)

Partial Contents: General Parameter Optimization of Tandem Helicopter Based on Improved Genetic Algorithm, Diagnosis of Worn Pitch-Change-Link Rod End in Helicopter Rotor System, Ion Implantation for Improving Survivability of Helicopter Gear Transmission Under Oil-Out Condition, Residual Strength of Plates with Multiple Collinear Cracks, Dynamic Moving Load Identification Method for Bridge Structure, Autonomous Control System Design for Aerospace Vehicle Using Multi-Agent System, Application of H Control and Inverse Dynamic System in Direct Side Force Control of UAV, Attitude Measurement Using Quaternion Based on UKF, Modeling and Scheduling of Real-Time Tasks in Multiple Segment Network Control Systems, Analysis of DC Output Voltage Ripple in Electromagnetic Doubly Salient Brushless DC Generator, Optimization of Auxiliary Poles in IPM Synchronous Machine, Analysis and Realization of Digitally Controlled Doubly Salient Permanent Magnet Motor Driver, Isolated Boost Full Bridge Converter for Fuel Cell Electric Vehicle, Mobile Robot Navigation Control Based on Hierarchical Reinforcement Learning, Dynamics Analysis of Hopping Robots, Subspace-Based Semi-Blind Channel Estimation for STBC-OFDM Systems.
NTIS
Aeronautics; Astronautics; Automatic Control

20060013450 QSS Group, Inc., Cleveland, OH, USA
Effects of Transducer Installation on Unsteady Pressure Measurements on Oscillating Blades
Lepicovsky, Jan; April 2006; 18 pp.; In English; Turbo Expo 2005, 6-9 Jun. 2005, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS3-00145; WBS 22-714-70-52
Report No.(s): NASA/CR-2006-213797; GT-2005-69000; E-15155; No Copyright; Avail.: CASI: A03, Hardcopy
Unsteady pressures were measured above the suction side of a blade that was oscillated to simulate blade stall flutter. Measurements were made at blade oscillation frequencies up to 500 Hz. Two types of miniature pressure transducers were used: surface-mounted flat custom-made, and conventional miniature, body-mounted transducers. The signals of the surface-mounted transducers are significantly affected by blade acceleration, whereas the signals of body-mounted transducers are practically free of this distortion. A procedure was introduced to correct the signals of surface-mounted transducers to rectify the signal distortion due to blade acceleration. The signals from body-mounted transducers, and corrected signals from surface-mounted transducers represent true unsteady pressure signals on the surface of a blade subjected to forced oscillations. However, the use of body-mounted conventional transducers is preferred for the following reasons: no signal corrections are needed for blade acceleration, the conventional transducers are noticeably less expensive than custom-made flat transducers, the survival rate of body-mounted transducers is much higher, and finally installation of body-mounted transducers does not disturb the blade surface of interest.
Author
Pressure Measurement; Aerodynamic Stalling; Unsteady Flow; Transducers; Oscillations; Pressure Sensors; Forced Vibration; Signal Distortion; Surface Distortion

20060013452 NASA Glenn Research Center, Cleveland, OH, USA
Fan Performance From Duct Rake Instrumentation on a 1.294 Pressure Ratio, 725 ft/sec Tip Speed Turbofan Simulator Using Vaned Passage Casing Treatment
Fite, E. Brian; April 2006; 63 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 581.02.08.03.03.01
Report No.(s): NASA/TM-2006-214241; E-15487; No Copyright; Avail.: CASI: A04, Hardcopy
A 1.294 pressure ratio, 725 ft/sec tip speed, variable pitch low noise fan was designed and tested in the NASA Glenn 9- by 15-foot Wind Tunnel. The design included a casing treatment that used recirculation to extend the fan stall line and provide an acceptable operating range. Overall aerodynamic experimental results are presented for this low tip speed, low noise fan without casing treatment as well as using several variants of the casing treatment that moved the air extraction and insertion axial locations. Measurements were made to assess effects on performance, operability, and noise. An unusual instability was discovered near the design operating line and is documented in the fan operating range. Measurements were made to compare stall margin improvements as well as measure the performance impact of the casing treatments. Experimental results in the presence of simulated inlet distortion, via screens, are presented for the baseline and recirculation casing treatment configurations. Estimates are made for the quantity of recirculation weight flow based on limited instrumentation in the recirculation system along with discussion of results and conclusions
Author
Turbofans; Distortion; Ducts; Extraction; Aerodynamics; Low Noise; Fan Blades; Pressure Ratio

20060013459 NASA Langley Research Center, Hampton, VA, USA
Further Investigation of Acoustic Propagation Codes for Three-Dimensional Geometries
Nark, Douglas M.; Watson, Willie R.; Jones, Michael G.; January 2006; 17 pp.; In English; 12th AIAA/CEAS Aeroacoustics Conference, 8-10 May 2006, Cambridge, MA, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-781-30-14
Report No.(s): AIAA Paper 2006-2586; No Copyright; Avail.: CASI: A03, Hardcopy

The ability to predict fan noise within complex three-dimensional aircraft engine nacelle geometries is a valuable tool in designing and assessing low-noise concepts. This work begins a systematic study to identify the areas of the design space in which propagation codes of varying fidelity may be used effectively to provide efficient design and assessment. An efficient lower-fidelity code is used in conjunction with two higher-fidelity, more computationally intensive methods to solve benchmark problems of increasing complexity. The codes represent a small sampling of the current propagation codes available or under development. Results of this initial study indicate that the lower-fidelity code provides satisfactory results for cases involving low to moderate attenuation rates, whereas, the two higher-fidelity codes perform well across the range of problems.
Author
Acoustic Propagation; Aerodynamic Noise; Low Noise; Fan Blades

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport 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.

20060013307 Hughes Technical Center, Atlantic City International Airport, NJ, USA
Alpha Factor Determination Using Data Collected at the National Airport Pavement Test Facility
Hayhoe, G. F.; Mar. 2006; 40 pp.; In English
Report No.(s): PB2006-109055; No Copyright; Avail.: National Technical Information Service (NTIS)

Full-scale test data for multiple-wheel, heavy gear load (MWHGL) loading of flexible airport pavements are summarized from three separate test series: one test series, the MWHGL tests, was conducted by the U.S. Army Corps of Engineers (USACE), and the other two series of tests were conducted by the Federal Aviation Administration (FAA) at the National Airport Pavement Test Facility (NAPTF). The MWHGL pavement structural configuration was used as the reference, and all NAPTF structures were converted to equivalent reference structures by the use of thickness equivalency factors relating the NAPTF and the MWHGL structural materials. Load repetition factors (alpha factors), required for the computation of pavement thickness by the California Bearing Ratio (CBR) design procedure for flexible airport pavements, were calculated for the NAPTF test data and plotted with the MWHGL alpha factors. Least squares quadratic curve fits were computed for the four- and six-wheel alpha factors, and the alpha factors at 10,000 coverages were computed for comparison with the International Civil Aviation Organization (ICAO) standard for computing Aircraft Classification Number (ACN). The results of the analysis are consistent with the existing alpha factor of 0.825 for four-wheel gears, but the results of the analysis are not consistent with the existing alpha factor of 0.788 for six-wheel gears. The six-wheel alpha factor at 10,000 coverages should be changed to a value approximately equal to the interim value of 0.72 adopted by the ICAO for calculating ACN for six-wheel gears.
NTIS
Airports; Pavements; Test Facilities

20060013393 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Beneath the Tip of the Iceberg: A Human Factors Analysis of General Aviation Accidents in Alaska Versus the Rest of the USA
Detwiler, Cristy A.; Hackworth, Carla A.; Holcomb, Kali A.; Boquet, Albert J.; Pfleiderer, Elaine; Wiegmann, Douglas A.; Shappell, Scott A.; March 2006; 14 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): AM-B-05-HRR-521
Report No.(s): DOT/FAA/AM-06/7; Copyright; Avail.: CASI: A03, Hardcopy

Historically, general aviation (GA) accidents have been overlooked and their impact under-appreciated when compared

with those in the commercial or military sector. Recently however, the Federal Aviation Administration and other governmental and civilian organizations have focused their attention on one piece of this proverbial 'iceberg,' that being GA accidents occurring in Alaska. This study examines more than 17,000 GA accidents using the Human Factors Analysis and Classification System. Comparisons of Alaska to the rest of the U.S. (RoUS) included traditional demographic and environmental variables, as well as the human errors committed by aircrews. Overall, categorical differences among unsafe acts (decision errors, skill-based errors, perceptual errors, and violations) committed by pilots involved in accidents in Alaska and those in the RoUS were minimal. However, a closer inspection of the data revealed notable variations in the specific forms these unsafe acts took within the accident record. Specifically, skill-based errors associated with loss of directional control were more likely to occur in Alaska than the rest of the U.S. Likewise, the decision to utilize unsuitable terrain was more likely to occur in Alaska. Additionally, accidents in Alaska were associated with violations concerning Visual Flight Rules into Instrument Meteorological Conditions. These data provide valuable information for those government and civilian programs tasked with improving GA safety in Alaska and the RoUS.
Author
Human Factors Engineering; Aircraft Accidents; Classifications; Directional Control; Visual Flight Rules; Safety; Perceptual Errors; Inspection; General Aviation Aircraft

20060013453 NASA Glenn Research Center, Cleveland, OH, USA
Progress in the Development of Practical Remote Detection of Icing Conditions
Reehorst, Andrew; Politovich, Marcia K.; Zednik, Stephan; Isaac, George A.; Cober, Stewart; April 2006; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 866.02.07.03
Report No.(s): NASA/TM-2006-214242; E-15488; Copyright; Avail.: CASI: A03, Hardcopy

The NASA Icing Remote Sensing System (NIRSS) has been under definition and development at NASA Glenn Research Center since 1997. The goal of this development activity is to produce and demonstrate the required sensing and data processing technologies required to accurately remotely detect and measure icing conditions aloft. As part of that effort NASA has teamed with NCAR to develop software to fuse data from multiple instruments into a single detected icing condition product. The multiple instrument approach utilizes a X-band vertical staring radar, a multifrequency microwave, and a lidar ceilometer. The radar data determine cloud boundaries, the radiometer determines the sub-freezing temperature heights and total liquid water content, and the ceilometer refines the lower cloud boundary. Data is post-processed with a LabVIEW program with a resultant supercooled liquid water profile and aircraft hazard depiction. Ground-based, remotely-sensed measurements and in-situ measurements from research aircraft were gathered during the international 2003-2004 Alliance Icing Research Study (AIRS II). Comparisons between the remote sensing system s fused icing product and the aircraft measurements are reviewed here. While there are areas where improvement can be made, the cases examined suggest that the fused sensor remote sensing technique appears to be a valid approach.
Author
Aircraft Icing; Remote Sensing; Data Processing; Radiometers; Radar Data; Ice Formation; In Situ Measurement; Superhigh Frequencies

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.

20060013454 NASA Glenn Research Center, Cleveland, OH, USA
Modular, Cost-Effective, Extensible Avionics Architecture for Secure, Mobile Communications
Ivancic, William D.; April 2006; 15 pp.; In English; 2006 Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 931.02.07.03
Report No.(s): NASA/TM-2006-214250; E-15495; No Copyright; Avail.: CASI: A03, Hardcopy

Current onboard communication architectures are based upon an all-in-one communications management unit. This unit and associated radio systems has regularly been designed as a one-off, proprietary system. As such, it lacks flexibility and cannot adapt easily to new technology, new communication protocols, and new communication links. This paper describes the

current avionics communication architecture and provides a historical perspective of the evolution of this system. A new onboard architecture is proposed that allows full use of commercial-off-the-shelf technologies to be integrated in a modular approach thereby enabling a flexible, cost-effective and fully deployable design that can take advantage of ongoing advances in the computer, cryptography, and telecommunications industries.
Author
Avionics; Communication Networks; Protocol (Computers); Commercial Off-the-Shelf Products; Communication Equipment

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.

20060013266 NASA Ames Research Center, Moffett Field, CA, USA
Towards Robust Designs Via Multiple-Objective Optimization Methods
Man Mohan, Rai; January 2006; 2 pp.; In English; VKI Lecture Series (Von Karman Institute), 6-10 Mar. 2006, Brussels, Belgium; No Copyright; Avail.: CASI: A01, Hardcopy

Fabricating and operating complex systems involves dealing with uncertainty in the relevant variables. In the case of aircraft, flow conditions are subject to change during operation. Efficiency and engine noise may be different from the expected values because of manufacturing tolerances and normal wear and tear. Engine components may have a shorter life than expected because of manufacturing tolerances. In spite of the important effect of operating- and manufacturing-uncertainty on the performance and expected life of the component or system, traditional aerodynamic shape optimization has focused on obtaining the best design given a set of deterministic flow conditions. Clearly it is important to both maintain near-optimal performance levels at off-design operating conditions, and, ensure that performance does not degrade appreciably when the component shape differs from the optimal shape due to manufacturing tolerances and normal wear and tear. These requirements naturally lead to the idea of robust optimal design wherein the concept of robustness to various perturbations is built into the design optimization procedure. The basic ideas involved in robust optimal design will be included in this lecture. The imposition of the additional requirement of robustness results in a multiple-objective optimization problem requiring appropriate solution procedures. Typically the costs associated with multiple-objective optimization are substantial. Therefore efficient multiple-objective optimization procedures are crucial to the rapid deployment of the principles of robust design in industry. Hence the companion set of lecture notes (Single- and Multiple-Objective Optimization with Differential Evolution and Neural Networks) deals with methodology for solving multiple-objective Optimization problems efficiently, reliably and with little user intervention. Applications of the methodologies presented in the companion lecture to robust design will be included here. The evolutionary method (DE) is first used to solve a relatively difficult problem in extended surface heat transfer wherein optimal fin geometries are obtained for different safe operating base temperatures. The objective of maximizing the safe operating base temperature range is in direct conflict with the objective of maximizing fin heat transfer. This problem is a good example of achieving robustness in the context of changing operating conditions. The evolutionary method is then used to design a turbine airfoil; the two objectives being reduced sensitivity of the pressure distribution to small changes in the airfoil shape and the maximization of the trailing edge wedge angle with the consequent increase in airfoil thickness and strength. This is a relevant example of achieving robustness to manufacturing tolerances and wear and tear in the presence of other objectives.
Author
Design Optimization; Fabrication; Complex Systems; Robustness (Mathematics); Heat Transfer; Operating Temperature; Shape Optimization; Airfoil Profiles; Engine Noise

20060013267 NASA Ames Research Center, Moffett Field, CA, USA
Impact of Airfoils on Aerodynamic Optimization of Heavy Lift Rotorcraft
Acree, Cecil W., Jr.; Martin Preston B.; Romander, Ethan A.; [2006]; 11 pp.; In English; American Helicopter Society Vertical Lift Aircraft Design Conference, 18-20 Jan. 2006, San Francisco, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Rotor airfoils were developed for two large tiltrotor designs, the Large Civil Tilt Rotor (LCTR) and the Military Heavy Tilt Rotor (MHTR). The LCTR was the most promising of several rotorcraft concepts produced by the NASA Heavy Lift Rotorcraft Systems Investigation. It was designed to carry 120 passengers for 1200 nm, with performance of 350 knots cruise

at 30,000 ft altitude. A parallel design, the MHTR, had a notional mission of 40,000 Ib payload, 500 nm range, and 300 knots cruise at 4000 ft, 95 F. Both aircraft were sized by the RC code developed by the U. S. Army Aeroflightdynamics Directorate (AFDD). The rotors were then optimized using the CAMRAD II comprehensive analysis code. Rotor airfoils were designed for each aircraft, and their effects on performance analyzed by CAMRAD II. Airfoil design criteria are discussed for each rotor. Twist and taper optimization are presented in detail for each rotor, with discussions of performance improvements provided by the new airfoils, compared to current technology airfoils. Effects of stall delay and blade flexibility on performance are also included.
Author
Tilt Rotor Aircraft; Flight Characteristics; Helicopter Design; Payloads; Rotors; Design Analysis; Airfoils

20060013309 Hughes Technical Center, Atlantic City International Airport, NJ, USA
Vertical Drop Test of an ATR 42-300 Airplane
Abramowitz, A.; Smith, T. G.; Vu, T.; Zvanya, J. R.; Mar. 2006; 228 pp.; In English
Report No.(s): PB2006-109052; No Copyright; Avail.: National Technical Information Service (NTIS)
On July 30, 2003, the Federal Aviation Administration conducted a vertical impact test of a large high-wing airplane. The test was conducted at the William J. Hughes Technical Center, Atlantic City International Airport, New Jersey. The objective of this test was to determine the impact response of the fuselage, fuel system, floor tracks, seats, and anthropomorphic test dummies when subjected to a severe, but survivable, simulated crash impact. An ATR 42-300 (42-passenger regional transport airplane) was dropped from a height of 14 ft (4.3 meters) that resulted in a vertical impact velocity of 30 ft/s (9.1 m/s). The airplane was configured to simulate a typical flight condition, including seats, cargo, simulated occupants, and simulated fuel. The final test weight of the airplane was 33,200 pounds (15,059 kg).
NTIS
Commuter Aircraft; Crashes; Drop Tests

20060013310 Hughes Technical Center, Atlantic City International Airport, NJ, USA, Hi-Tec Systems, Egg Harbor, NJ, USA
High-Reach Extendable Turrets with Skin-Penetrating Nozzle
Bagot, K.; Subbotin, N.; Nov. 2005; 36 pp.; In English
Report No.(s): PB2006-109051; No Copyright; Avail.: National Technical Information Service (NTIS)
New equipment for aircraft rescue firefighting vehicles can help improve firefighting after an aircraft crash. New equipment such as a high-reach extendable turret (HRET) with skin-penetrating nozzle mounted on an airport firefighting vehicle could extinguish fires faster, apply firefighting agent more accurately on fires, and possibly save passengers lives as a result. The evaluation in this report will determine the extinguishment abilities of an HRET with skin-penetrating nozzle on simulated real fire aircraft crashes and during a full-scale fire field test. One objective of this research was to compare the abilities of an airport firefighting vehicle using an HRET to that of another vehicle using traditional airport firefighting methods of extinguishment on several real fire aircraft crash simulations. Another objective was to evaluate and determine if an airport firefighting vehicle using an HRET with skin-penetrating nozzle can control and extinguish an aircraft interior fire and reduce interior temperatures. Two different research efforts were undertaken for the described objectives. One was completed by the Air Force Research Laboratory using its fire test facility, and the second was completed at the San Antonio Airport using a training aircraft.
NTIS
Crashes; Fire Fighting

20060013321 Congressional Budget Office, Washington, DC, USA
Alternatives for Long-Range Ground-Attack Systems
Mar. 2006; 82 pp.; In English
Report No.(s): PB2006-109325; No Copyright; Avail.: National Technical Information Service (NTIS)
The recent air campaigns in Afghanistan and Iraq highlighted the utility of long-range ground-attack systems. The Air Forces fleet of B-52, B-1, and B-2 heavy bombers helped coalition forces overcome the limited availability of local air bases by operating from more distant bases and provided responsive air support to ground forces by orbiting over the battlefield for long periods of time. Recognizing those contributions, the Department of Defense (DoD) is in the process of developing new concepts for the role of long-range systems in future conflicts and is also beginning to examine new systems that could be used to attack targets anywhere in the world. This Congressional Budget Office (CBO) study--prepared at the request of the

Subcommittee on Strategic Forces of the Senate Committee on Armed Services--looks at the capabilities and costs associated with alternative long-range strike systems that DoD might develop and procure to improve its ability to conduct ground-attack operations. The study compares the advantages, disadvantages, and costs of eight alternative systems--five aircraft-based systems and three missile-based systems.
NTIS
Alternatives; Military Operations; Warfare

20060013327 Wichita State Univ., Wichita, KS, USA
Teardown Evaluation of Areas of Interest from the T-34A N141SW Aircraft Wreckage
Laubach, M.; Cope, D.; Mar. 2006; 64 pp.; In English
Report No.(s): PB2006-109057; No Copyright; Avail.: CASI: A04, Hardcopy

To aid with the assessment of aging acrobatic aircraft, the Federal Aviation Administration (FAA) teamed with the National Institute for Aviation Research of Wichita State University to teardown and inspect areas of interest from the T-34A N141SW accident aircraft. Due to the recent history of fatigue cracking and failure, a destructive evaluation of the T-34A would be useful to the FAA to specifically address the T-34A concerns, and in a general sense, to assess the condition of a high-time acrobatic category aircraft. The following four areas of interest from the N141SW accident aircraft were examined for cracks and corrosion: right wing front carry-through lower spar, horizontal and vertical stabilizer attachment points, right wing rear spar lower cap wing station 66, and right wing rear spar lower bathtub fitting. Cracks found on these areas of the accident aircraft were opened, and the crack faces were analyzed to determine failure mode. Surrounding structure was also inspected microscopically for additional defects.
NTIS
Wreckage; Evaluation; Photographs; Destruction; Defects; Failure Modes; Aircraft

20060013435 NASA Langley Research Center, Hampton, VA, USA
Rapid Assessment of Aircraft Structural Topologies for Multidisciplinary Optimization and Weight Estimation
Samareh, Jamshid A.; Sensmeier, mark D.; Stewart, Bret A.; [2006]; 12 pp.; In English; 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 1-4 May 2006, Newport, RI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL04AA72G; 23-064-20-10; No Copyright; Avail.: CASI: A03, Hardcopy

Algorithms for rapid generation of moderate-fidelity structural finite element models of air vehicle structures to allow more accurate weight estimation earlier in the vehicle design process have been developed. Application of these algorithms should help to rapidly assess many structural layouts before the start of the preliminary design phase and eliminate weight penalties imposed when actual structure weights exceed those estimated during conceptual design. By defining the structural topology in a fully parametric manner, the structure can be mapped to arbitrary vehicle configurations being considered during conceptual design optimization. Recent enhancements to this approach include the porting of the algorithms to a platform-independent software language Python, and modifications to specifically consider morphing aircraft-type configurations. Two sample cases which illustrate these recent developments are presented.
Author
Aircraft Structures; Topology; Multidisciplinary Design Optimization; Structural Weight; Estimating

20060013458 NASA Langley Research Center, Hampton, VA, USA
INITIAL ASSESSMENT of SURFACE PRESSURE CHARACTERISTICS of TWO ROTARY WING UAV DESIGNS
Jones, Henry E.; Wong, Oliver D.; Watkins, A. Neal; Noonan, Kevin W.; Reis, Deane G.; Malovrh, Brendon D.; Ingram, Joanne L.; January 2006; 45 pp.; In English; AHS International 62nd Annual Forum and Technology Display, 9-11 May 2006, Phoenix, AZ, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper presents results of an experimental investigation of two rotary-wing UAV designs. The primary goal of the investigation was to provide a set of interactional aerodynamic data for an emerging class of rotorcraft. The present paper provides an overview of the test and an introduction to the test articles, and instrumentation. Sample data in the form of fixed system pressure coefficient response to changes in configuration attitude and flight condition for both rotor off and on conditions are presented. The presence of the rotor is seen to greatly affect the magnitude of the response. Pressure coefficients were measured using both conventional pressure taps and via pressure sensitive paint. Comparisons between the two methods

are presented and demonstrate that the pressure sensitive paint is a promising method; however, further work on the technique is required.
Author
Rotary Wing Aircraft; Pilotless Aircraft; Pressure; Aircraft Design; Subsonic Wind Tunnels; Wind Tunnel Tests

20060013485 NASA Langley Research Center, Hampton, VA, USA
Aircraft Conceptual Design and Risk Analysis Using Physics-Based Noise Prediction
Olson, Erik D.; Mavris, Dimitri N.; [2006]; 22 pp.; In English; 12th AIAA/CEAS Aeroacoustics Conference, 8-10 May 2006, Cambridge, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-065-20-30
Report No.(s): AIAA Paper 2006-2619; Copyright; Avail.: CASI: A03, Hardcopy

An approach was developed which allows for design studies of commercial aircraft using physics-based noise analysis methods while retaining the ability to perform the rapid trade-off and risk analysis studies needed at the conceptual design stage. A prototype integrated analysis process was created for computing the total aircraft EPNL at the Federal Aviation Regulations Part 36 certification measurement locations using physics-based methods for fan rotor-stator interaction tones and jet mixing noise. The methodology was then used in combination with design of experiments to create response surface equations (RSEs) for the engine and aircraft performance metrics, geometric constraints and take-off and landing noise levels. In addition, Monte Carlo analysis was used to assess the expected variability of the metrics under the influence of uncertainty, and to determine how the variability is affected by the choice of engine cycle. Finally, the RSEs were used to conduct a series of proof-of-concept conceptual-level design studies demonstrating the utility of the approach. The study found that a key advantage to using physics-based analysis during conceptual design lies in the ability to assess the benefits of new technologies as a function of the design to which they are applied. The greatest difficulty in implementing physics-based analysis proved to be the generation of design geometry at a sufficient level of detail for high-fidelity analysis.
Author
Commercial Aircraft; Design Analysis; Effective Perceived Noise Levels; Aerodynamic Noise; Tradeoffs; Risk; Jet Mixing Flow; Interactional Aerodynamics; Aeroacoustics

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; 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.

20060013451 NASA Glenn Research Center, Cleveland, OH, USA
Small Hot Jet Acoustic Rig Validation
Brown, Cliff; Bridges, James; April 2006; 241 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 22-781-30-62
Report No.(s): NASA/TM-2006-214234; E-15481; No Copyright; Avail.: CASI: A11, Hardcopy

The Small Hot Jet Acoustic Rig (SHJAR), located in the Aeroacoustic Propulsion Laboratory (AAPL) at the NASA Glenn Research Center in Cleveland, Ohio, was commissioned in 2001 to test jet noise reduction concepts at low technology readiness levels (TRL 1-3) and develop advanced measurement techniques. The first series of tests on the SHJAR were designed to prove its capabilities and establish the quality of the jet noise data produced. Towards this goal, a methodology was employed dividing all noise sources into three categories: background noise, jet noise, and rig noise. Background noise was directly measured. Jet noise and rig noise were separated by using the distance and velocity scaling properties of jet noise. Effectively, any noise source that did not follow these rules of jet noise was labeled as rig noise. This method led to the identification of a high frequency noise source related to the Reynolds number. Experiments using boundary layer treatment and hot wire probes documented this noise source and its removal, allowing clean testing of low Reynolds number jets. Other tests performed characterized the amplitude and frequency of the valve noise, confirmed the location of the acoustic far field, and documented the background noise levels under several conditions. Finally, a full set of baseline data was acquired. This paper contains the methodology and test results used to verify the quality of the SHJAR rig.
Author
Jet Aircraft Noise; Aeroacoustics; Boundary Layers; Background Noise; Noise Reduction

20060013522 Research and Technology Organization, Neuilly-sur-Seine, France

Micro Gas Turbines

December 2005; In English; Applied Vehicle Technology (AVT/VKI) Panel Lectures Series, 14-18 May 2004, Rhode-Saint-Genese, Belgium; See also 20060013523 - 20060013537

Report No.(s): RTO-EN-AVT-131; AC/323(AVT-131)TP/94; Copyright; Avail.: CASI: C01, CD-ROM

Portable equipment as well as propulsion of small airplanes (UAV) and robots have enhanced the need for portable power supplies of large energy density (kWh/kg). The need for high performance and the specific problems resulting from the miniaturization of components are the motivation for the present lecture series. This course describes the state-of-the-art and gives an overview of the research activities on problems that are specific for micro and nano-gas-turbines, such as large heat fluxes, oil free bearings, high performance and compact heat exchangers, special combustion chamber designs and the use of non-conventional fuels, unconventional materials and appropriate manufacturing techniques, and new electrical generators and motors. It is shown what progress is still needed in all those fields before portable gas-turbine units between .1 and 1 kW will become available. Possible applications of micro-gas-turbines for propulsion of UAV and integration in fuel-cells are also presented. It is concluded that a lot of research is still required before the target of 75% thermal efficiency will be reached for the latter ones.

Author

Gas Turbines; Combustion Chambers; Heat Exchangers; Miniaturization; Portable Equipment; Thermodynamic Efficiency

20060013524 Tokyo Univ., Japan

Lessons Learned from the Ultra-Micro Gas Turbine Development at University of Tokyo

Nagashima, Toshio; Micro Gas Turbines; December 2005, pp. 14-1 - 14-58; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The outcome of NEDO supported international research project led by University of Tokyo is reviewed, with respect to developing key technologies for ultra-micro gas turbines (UMGT). The study suggested Finger-top gas turbines as a currently feasible extreme that install rotors of 8 mm in diameter with 1.2 million rpm to produce tens of watts net output. Prior to practicing such UMGT system integration, Palm-top gas turbine engine of an expected 2 - 3 kW output was first prototyped to operate successfully under a measurable control system, using propane as the fuel and installing a compact heat exchanger, which yielded valuable conceptual as well as practical data base for further advancement of UMGT designing.

Author

Gas Turbine Engines; Miniaturization; Heat Exchangers; Energy Conversion; Systems Integration; Data Bases; Gas Turbines

20060013526 Tokyo Univ., Japan

Aero-Thermal Research Particulars in Ultra-Micro Gas Turbines

Nagashima, Toshio; Teramoto, Susumu; Kato, Chisachi; Yuasa, Saburo; Micro Gas Turbines; December 2005, pp. 3-1 - 3-38; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Aerodynamics in turbo-components and matched combustor characteristics relating to the design of ultramicro gas turbines (UMGT) were presented. Some detailed analysis were provided for the effects of heat transfer, tip clearance and geometrical restriction imposed to UMGT flow passages, as well as a leading concept of combustor design to achieve micro flame structure for enhanced efficiency and stability.

Author

Aerodynamic Heating; Combustion Chambers; Gas Turbines; Heat Transfer; Temperature Effects

20060013537 Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese, Belgium

Micro Gas Turbines: A Short Survey of Design Problems

VandenBraembussche, R. A.; Micro Gas Turbines; December 2005, pp. 1-1 - 16; In English; See also 20060013522; Original contains color and black and white illustrations

Contract(s)/Grant(s): Proj. SBO-030288; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Micro gas turbines have experienced a growing interest during the last decade. Their large energy density (Whr/kg) makes them attractive for portable power units as well as for propulsion of small airplanes (UAV). They are also of interest for distributed power generation in applications where heat and power generation can be combined. The need for high

performance in both applications is at the origin of a worldwide interest and research on micro gas turbines and the motivation for the present lecture series. Scaling is a common technique to define larger or smaller geometries with similar characteristics. However a simple scaling of a high performance large gas turbine will not result in a good micro gas turbine. The main factors perturbing such a scaling are: The large change in Reynolds number. Massive heat transfer between the hot and cold components (negligible in large machines). Geometrical restrictions related to material and manufacturing of miniaturized components. The purpose of the present lecture is to provide a first insight into the aero-thermal problems of micro gas turbines.
Derived from text
Aerodynamic Heating; Design Analysis; Gas Turbines; Heat Transfer; Miniaturization; Propulsion

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.

20060013409 NASA Ames Research Center, Moffett Field, CA, USA
Performance, Loads and Stability of Heavy Lift Tiltrotors
Acree, Cecil W., Jr.; Johnson, Wayne; [2006]; 9 pp.; In English; AHS Vertical Lift Aircraft Design Conference, 18-20 Jan. 2006, San Francisco, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Summaries of rotor performance are presented for a 124,000-lb Large Civil Tilt Rotor (LCTR) design, along with isolated-rotor and fully-coupled wing/rotor aeroelastic stability. A major motivation of the present research is the effect of size on rotor dynamics. Simply scaling up existing rotor designs to the vehicle size under study would result in unacceptable rotor weight. The LCTR was the most promising of several large rotorcraft concepts produced by the NASA Heavy Lift Rotorcraft Systems Investigation. It was designed to carry 120 passengers for 1200 nm, with performance of 350 knots at 30,000 ft altitude. Design features included a low-mounted wing and hingeless rotors, with a very low cruise tip speed of 350 ft/sec. The LCTR was sized by the'RC code developed by the U. S. Army Aeroflightdynamics Directorate. The rotor was then optimized using the CAMRAD II comprehensive analysis code. The blade and wing structures were designed by Pennsylvania State University to meet the rotor loads calculated by CAMRAD II and wing loads required for certification. Aeroelastic stability was confirmed by further CAMRAD II analysis, based on the optimized rotor and wing designs.
Author
Tilt Rotor Aircraft; Aeroelasticity; Rotor Dynamics; Wing Loading; Rotary Wing Aircraft; Stability; Flight Characteristics; Helicopter Design

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)*.

20060013215 Tetra Tech Environmental Management, Inc., Cincinnati, OH, USA
XRF Technologies for Measuring Trace Elements in Soil and Sediment: Rigaku ZSX Mini II XRF Analyzer. Innovative Technology Verification Report
Apr. 2006; 208 pp.; In English
Report No.(s): PB2006-109039; No Copyright; Avail.: CASI: A10, Hardcopy

The Rigaku ZSX Mini II (ZSX Mini II) XRF Services x-ray fluorescence (XRF) analyzer was demonstrated under the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Program. The field portion of the demonstration was conducted in January 2005 at the Kennedy Athletic, Recreational and Social Park (KARS) at Kennedy Space Center on Merritt Island, Florida. The demonstration was designed to collect reliable performance and cost data for the ZSX Mini II analyzer and seven other commercially available XRF instruments for measuring trace elements in soil and sediment. The performance and cost data were evaluated to document the relative performance of each XRF instrument. This innovative technology verification report describes the objectives and the results of that evaluation and serves to verify the performance and cost of the ZSX Mini II analyzer. Separate reports have been prepared for the other XRF instruments that were evaluated as part of the demonstration. The objectives of the evaluation included determining each XRF

instrument's accuracy, Precision, sample throughput, tendency for matrix effects.
NTIS
Costs; Environmental Cleanup; Soils; X Ray Fluorescence

20060013217 Tetra Tech Environmental Management, Inc., Cincinnati, OH, USA
XRF Technologies for Measuring Trace Elements in Soil and Sediment: Oxford X-Met 3000TX XRF Analyzer. Innovative Technology Verification Report
Apr. 2006; 230 pp.; In English
Report No.(s): PB2006-109038; No Copyright; Avail.: CASI: A11, Hardcopy

The Oxford Instruments Analytical, Ltd., (Oxford) X-Met 3000 TX (X-Met) XRF Services x-ray fluorescence (XRF) analyzer was demonstrated under the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Program. The field portion of the demonstration was conducted in January 2005 at the Kennedy Athletic, Recreational and Social Park (KARS) at Kennedy Space Center on Merritt Island, Florida. The demonstration was designed to collect reliable performance and cost data for the X-Met analyzer and seven other commercially available XRF instruments for measuring trace elements in soil and sediment. The performance and cost data were evaluated to document the relative performance of each XRF instrument. This innovative technology verification report describes the objectives and the results of that evaluation and serves to verify the performance and cost of the X-Met analyzer. Separate reports have been prepared for the other XRF instruments that were evaluated as part of the demonstration. The objectives of the evaluation included determining each XRF instrument's accuracy, precision, sample throughput, and tendency for matrix effect.
NTIS
Costs; Environmental Cleanup; Soils; Trace Elements; X Ray Fluorescence

20060013229 Tetra Tech Environmental Management, Inc., Cincinnati, OH, USA
XRF Technologies for Measuring Trace Elements in Soil and Sediment: Oxford ED2000 XRF Analyzer. Innovative Technology Verification Report
Apr. 2006; 208 pp.; In English
Report No.(s): PB2006-109037; No Copyright; Avail.: CASI: A10, Hardcopy

The Oxford ED2000 x-ray fluorescence (XRF) analyzer was demonstrated under the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Program. The field portion of the demonstration was conducted in January 2005 at the Kennedy Athletic, Recreational and Social Park (KARS) at Kennedy Space Center on Merritt Island, Florida. The demonstration was designed to collect reliable performance and cost data for the ED2000 analyzer and seven other commercially available XRF instruments for measuring trace elements in soil and sediment. The performance and cost data were evaluated to document the relative performance of each XRF instrument. This innovative technology verification report describes the objectives and the results of that evaluation and serves to verify the performance and cost of the ED2000 analyzer. Separate reports have been prepared for the other XRF instruments that were evaluated as part of the demonstration.
NTIS
Costs; Environmental Cleanup; Soils; Trace Elements; X Ray Fluorescence

20060013230 Tetra Tech Environmental Management, Inc., Cincinnati, OH, USA
XRF Technologies for Measuring Trace Elements in Soil and Sediment: Niton XLi 700 Series XRF Analyzer. Innovative Technology Verification Report
Apr. 2006; 212 pp.; In English
Report No.(s): PB2006-109035; No Copyright; Avail.: CASI: A10, Hardcopy

The Niton XLi 700 Series (XLi) XRF Services x-ray fluorescence (XRF) analyzer was demonstrated under the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Program. The field portion of the demonstration was conducted in January 2005 at the Kennedy Athletic, Recreational and Social Park (KARS) at Kennedy Space Center on Merritt Island, Florida. The demonstration was designed to collect reliable performance and cost data for the XLi analyzer and seven other commercially available XRF instruments for measuring trace elements in soil and sediment. The performance and cost data were evaluated to document the relative performance of each XRF instrument. This innovative technology verification report describes the objectives and the results of that evaluation and serves to verify the performance

and cost of the XLi analyzer. Separate reports have been prepared for the other XRF instruments that were evaluated as part of the demonstration.
NTIS
Costs; Environmental Cleanup; Soils; X Ray Fluorescence; X Rays

20060013231 Tetra Tech Environmental Management, Inc., Cincinnati, OH, USA
XRF Technologies for Measuring Trace Elements in Soil and Sediment: Niton XLt 700 Series XRF Analyzer. Innovative Technology Verification Report
Apr. 2006; 206 pp.; In English
Report No.(s): PB2006-109036; No Copyright; Avail.: CASI: A10, Hardcopy

The Niton XLt 700 Series (XLt) XRF Services x-ray fluorescence (XRF) analyzer was demonstrated under the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Program. The field portion of the demonstration was conducted in January 2005 at the Kennedy Athletic, Recreational and Social Park (KARS) at Kennedy Space Center on Merritt Island, Florida. The demonstration was designed to collect reliable performance and cost data for the XLt analyzer and seven other commercially available XRF instruments for measuring trace elements in soil and sediment. The performance and cost data were evaluated to document the relative performance of each XRF instrument. This innovative technology verification report describes the objectives and the results of that evaluation and serves to verify the performance and cost of the XLt analyzer. Separate reports have been prepared for the other XRF instruments that were evaluated as part of the demonstration.
NTIS
Costs; Environmental Cleanup; Soils; X Ray Fluorescence

20060013234 Tetra Tech Environmental Management, Inc., Cincinnati, OH, USA
XRF Technologies for Measuring Trace Elements in Soil and Sediment: Innov-X XT400 Series XRF Analyzer. Innovative Technology Verification Report
Apr. 2006; 216 pp.; In English
Report No.(s): PB2006-109034; No Copyright; Avail.: CASI: A10, Hardcopy

The Innov-X XT400 Series (XT400) x-ray fluorescence (XRF) analyzer was demonstrated under the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Program. The field portion of the demonstration was conducted in January 2005 at the Kennedy Athletic, Recreational and Social Park (KARS) at Kennedy Space Center on Merritt Island, Florida. The demonstration was designed to collect reliable performance and cost data for the XT400 analyzer and seven other commercially available XRF instruments for measuring trace elements in soil and sediment. The performance and cost data were evaluated to document the relative performance of each XRF instrument.
NTIS
Costs; Environmental Cleanup; Soils; X Ray Fluorescence

20060013259 Tetra Tech Environmental Management, Inc., Cincinnati, OH, USA
XRF Technologies for Measuring Trace Elements in Soil and Sediment: Rontec PicoTAX XRF Analyzer. Innovative Technology Verification Report
Apr. 2006; 212 pp.; In English
Report No.(s): PB2006-109040; No Copyright; Avail.: CASI: A10, Hardcopy

The Rontec PicoTAX x-ray fluorescence (XRF) analyzer was demonstrated under the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Program. The field portion of the demonstration was conducted in January 2005 at the Kennedy Athletic, Recreational and Social Park (KARS) at Kennedy Space Center on Merritt Island, Florida. The demonstration was designed to collect reliable performance and cost data for the PicoTAX analyzer and seven other commercially available XRF instruments for measuring trace elements in soil and sediment. The performance and cost data were evaluated to document the relative performance of each XRF instrument. This innovative technology verification report describes the objectives and the results of that evaluation and serves to verify the performance and cost of the PicoTAX analyzer. Separate reports have been prepared for the other XRF instruments that were evaluated as part of the demonstration. The objectives of the evaluation included determining each XRF instrument's accuracy, precision, sample throughput, and tendency for matrix effects.
NTIS
Costs; Environmental Cleanup; Soils; X Ray Fluorescence

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*.

20060013244 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering (Hangtian Yu Yixue Gongcheng), Volume 18, No. 6, December 2005
Wei, J.; Dec. 2005; 104 pp.; In Chinese; Portions of this document are not fully legible
Report No.(s): PB2006-104467; Copyright; Avail.: National Technical Information Service (NTIS)

Partial Contents: A Preliminary Study on Non-invasive Measurement of Intra-abdominal Pressure(In English), Genetic Construction and Characterization of Murine Interleakin-18 Immunatein with a Truncated Pseudomonas Exotoxin(In English), Study of Reentrant Waves in Simulated Myocardial Isehemia(In English), Expression of Apoptosis Related Cenes bel-2 and p53 in Rat Brain after Exposure to + Ox in Simulated Emergent Return of Spacecraft, Effects of Intermittent Head-up Tilt on Histomorphological Changes of Femoral Vein and Jugular Vein in Rabbits under Simulated Weightlessness, Observation of Diffusion Weighted MRI and Pathology of Cerebral Edema during Hypoxia, Effects of Soy Isoflavones on Bone Loss in Female Rats after Simulated Weightlessness, Comparison of Effects of Simulated Weightlessness on ERPs in Fast and Slow Reaction Groups.
NTIS
Aerospace Medicine

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)*.

20060013242 NASA Johnson Space Center, Houston, TX, USA
Radio Frequency (RF) Attenuation Measurements of the Space Shuttle Vehicle
Scully, R. C.; Kent, B. M.; Kempf, D. R.; Johnk, R. T.; [2006]; 4 pp.; In English; 2006 IEEE Symposium on EMC, 14-18 Aug. 2006, Portland, OR, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Following the loss of Columbia, the Columbia Accident Investigation Board (CAIB) provided recommendations to be addressed prior to Return To Flight (RTF). As a part of CAIB Recommendation 3.4.1 - Ground Based Imagery, new C-band and X-band radars were added to the array of ground-based radars and cameras already in-situ at Kennedy Space Center. Because of higher power density considerations and new operating frequencies, the team of Subject Matter Experts (SMEs) assembled to investigate the technical details of introducing the new radars recommended a series of radio frequency (RF) attenuation tests be performed on the Space Shuttle vehicle to establish the attenuation of the vehicle outer mold line structure with respect to its external RF environment. Because of time and complex logistical constraints, it was decided to split the test into two separate efforts. The first of these would be accomplished with the assistance of the Air Force Research Laboratory (AFRL), performing RF attenuation measurements on the aft section of OV-103 (Discovery) while in-situ in Orbiter Processing Facility (OPF) 3, located at Kennedy Space Center. The second would be accomplished with the assistance of the National Institute of Standards and Technology (NIST) and the electromagnetic interference (EMI) laboratory out of the Naval Air Warfare Center, Patuxent River, Maryland (PAX River), performing RF attenuation measurements on OV-105 (Endeavour) in-situ inside the Space Shuttle Landing Facility (SLF) hangar, also located at Kennedy Space Center. This paper provides a summary description of these efforts and their results.
Author
Radio Frequencies; Superhigh Frequencies; Space Shuttles; Imagery; Electromagnetic Interference; Microwave Frequencies

16
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; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20060013233 NASA Johnson Space Center, Houston, TX, USA
Current Characteristics and Trends of the Tracked Satellite Population in the Human Space Flight Regime
Johnson, Nicholas L.; [2006]; 1 pp.; In English; 57th International Astronautical Congress, 2-6 Oct. 2006, Valencia, Spain; No Copyright; Avail.: Other Sources; Abstract Only

Since the end of the Apollo program in 1972, human space flight has been restricted to altitudes below 600 km above the Earth s surface with most missions restricted to a ceiling below 400 km. An investigation of the tracked satellite population transiting and influencing the human space flight regime during the past 11 years (equivalent to a full solar cycle) has recently been completed. The overall effects of satellite breakups and solar activity are typically less pronounced in the human space flight regime than other regions of low Earth orbit. As of January 2006 nearly 1500 tracked objects resided in or traversed the human space flight regime, although two-thirds of these objects were in orbits of moderate to high eccentricity, significantly reducing their effect on human space flight safety. During the period investigated, the spatial density of tracked objects in the 350-400 km altitude regime of the International Space Station demonstrated a steady decline, actually decreasing by 50% by the end of the period. On the other hand, the region immediately above 600 km experienced a significant increase in its population density. This regime is important for future risk assessments, since this region represents the reservoir of debris which will influence human space flight safety in the future. The paper seeks to put into sharper perspective the risks posed to human space flight by the tracked satellite population, as well as the influences of solar activity and the effects of compliance with orbital debris mitigation guidelines on human space flight missions. Finally, the methods and successes of characterizing the population of smaller debris at human space flight regimes are addressed.
Author
Spacecraft Breakup; Low Earth Orbits; Flight Safety; Altitude

20060013394 Dynamic Range Corp., Seabrook, MD, USA
Environmental Conditions for Space Flight Hardware: A Survey
Plante, Jeannette; Lee, Brandon; [2005]; 15 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Interest in generalization of the physical environment experienced by NASA hardware from the natural Earth environment (on the launch pad), man-made environment on Earth (storage acceptance an d qualification testing), the launch environment, and the space environment, is ed to find commonality among our hardware in an effort to reduce cost and complexity. NASA is entering a period of increase in its number of planetary missions and it is important to understand how our qualification requirements will evolve with and track these new environments. Environmental conditions are described for NASA projects in several ways for the different periods of the mission life cycle. At the beginning, the mission manager defines survivability requirements based on the mission length, orbit, launch date, launch vehicle, and other factors . such as the use of reactor engines. Margins are then applied to these values (temperature extremes, vibration extremes, radiation tolerances, etc,) and a new set of conditions is generalized for design requirements. Mission assurance documents will then assign an additional margin for reliability, and a third set of values is provided for during testing. A fourth set of environmental condition values may evolve intermittently from heritage hardware that has been tested to a level beyond the actual mission requirement. These various sets of environment figures can make it quite confusing and difficult to capture common hardware environmental requirements. Environmental requirement information can be found in a wide variety of places. The most obvious is with the individual projects. We can easily get answers to questions about temperature extremes being used and radiation tolerance goals, but it is more difficult to map the answers to the process that created these requirements: for design, for qualification, and for actual environment with no margin applied. Not everyone assigned to a NASA project may have that kind of insight, as many have only the environmental requirement numbers needed to do their jobs but do not necessarily have a programmatic-level understanding of how all of the environmental requirements fit together.
Derived from text
Aerospace Environments; Mission Planning; Space Missions; Radiation Tolerance; Launch Vehicles; Vibration; Performance Tests

20060013463 Lockheed Martin Space Operations, Houston, TX, USA

Exploration Spacecraft and Space Suit Internal Atmosphere Pressure and Composition

Lange, Kevin; Duffield, Bruce; Jeng, Frank; Campbell, Paul; [2005]; 14 pp.; In English; 2005 Bioastronautics Investigator's Workshop, 10-12 Jan. 2005, Galveston, TX, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NAS9-19100; No Copyright; Avail.: CASI: A03, Hardcopy

The design of habitat atmospheres for future space missions is heavily driven by physiological and safety requirements. Lower EVA prebreathe time and reduced risk of decompression sickness must be balanced against the increased risk of fire and higher cost and mass of materials associated with higher oxygen concentrations. Any proposed increase in space suit pressure must consider impacts on space suit mass and mobility. Future spacecraft designs will likely incorporate more composite and polymeric materials both to reduce structural mass and to optimize crew radiation protection. Narrowed atmosphere design spaces have been identified that can be used as starting points for more detailed design studies and risk assessments.

Derived from text

Space Suits; Radiation Protection; Habitats; Atmospheric Pressure; Decompression Sickness; Space Missions; Safety Factors; Risk

20060013502 Lockheed Martin Space Operations, Houston, TX, USA

Understanding Columbia's Reentry Problems

Paul, Thomas; [2006]; 2 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS9-19100; No Copyright; Avail.: CASI: A01, Hardcopy

Soon after the Space Shuttle Columbia accident occurred last year, a group of CFD analysts from NASA centers and private industry was organized to help determine the cause of the accident. This group was under the direction of the Applied Aeroscience and CFD Branch of the Aeroscience and Flight Mechanics Division at the Johnson Space Center. For external flow simulations, noncommercia2 CFD codes that specialize in hypersonic or high Mach number flows were used. These tools were used to determine heating rates, pressures, and temperatures for a large number of vehicle damage scenarios. Lockheed Martin Space Operations was called upon to provide CFD support in the area of internal flows within the shuttle wing cavity, and for these simulations, FLUENT 6.1 was chosen. Two large-scale, simplified models were m to understand the flow patterns once a breach of the internal wing cavity was initiated. The results were primarily used to visualize flow patterns within the wing cavity. The first CFD model included the entire lee wing without the wheel well cavity. The purpose of the first model, which did not include the reinforced carbon-carbon (RCC) cavity along the wing leading edge, was to visualize the flow field within the wing cavity immediately after the leading edge spar breach, This model assumed that the flow coming into the wing cavity was normal to the spar. It included all of the primary vents that allow for flow between the main cavities of the wing. A six-inch diameter hole was modeled in the spar at the approximate location where the spar breach was judged to have occurred, which was between RCC panels 8 and 9. The results of the modeling showed that at this location, the high temperature, high velocity gas stream entering the wing cavity impinged on the outboard wheel well cavity. Instrumentation in the Shuttle wheel well cavity registered abnormal temperatures during reentry, so the FLUENT results helped support the conclusion of the accident investigation team that the spar breach was in the RCC panel 8-9 area, and that the initial spar breach was likely entering the wing cavity normal to the spar. This model also showed that the flow entering the wing cavity tended to swirl within the cavity just outboard of the wheel well, and did not initially penetrate further into the rear cavities of the wing. The second CFD model was a 2-D simulation of the left wing cavity and the RCC cavity. It was used to visualize the flow through the RCC breach, through the wing spar breach, and into the wing cavity directly outboard of the wheel well. The purpose of this model was to verify whether or not it was possible for the flow to come into the wing cavity normal to the leading edge spar. The results from this 2-D model showed that the internal structure behind the RCC panels probably deflected the flow entering the RCC cavity so that it impinged normal to the spar. As in the 3-D model, this deflected flow stream was Found to impinge on the wheel well outer wall. This model again supported the conclusions regarding the location of the spar breach and how the flow behaved inside the wing cavity.

Author

Accident Investigation; Columbia (Orbiter); Space Shuttles; Computational Fluid Dynamics; Simulation; Flight Mechanics; Structural Members; Leading Edges

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*.

20060013197 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Empirical Comparison between Two Recursive Filters for Attitude and Rate Estimation of Spinning Spacecraft
Harman, Richard R.; January 2006; 2 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The advantages of inducing a constant spin rate on a spacecraft are well known. A variety of science missions have used this technique as a relatively low cost method for conducting science. Starting in the late 1970s, NASA focused on building spacecraft using 3-axis control as opposed to the single-axis control mentioned above. Considerable effort was expended toward sensor and control system development, as well as the development of ground systems to independently process the data. As a result, spinning spacecraft development and their resulting ground system development stagnated. In the 1990s, shrinking budgets made spinning spacecraft an attractive option for science. The attitude requirements for recent spinning spacecraft are more stringent and the ground systems must be enhanced in order to provide the necessary attitude estimation accuracy. Since spinning spacecraft (SC) typically have no gyroscopes for measuring attitude rate, any new estimator would need to rely on the spacecraft dynamics equations. One estimation technique that utilized the SC dynamics and has been used successfully in 3-axis gyro-less spacecraft ground systems is the pseudo-linear Kalman filter algorithm. Consequently, a pseudo-linear Kalman filter has been developed which directly estimates the spacecraft attitude quaternion and rate for a spinning SC. Recently, a filter using Markley variables was developed specifically for spinning spacecraft. The pseudo-linear Kalman filter has the advantage of being easier to implement but estimates the quaternion which, due to the relatively high spinning rate, changes rapidly for a spinning spacecraft. The Markley variable filter is more complicated to implement but, being based on the SC angular momentum, estimates parameters which vary slowly. This paper presents a comparison of the performance of these two filters. Monte-Carlo simulation runs will be presented which demonstrate the advantages and disadvantages of both filters.
Author
Attitude (Inclination); Estimates; Angular Momentum; Kalman Filters; Linear Filters; Spacecraft Design; Systems Engineering; Gyroscopes

20060013198 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Rigid Body Rate Inference from Attitude Variation
Bar-Itzhack, I. Y.; Harman, Richard R.; Thienel, Julie K.; [2006]; 30 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In this paper we research the extraction of the angular rate vector from attitude information without differentiation, in particular from quaternion measurements. We show that instead of using a Kalman filter of some kind, it is possible to obtain good rate estimates, suitable for spacecraft attitude control loop damping, using simple feedback loops, thereby eliminating the need for recurrent covariance computation performed when a Kalman filter is used. This considerably simplifies the computations required for rate estimation in gyro-less spacecraft. Some interesting qualities of the Kalman filter gain are explored, proven and utilized. We examine two kinds of feedback loops, one with varying gain that is proportional to the well known Q matrix, which is computed using the measured quaternion, and the other type of feedback loop is one with constant coefficients. The latter type includes two kinds; namely, a proportional feedback loop, and a proportional-integral feedback loop. The various schemes are examined through simulations and their performance is compared. It is shown that all schemes are adequate for extracting the angular velocity at an accuracy suitable for control loop damping.
Author
Attitude Control; Angular Velocity; Kalman Filters; Quaternions; Rigid Structures; Spacecraft Control; Damping; Estimates; Loops

20060013403 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Debris/Ice/TPS Assessment and Integrated Photographic Analysis of Shuttle Mission STS-105
Oliu, Armando; February 2005; 99 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2005-211537; No Copyright; Avail.: CASI: A05, Hardcopy

The Debris Team has developed and implemented measures to control damage from debris in the Shuttle operational

environment and to make the control measures a part of routine launch flows. These measures include engineering surveillance during vehicle processing and closeout operations, facility and flight hardware inspections before and after launch, and photographic analysis of mission events. Photographic analyses of mission imagery from launch, on-orbit, and landing provide significant data in verifying proper operation of systems and evaluating anomalies. In addition to the Kennedy Space Center Photo/Video Analysis, reports from Johnson Space Center and Marshall Space Flight Center are also included in this document to provide an integrated assessment of the mission.
Derived from text
Space Shuttle Missions; Debris; Anomalies; Ice; Inspection; Space Transportation System; Aerospace Environments; Damage

20060013404 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Debris/Ice/TPS Assessment and Integrated Photographic Analysis of Shuttle Mission STS-108
Oliu, Armando; March 2005; 136 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2005-212556; No Copyright; Avail.: CASI: A07, Hardcopy

The Debris Team has developed and implemented measures to control damage from debris in the Shuttle operational environment and to make the control measures a part of routine launch flows. These measures include engineering surveillance during vehicle processing and closeout operations, facility and flight hardware inspections before and after launch, and photographic analysis of mission events. Photographic analyses of mission imagery from launch, on-orbit, and landing provide significant data in verifying proper operation of systems and evaluating anomalies. In addition to the Kennedy Space Center Photo/Video Analysis, reports from Johnson Space Center and Marshall Space Flight Center are also included in this document to provide an integrated assessment of the mission.
Derived from text
Aerospace Environments; Space Shuttle Missions; Launching; Ice; Debris; Damage; Anomalies; Inspection

20060013405 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Debris/Ice/TPS Assessment and Integrated Photographic Analysis of Shuttle Mission STS-109
Oliu, Armando; March 2005; 103 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2005-212557; No Copyright; Avail.: CASI: A06, Hardcopy

The Debris Team has developed and implemented measures to control damage from debris in the Shuttle operational environment and to make the control measures a part of routine launch flows. These measures include engineering surveillance during vehicle processing and closeout operations, facility and flight hardware inspections before and after launch, and photographic analysis of mission events. Photographic analyses of mission imagery from launch, on-orbit, and landing provide significant data in verifying proper operation of systems and evaluating anomalies. In addition to the Kennedy Space Center Photo/Video Analysis, reports from Johnson Space Center and Marshall Space Flight Center are also included in this document to provide an integrated assessment of the mission.
Derived from text
Space Shuttle Missions; Launching; Inspection; Anomalies; Aerospace Environments; Debris; Ice; Damage

20060013406 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Debris/Ice/TPS Assessment and Integrated Photographic Analysis of Shuttle Mission STS-110
Oliu, Armando; March 2005; 114 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-212558; No Copyright; Avail.: CASI: A06, Hardcopy

The Debris Team has developed and implemented measures to control damage from debris in the Shuttle operational environment and to make the control measures a part of routine launch flows. These measures include engineering surveillance during vehicle processing and closeout operations, facility and flight hardware inspections before and after launch, and photographic analysis of mission events. Photographic analyses of mission imagery from launch, on-orbit, and landing provide significant data in verifying proper operation of systems and evaluating anomalies. In addition to the Kennedy Space Center Photo/Video Analysis, reports from Johnson Space Center and Marshall Space Flight Center are also included in this document to provide an integrated assessment of the mission.
Derived from text
Space Shuttle Missions; Launching; Inspection; Anomalies; Debris; Damage; Ice; Aerospace Environments

20060013429 NASA Kennedy Space Center, Cocoa Beach, FL, USA

Debris/Ice/TPS Assessment and Integrated Photographic Analysis of Shuttle Mission STS-112

Oliu, Armando; Oct. 7, 2002; 126 pp.; In English; Original contains black and white illustrations

Report No.(s): NASA/TM-2005-212560; No Copyright; Avail.: CASI: A07, Hardcopy

A debris/ice/thermal protection system assessment and integrated photographic analysis was conducted for Shuttle mission STS-112. Debris inspections of the flight elements and launch pad were performed before and after launch. Icing conditions on the External Tank were assessed by the use of computer programs and infrared scanned data during cryogenic loading of the vehicle, followed by on-pad visual inspection. High speed photography of the launch was analyzed to identify ice/debris sources and evaluate potential vehicle damage and/or in-flight anomalies. The report documents the debris/ice/thermal protection system conditions and integrated photographic analysis of Space Shuttle mission STS-112 and the resulting effect of the Space Shuttle Program.

Author

Space Shuttle Missions; Debris; Ice Formation; Thermal Protection; Space Transportation System; Infrared Radiation; Inspection; Cryogenics; Launching

20060013482 NASA Johnson Space Center, Houston, TX, USA

Design and Certification of the Extravehicular Activity Mobility Unit (EMU) Water Processing Jumper

Peterson, Laurie J.; Neumeyer, Derek J.; Lewis, John F.; [2006]; 6 pp.; In English; International Conference of Environmental Systems, 17-20 Jul. 2006, Norfolk, VA, USA; Original contains color illustrations

Contract(s)/Grant(s): 769.06.01.01.01

Report No.(s): 06ICES-169; Copyright; Avail.: Other Sources

The Extravehicular Mobility Units (EMUs) onboard the International Space Station (ISS) experienced a failure due to cooling water contamination from biomass and corrosion byproducts forming solids around the EMU pump rotor. The coolant had no biocide and a low pH which induced biofilm growth and corrosion precipitates, respectively. NASA JSC was tasked with building hardware to clean the ionic, organic, and particulate load from the EMU coolant loop before and after Extravehicular Activity (EVAs). Based on a return sample of the EMU coolant loop, the chemical load was well understood, but there was not sufficient volume of the returned sample to analyze particulates. Through work with EMU specialists, chemists, (EVA) Mission Operations Directorate (MOD) representation, safety and mission assurance, astronaut crew, and team engineers, requirements were developed for the EMU Water Processing hardware (sometimes referred to as the Airlock Coolant Loop Recovery [A/L CLR] system). Those requirements ranged from the operable level of ionic, organic, and particulate load, interfaces to the EMU, maximum cycle time, operating pressure drop, flow rate, and temperature, leakage rates, and biocide levels for storage. Design work began in February 2005 and certification was completed in April 2005 to support a return to flight launch date of May 12, 2005. This paper will discuss the details of the design and certification of the EMU Water Processing hardware and its components

Author

Contamination; Coolants; Extravehicular Mobility Units; Corrosion; Biomass; By-Products; Rotors; International Space Station

20060013503 NASA Langley Research Center, Hampton, VA, USA

Planetary Airplane Extraction System Development and Subscale Testing

Teter, John E., Jr.; [2006]; 14 pp.; In English; 38th Aerospace Mechanisms Symposium, 17-19 May 2006, Williamsburg, VA, USA; Original contains color illustrations

Contract(s)/Grant(s): 581.02.08.07; No Copyright; Avail.: CASI: A03, Hardcopy

The Aerial Regional-scale Environmental Survey (ARES) project employs an airplane as the science platform from which to collect science data in the previously inaccessible, thin atmosphere of Mars. In order for the airplane to arrive safely in the Martian atmosphere a number of sequences must occur. A critical element in the entry sequence at Mars is an extraction maneuver to separate the airplane quickly (in less than a second) from its protective backshell to reduce the possibility of re-contact, potentially leading to mission failure. This paper describes the development, testing, and lessons learned from building a 1/3 scale model of this airplane extraction system. This design, based on the successful Mars Exploration Rover (MER) extraction mechanism, employs a series of trucks rolling along tracks located on the surface of the central parachute can. Numerous tests using high speed video were conducted at the Langley Research Center (LaRC) to validate this concept. One area of concern was that that although the airplane released cleanly, a pitching moment could be introduced. While

targeted for a Mars mission, this concept will enable environmental surveys by aircraft in other planetary bodies with a sensible atmosphere such as Venus or Saturn s moon, Titan.
Author
Extraction; Scale Models; Mars Atmosphere; Mars Missions; Systems Engineering; Mars Exploration

20060013504 NASA Langley Research Center, Hampton, VA, USA
Structural Analysis and Testing of the Inflatable Re-entry Vehicle Experiment (IRVE)
Lindell, Michael C.; Hughes, Stephen J.; Dixon, Megan; Wiley, Cliff E.; [2006]; 19 pp.; In English; 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 1-4 May 2006, Newport, RI, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-614-10-04-13
Report No.(s): AIAA Paper 2006-1699; Copyright; Avail.: CASI: A03, Hardcopy

The Inflatable Re-entry Vehicle Experiment (IRVE) is a 3.0 meter, 60 degree half-angle sphere cone, inflatable aeroshell experiment designed to demonstrate various aspects of inflatable technology during Earth re-entry. IRVE will be launched on a Terrier-Improved Orion sounding rocket from NASA s Wallops Flight Facility in the fall of 2006 to an altitude of approximately 164 kilometers and re-enter the Earth s atmosphere. The experiment will demonstrate exo-atmospheric inflation, inflatable structure leak performance throughout the flight regime, structural integrity under aerodynamic pressure and associated deceleration loads, thermal protection system performance, and aerodynamic stability. Structural integrity and dynamic response of the inflatable will be monitored with photogrammetric measurements of the leeward side of the aeroshell during flight. Aerodynamic stability and drag performance will be verified with on-board inertial measurements and radar tracking from multiple ground radar stations. In addition to demonstrating inflatable technology, IRVE will help validate structural, aerothermal, and trajectory modeling and analysis techniques for the inflatable aeroshell system. This paper discusses the structural analysis and testing of the IRVE inflatable structure. Equations are presented for calculating fabric loads in sphere cone aeroshells, and finite element results are presented which validate the equations. Fabric material properties and testing are discussed along with aeroshell fabrication techniques. Stiffness and dynamics tests conducted on a small-scale development unit and a full-scale prototype unit are presented along with correlated finite element models to predict the in-flight fundamental mod
Author
Reentry Vehicles; Inflatable Structures; Aeroshells; Aerodynamic Stability; Structural Analysis; Aerothermodynamics; Sounding Rockets

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 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20060013282 National Renewable Energy Lab., Golden, CO USA
Module Encapsulant Diagnostic and Modeling
Kempe, M.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860684; NREL/CP-520-37027; No Copyright; Avail.: National Technical Information Service (NTIS)

Encapsulant materials are used in photovoltaic devices for mechanical support, electrical isolation, and protection against corrosion. The ability of an encapsulant to protect against surface corrosion is related to its adhesional strength. The adhesion of candidate encapsulants under accelerated environmental stress was examined to determine what materials have the best hydrolytic stability and are more likely to reduce corrosion rates. Under environmental exposure, the ingress of water has been correlated with increased corrosion rates. The diffusivity of different encapsulants has been measured to determine how long it takes for water to enter a module. The high diffusivity of ethylene vinyl acetate indicates that, even with the use of an impermeable back-sheet, moisture from the sides will diffuse throughout the entire module. To significantly reduce moisture ingress requires a true hermetic seal, the use of an encapsulant loaded with desiccant, or the use of a very low diffusivity encapsulant.
NTIS
Corrosion; Encapsulating

20060013328 Hughes Technical Center, Atlantic City International Airport, NJ, USA, SRA International, Inc., Egg Harbor Twp., NJ, USA, Lonza, Inc., Allendale, NJ, USA, Hewlett-Packard Co., Aguadilla, PR, USA

Fire-Smart DDE Polymers

Lyon, R. E.; Speitel, L.; Filipczak, R.; Walters, R.; Crowley, S.; Mar. 2006; 46 pp.; In English

Report No.(s): PB2006-109056; No Copyright; Avail.: CASI: A03, Hardcopy

The chemistry and properties of polymers containing the fire-smart moiety 1,1-dichloro-2,2-diphenylethene (DDE) are described. These polymers are typically derived from the bisphenol of chloral and are low-cost, easily processed, and have good mechanical properties and toughness under normal conditions. Under fire conditions, the DDE group undergoes an intramolecular rearrangement to diphenylethynyl with the elimination of hydrogen chloride (a noncombustible gas) and intermolecular cross-linking to form an aromatic char residue in high yield. The flammability and mechanical properties of DDE-containing polymers are described.

NTIS

Polymers; Polymer Chemistry; Bisphenols; Hydrogen Chlorides; Residues

20060013466 NASA Johnson Space Center, Houston, TX, USA

Reference standard for carbonaceous impurity measurements in carbon nanotubes.

Nikolaev, Pavel; [2004]; 1 pp.; In English; Material Research Society Fall 2004, 29 Nov. - 3 Dec. 2004, Boston, MA, USA

Contract(s)/Grant(s): NAS9-19100; No Copyright; Avail.: Other Sources; Abstract Only

Near-infrared spectroscopy is a convenient tool for measuring nanotube/carbonaceous impurities ratios in carbon nanotube samples. These measurements are based on separation of contributions from nanotubes and impurities to the near-infrared absorption of samples dispersed in DMF, and sample purity is expressed relative to some reference sample. In the current work we produced a reference standard for NIR measurements using purified laser nanotubes. The sample was oxidized slowly using a Temperature Programmed Oxidation (TPO) setup in 2% oxygen/98% helium atmosphere. In these conditions, the sample oxidized in several steps, which were attributed to carbonaceous impurities, nanotubes and graphitic shells based on TEM and Raman observations. Stopping oxidation at 625 C (this temperature is sample-specific) allowed us to produce a sample with no carbonaceous impurities and well-defined ratio of nanotubes, graphite and metal catalyst. Since carbonaceous impurities no longer hold nanotubes and particles together, further centrifuging allowed us to remove particles and use this sample as a reference standard in NIR measurements.

Author

Carbon Nanotubes; Impurities; Spectroscopy; Oxidation; Helium; Oxygen; Purity; Catalysts

24
COMPOSITE MATERIALS

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

20060013319 Kentucky Univ., Lexington, KY USA

Inspection and Evaluation of a Bridge Deck Reinforced with Carbon Fiber Reinforced Polymer (CFRP) Bars

Chiaw, C. C.; Harik, I.; Mar. 2006; 24 pp.; In English

Report No.(s): PB2006-110314; KTC-06-06/FRT102-00-1F; No Copyright; Avail.: CASI: A03, Hardcopy

Cracking in reinforced concrete decks is inevitable. It leads to the corrosion and eventual deterioration of the deck system. The use of non-corrosive reinforcement is one alternative to steel in reinforced concrete construction. This report deals with the field evaluation and performance of a concrete bridge deck reinforced with carbon fiber reinforced polymer (CFRP) bars. The bridge is identified as the Elkin Station Road Bridge on route CR1210 over the Two-Mile Creek in Clark County, KY. The CFRP bars were placed in the top and bottom mats of the bridge deck in both the transverse and longitudinal directions. The results of the laboratory tensile tests of the CFRP bars used in the deck are presented in this report. The bridge was opened to traffic in May 2002. Monitoring of crack formation and location, and maximum crack width and length in the deck initiated in June 2002 and continued until September 2005. The cracks in the deck were not measurable since the maximum observed crack width was less than the smallest unit (1/100 inch) on the crack comparator. This indicates that the cracks are well below the maximum allowed crack width of 0.013 inch per AASHTO Standard Specification for exterior exposure.

NTIS

Carbon Fiber Reinforced Plastics; Carbon Fibers; Fiber Composites; Crack Propagation; Crack Initiation; Cracks

20060013345 NASA Glenn Research Center, Cleveland, OH, USA

NASALife-Component Fatigue and Creep Life Prediction Program and Illustrative Examples

Murthy, Pappu L. N.; Mital, Subodh K.; Gyekenyesi, John Z.; [2005]; 6 pp.; In English; International Conference on Computational and Experimental Engineering and Sciences, 1-6 Dec. 2005, Madras, India; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-714-30-20; Copyright; Avail.: CASI: A02, Hardcopy

NASALife is a life prediction program for propulsion system components made of ceramic matrix composites (CMC) under cyclic thermo-mechanical loading and creep rupture conditions. Although, the primary focus was for CMC components the underlying methodologies are equally applicable to other material systems as well. The program references data for low cycle fatigue (LCF), creep rupture, and static material properties as part of the life prediction process. Multiaxial stresses are accommodated by Von Mises based methods and a Walker model is used to address mean stress effects. Varying loads are reduced by the Rainflow counting method. Lastly, damage due to cyclic loading (Miner s rule) and creep are combined to determine the total damage per mission and the number of missions the component can survive before failure are calculated. Illustration of code usage is provided through example problem of a CMC turbine stator vane made of melt-infiltrated, silicon carbide fiber-reinforced, silicon carbide matrix composite (MI SiC/SiC)

Derived from text

Prediction Analysis Techniques; Creep Properties; Ceramic Matrix Composites; Propulsion System Configurations; Fatigue Life; Life (Durability); Cyclic Loads

20060013348 NASA Glenn Research Center, Cleveland, OH, USA

Modified Single-Wall Carbon Nanotubes for Reinforce Thermoplastic Polyimide

Lebron-COlon, Marisabel; Meador, Michael A.; [2006]; 8 pp.; In English; SAMPE 2006, 30 Apr. - 4 May 2006, Long Beach, CA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

A significant improvement in the mechanical properties of the thermoplastic polyimide film was obtained by the addition of noncovalently functionalized single-wall carbon nanotubes (SWNTs). Polyimide films were reinforced using pristine SWNTs and functionalized SWNTs (F-SWNTs). The tensile strengths of the polyimide films containing F-SWNTs were found to be approximately 1.4 times higher than those prepared from pristine SWNTs.

Author

Carbon Nanotubes; Polyimides; Thermoplasticity; Nanocomposites; Reinforcing Materials

20060013414 Ohio Aerospace Inst., Cleveland, OH, USA

Modeling the Stress Strain Behavior of Woven Ceramic Matrix Composites

Morscher, Gregory N.; January 2006; 31 pp.; In English; 107th Annual American Ceramic Society Conference Richard M. Fulrath Symposium, 10-13 Apr. 2005, Baltimore, MD, USA; Original contains color illustrations

Contract(s)/Grant(s): NNC05AA16A; 953033.01.03.33

Report No.(s): E-15518; No Copyright; Avail.: CASI: A03, Hardcopy

Woven SiC fiber reinforced SiC matrix composites represent one of the most mature composite systems to date. Future components fabricated out of these woven ceramic matrix composites are expected to vary in shape, curvature, architecture, and thickness. The design of future components using woven ceramic matrix composites necessitates a modeling approach that can account for these variations which are physically controlled by local constituent contents and architecture. Research over the years supported primarily by NASA Glenn Research Center has led to the development of simple mechanistic-based models that can describe the entire stress-strain curve for composite systems fabricated with chemical vapor infiltrated matrices and melt-infiltrated matrices for a wide range of constituent content and architecture. Several examples will be presented that demonstrate the approach to modeling which incorporates a thorough understanding of the stress-dependent matrix cracking properties of the composite system.

Author

Ceramic Matrix Composites; Fiber Composites; Woven Composites; Silicon Carbides; Matrix Materials; Fabrication; Cracking (Fracturing)

20060013416 NASA Glenn Research Center, Cleveland, OH, USA

Compressive failure of fiber composites under multi-axial loading

Basu, Shiladitya; Waas, Anthony M.; Ambur, Damodar R.; Elsevier, Journal of Mechanics and Physics of Solids; January 2006; Vol. 54, 3, pp. 611-634; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NCC1-01050; Copyright; Avail.: Other Sources

This paper examines the compressive strength of a fiber reinforced lamina under multi-axial stress states. An equilibrium analysis is carried out in which a kinked band of rotated fibers, described by two angles, is sandwiched between two regions in which the fibers are nominally straight. Proportional multi-axial stress states are examined. The analysis includes the possibility of bifurcation from the current equilibrium state. The compressive strength of the lamina is contingent upon either attaining a load maximum in the equilibrium response or satisfaction of a bifurcation condition, whichever occurs first. The results show that for uniaxial loading a non-zero kink band angle beta produces the minimum limit load. For multi-axial loading, different proportional loading paths show regimes of bifurcation dominated and limit load dominated behavior. The present results are able to capture the beneficial effect of transverse compression in raising the composite compressive strength as observed in experiments.
Author
Axial Stress; Compressive Strength; Fiber Composites; Failure Analysis; Loads (Forces); Laminates

20060013424 Ohio Aerospace Inst., Brook Park, OH, USA
Modeling the Elastic Modulus of 2D Woven CVI SiC Composites
Morscher, Gregory N.; [2006]; 28 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNC05AA16A; WBS 033.01.03.33; No Copyright; Avail.: CASI: A03, Hardcopy

The use of fiber, interphase, CVI SiC minicomposites as structural elements for 2D-woven SiC fiber reinforced chemically vapor infiltrated (CVI) SiC matrix composites is demonstrated to be a viable approach to model the elastic modulus of these composite systems when tensile loaded in an orthogonal direction. The 0deg (loading direction) and 90deg (perpendicular to loading direction) oriented minicomposites as well as the open porosity and excess SiC associated with CVI SiC composites were all modeled as parallel elements using simple Rule of Mixtures techniques. Excellent agreement for a variety of 2D woven Hi-Nicalon(TradeMark) fiber-reinforced and Sylramic-iBN reinforced CVI SiC matrix composites that differed in numbers of plies, constituent content, thickness, density, and number of woven tows in either direction (i.e, balanced weaves versus unbalanced weaves) was achieved. It was found that elastic modulus was not only dependent on constituent content, but also the degree to which 90deg minicomposites carried load. This depended on the degree of interaction between 90deg and 0deg minicomposites which was quantified to some extent by composite density. The relationships developed here for elastic modulus only necessitated the knowledge of the fractional contents of fiber, interphase and CVI SiC as well as the tow size and shape. It was concluded that such relationships are fairly robust for orthogonally loaded 2D woven CVI SiC composite system and can be implemented by ceramic matrix composite component modelers and designers for modeling the local stiffness in simple or complex parts fabricated with variable constituent contents.
Author
Ceramic Matrix Composites; Woven Composites; Composite Materials; Modulus of Elasticity; Porosity; Loads (Forces); Fabrication

20060013437 NASA Langley Research Center, Hampton, VA, USA
Mechanical Properties of T650-35/AFR-PE-4 at Elevated Temperatures for Lightweight Aeroshell Designs
Whitley, Karen S.; Collins, TImothy J.; [2006]; 13 pp.; In English; 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 1-4 May 2006, Newport, RI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 759-07-11
Report No.(s): AIAA Paper 2006-2202; No Copyright; Avail.: CASI: A03, Hardcopy

Considerable efforts have been underway to develop multidisciplinary technologies for aeroshell structures that will significantly increase the allowable working temperature for the aeroshell components, and enable the system to operate at higher temperatures while sustaining performance and durability. As part of these efforts, high temperature polymer matrix composites and fabrication technologies are being developed for the primary load bearing structure (heat shield) of the spacecraft. New high-temperature resins and composite material manufacturing techniques are available that have the potential to significantly improve current aeroshell design. In order to qualify a polymer matrix composite (PMC) material as a candidate aeroshell structural material, its performance must be evaluated under realistic environments. Thus, verification testing of lightweight PMC's at aeroshell entry temperatures is needed to ensure that they will perform successfully in high-temperature environments. Towards this end, a test program was developed to characterize the mechanical properties of two candidate material systems, T650-35/AFR-PE-4 and T650-35/RP46. The two candidate high-temperature polyimide resins, AFR-PE-4 and RP46, were developed at the Air Force Research Laboratory and NASA Langley Research Center, respectively. This paper presents experimental methods, strength, and stiffness data of the T650-35/AFR-PE-4 material as a function of elevated temperatures. The properties determined during the research test program herein, included tensile

strength, tensile stiffness, Poisson s ratio, compressive strength, compressive stiffness, shear modulus, and shear strength. Unidirectional laminates, a cross-ply laminate and two eight-harness satin (8HS)-weave laminates (4-ply and 10-ply) were tested according to ASTM standard methods at room and elevated temperatures (23, 316, and 343 C). All of the relevant test methods and data reduction schemes are outlined along with mechanical data. These data contribute to a database of material properties for high-temperature polyimide composites that will be used to identify the material characteristics of potential candidate materials for aeroshell structure applications.
Author
Aeroshells; Mechanical Properties; Aircraft Design; High Temperature; Fabrication; Composite Materials

20060013456 NASA Langley Research Center, Hampton, VA, USA
Variable Stiffness Panel Structural Analyses With Material Nonlinearity and Correlation With Tests
Wu, K. Chauncey; Gurdal, Zafer; [2006]; 20 pp.; In English; 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 1-4 May 2006, Newport, RI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-064-30-34
Report No.(s): AIAA Paper 2006-2165; Copyright; Avail.: CASI: A03, Hardcopy

Results from structural analyses of three tow-placed AS4/977-3 composite panels with both geometric and material nonlinearities are presented. Two of the panels have variable stiffness layups where the fiber orientation angle varies as a continuous function of location on the panel planform. One variable stiffness panel has overlapping tow bands of varying thickness, while the other has a theoretically uniform thickness. The third panel has a conventional uniform-thickness [plus or minus 45](sub 5s) layup with straight fibers, providing a baseline for comparing the performance of the variable stiffness panels. Parametric finite element analyses including nonlinear material shear are first compared with material characterization test results for two orthotropic layups. This nonlinear material model is incorporated into structural analysis models of the variable stiffness and baseline panels with applied end shortenings. Measured geometric imperfections and mechanical prestresses, generated by forcing the variable stiffness panels from their cured anticlastic shapes into their flatter test configurations, are also modeled. Results of these structural analyses are then compared to the measured panel structural response. Good correlation is observed between the analysis results and displacement test data throughout deep postbuckling up to global failure, suggesting that nonlinear material behavior is an important component of the actual panel structural response.
Author
Nonlinearity; Panels; Stiffness; Structural Analysis; Composite Materials; Mechanical Properties

20060013467 NASA Langley Research Center, Hampton, VA, USA
Thermal Conductivity of Polyimide/Nanofiller Blends
Ghose, S.; Watson, K. A.; Delozier, D. M.; Working, D. c.; Connell, J. W.; Smith, J. G.; Sun, Y. P.; Lin, Y.; [2006]; 15 pp.; In English; SAMPE 2006 Symposium and Exhibition (51st ISSE), 30 Apr. - 4 May 2006, Long Beach, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-612-20-07-12; Copyright; Avail.: CASI: A03, Hardcopy

In efforts to improve the thermal conductivity of Ultem(TM) 1000, it was compounded with three carbon based nano-fillers. Multiwalled carbon nanotubes (MWCNT), vapor grown carbon nanofibers (CNF) and expanded graphite (EG) were investigated. Ribbons were extruded to form samples in which the nano-fillers were aligned. Samples were also fabricated by compression molding in which the nano-fillers were randomly oriented. The thermal properties were evaluated by DSC and TGA, and the mechanical properties of the aligned samples were determined by tensile testing. The degree of dispersion and alignment of the nanoparticles were investigated with high-resolution scanning electron microscopy. The thermal conductivity of the samples was measured in both the direction of alignment as well as perpendicular to that direction using the Nanoflash technique. The results of this study will be presented.
Author
Fabrication; Mechanical Properties; Mixtures; Nanoparticles; Polyimides; Thermal Conductivity

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20060013285 Maryland Univ., College Park, MD, USA
Nanobiogeochemistry of Microbe/Mineral Interactions: A Force Microscopy and Bioinformatics Approach
Lower, S. K.; January 2005; 10 pp.; In English
Report No.(s): DE2006-860984; No Copyright; Avail.: National Technical Information Service (NTIS)

In the original proposal (section 5, General Approach and Hypotheses, and Section 6, Research Plan), the planned research program for this three-year project was divided into three major tasks. These included research involving (1) biological force microscopy to study intermolecular forces between whole bacterial cells and minerals, (2) chemical force microscopy to study interactions between discrete biomolecules and mineral surfaces, and (3) molecular modeling of interactions between functional groups on biological and mineralogical surfaces. Dr. Lower was in charge of task 1, biological force microscopy. Dr. Lower has been involved in tasks 2 and 3 but, as these are under the supervision of Dr. Hochella, these tasks will not be discussed herein.
NTIS
Microorganisms; Microscopy; Minerals

20060013299 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
Experimental Studies in the System H2O-CH4-'Petroleum' - Salt Using Synthetic Fluid Inclusions. (Report for August 1998-June 2005)
Bodnar, R. J.; January 2005; 8 pp.; In English
Report No.(s): DE2006-840894; No Copyright; Avail.: National Technical Information Service (NTIS)

The aim of this project was to determine phase equilibrium and physcial vapor transport (PVT) properties of fluids in the water-methane system using synthetic fluid inclusions. This information is critical to understanding the behavior of natural fluid inclusions trapped in hydrocarbon-bearing environments such as sedimentary basins, oil and gas fields, methane hydrate occurrences and Mississippi Valley type Pb-Zn deposits.
NTIS
Crude Oil; Inclusions; Methane; Synthetic Fuels; Water

20060013322 Argonne National Lab., IL USA
Basic Research Needs for the Hydrogen Economy. Report of the Basic Energy Sciences Workshop on Hydrogen, Production, Storage, and Use. Held on May 13-15, 2003
Feb. 2004; 182 pp.; In English; Energy Sciences Workshop on Hydrogen, Production, Storage, and Use, May 13 - 15, 2003
Contract(s)/Grant(s): DE-W-31-109-ENG-38
Report No.(s): PB2006-109337; No Copyright; Avail.: National Technical Information Service (NTIS)

This Workshop Report responds to the four research challenges for the hydrogen economy outlined by Secretary of Energy Spencer Abraham in his address to the National Hydrogen Association: - Dramatically lower the cost of fuel cells for transportation, -Develop a diversity of sources for hydrogen production at energy costs comparable to gasoline, - Find viable methods of on-board storage of hydrogen for transportation uses, and - Develop a safe and effective infrastructure for seamless delivery of hydrogen from production to storage to use. The reports of the panels on hydrogen production, storage, and use in fuel cells and the high-priority research directions identified by the Workshop address these research challenges. The focus of the Workshop was to identify knowledge gaps in the scientific and technological bases for hydrogen production, storage and use, and to identify high-priority fundamental research directions that would likely have high impact on enabling a hydrogen economy.
NTIS
Hydrogen; Hydrogen Production; Research

20060013422 NASA Glenn Research Center, Cleveland, OH, USA
Chemical, Physical, and Mechanical Characterization of Isocyanate Cross-linked Amine-Modified Silica Aerogels
Katti, Atul; Shimpi, Nilesh; Roy, Samit; Lu, Hongbing; Fabrizio, Eve F.; Dass, Amala; Capadona, Lynn A.; Leventis, Nicholas; Chemistry of Materials; January 2006; Volume 18, pp. 285-296; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 22-066-10-11; Copyright; Avail.: Other Sources

We describe a new mechanically strong lightweight porous composite material obtained by encapsulating the skeletal framework of amine-modified silica aerogels with polyurea. The conformal polymer coating preserves the mesoporous structure of the underlying silica framework and the thermal conductivity remains low at 0.041 plus or minus 0.001 W m(sup -1 K(sup -1). The potential of the new cross-linked silica aerogels for load-carrying applications was determined through characterization of their mechanical behavior under compression, three-point bending, and dynamic mechanical analysis (DMA). A primary glass transition temperature of 130 C was identified through DMA. At room temperature, results indicate a hyperfoam behavior where in compression cross-linked aerogels are linearly elastic under small strains (less than 4%) and then exhibit yield behavior (until 40% strain), followed by densification and inelastic hardening. At room temperature the compressive Young's modulus and the Poisson's ratio were determined to be 129 plus or minus 8 MPa and 0.18, respectively, while the strain at ultimate failure is 77% and the average specific compressive stress at ultimate failure is 3.89 x 10(exp 5) N m kg(sup -1). The specific flexural strength is 2.16 x 10(exp 4) N m kg(sup -1). Effects on the compressive behavior of strain rate and low temperature were also evaluated.
Author
Aerogels; Amines; Isocyanates; Mechanical Properties; Silicon Dioxide; Crosslinking; Physical Properties; Chemical Properties

20060013521 NASA Glenn Research Center, Cleveland, OH, USA
Protection of 2-(3-Thienyl)ethanol with 3-Thienylacetic Acid and Hard Cross- Linked Conducting Films by Electropolymerization of the Ester
Leventis, Nicholas; Dass, Amala; Mulik, Sudir; Sotiriou-Leventis, Chariklia; [2005]; 23 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-06-10-11; Copyright; Avail.: CASI: A03, Hardcopy

The ester (compound 1) of 2-(3-thienyl)ethanol (T-etOH) with 3-thienylacetic acid was synthesized as a monomer whose two thiophene groups could be electropolymerized independently, becoming members of different polymer chains in a highly-crosslinked highly-insoluble polymer. Indeed, 1 was electropolymerized successfully alone and together with 3-methylthiophene (3MeT). Films of poly(1) are hard (3H, as opposed to less than 6B for poly(3MeT)), and the close proximity of the polymeric strands creates pi-stacking interactions. The behavior of 1 suggests that by: (a) limiting the potential used for the oxidation of monomeric esters of T-etOH at the foot of their oxidation waves (less than 1.8 V vs. Ag/AgCl); and, (b) compensating for the decrease in the electrogenerated radical concentration by increasing the monomer concentration, practically all esters of T-etOH should be electropolymerizable. This was confirmed by durable film formation from the archetypical ester of T-etOH, the 2-(3-thienyl)ethyl acetate (T-etOAc), whose homo-electropolymerization is reported for the first time.
Author
Crosslinking; Polymerization; Esters; Synthesis (Chemistry); Electrochemistry; Acetic Acid; Ethyl Alcohol

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METALS AND METALLIC MATERIALS

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

20060013306 Texas Univ., Arlington, TX, USA, Oak Ridge National Lab., TN USA
Development of Semi-Stochastic Algorithm for Optimizing Alloy Composition of High-Temperature Austenitic Stainless Steels (H-Series) for Desired Mechanical and Corrosion Properties. (Final Technical Report.)
Dulikravich, G. S.; Sikka, V. K.; Muralidharan, G.; Mar. 2005; 88 pp.; In English
Report No.(s): DE2006-838432; ORNL/TM-2005/81; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this project is to adapt and use an advanced semi-stochastic algorithm for constrained multiobjective optimization and combine it with experimental testing and verification to determine optimum concentrations of alloying elements in heat-resistant and corrosion-resistant H-Series austenitic stainless steel alloys that will simultaneously maximize a number of alloy's mechanical and corrosion properties. The approach consists of the use of an advanced semi-stochastic algorithm adapted for constrained multiobjective optimization combined with selective experimental testing and verification

to determine optimum concentrations of alloying elements in heat-resistant and corrosion-resistant H-Series austenitic stainless steel alloys and Ni-based superalloys.
NTIS
Algorithms; Austenitic Stainless Steels; Corrosion; Corrosion Resistance; High Temperature; Mechanical Properties; Stainless Steels; Stochastic Processes

20060013419 NASA Glenn Research Center, Cleveland, OH, USA
TEMPORAL EVOLUTION of SUB-NANOMETER COMPOSITIONAL PROFILES ACROSS the GAMMA/ GAMMA' INTERFACE IN A MODEL Ni-Al-Cr SUPERALLOY
Sudbrack, Chantal K.; Noebe, Ronald D.; Seidman, David N.; [2005]; 6 pp.; In English
Contract(s)/Grant(s): NSF DMR-02-41928; WBS 033.01.03.02; Copyright; Avail.: CASI: A02, Hardcopy

Early-stage phase separation in a Ni-5.2 Al-14.2 Cr at.% superalloy, isothermally decomposing at 873 K, is investigated with atom-probe tomography. Sub-nanometer scale compositional profiles across the gamma/gamma'(L12) interfaces demonstrate that both the gamma-matrix and the gamma'-precipitate compositions evolve with time. Observed chemical gradients of Al depletion and Cr enrichment adjacent to the gamma'-precipitates are transient, consistent with well-established model predictions for diffusion-limited growth, and mark the first detailed observation of this phenomenon. Furthermore, it is shown that Cr atoms are kinetically trapped in the growing precipitates.
Author
Heat Resistant Alloys; Precipitates; Decomposition; Isothermal Processes; Diffusion; Enrichment

20060013420 NASA Glenn Research Center, Cleveland, OH, USA
Experimental Investigation of Solder Joint Defect Formation and Mitigation in Reduced-Gravity Environments
Watson, J. Kevin; Struk, Peter M.; Pettegrew, RIchard D.; Downs, Robert S.; [2006]; 15 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 801.04.15.01.02.D1; No Copyright; Avail.: CASI: A03, Hardcopy

This paper documents a research effort on reduced gravity soldering of plated through hole joints which was conducted jointly by the National Center for Space Exploration Research, NASA Glenn Research Center, and NASA Johnson Space Center. Significant increases in joint porosity and changes in external geometry were observed in joints produced in reduced gravity as compared to normal gravity. Multiple techniques for mitigating the observed increase in porosity were tried, including several combinations of flux and solder application techniques, and demoisturizing the circuit board prior to soldering. Results were consistent with the hypothesis that the source of the porosity is a combination of both trapped moisture in the circuit board itself, as well as vaporized flux that is trapped in the molten solder. Other topics investigated include correlation of visual inspection results with joint porosity, pore size measurements, limited pressure effects (0.08 MPa - 0.1 MPa) on the size and number of pores, and joint cooling rate.
Author
Soldering; Pressure Effects; Porosity; Moisture; Microgravity; Visual Observation

20060013421 NASA Glenn Research Center, Cleveland, OH, USA
Properties of a Ni(sub 19.5)Pd(sub 30)Ti(sub 50.5) high-temperature shape memory alloy in tension and compression
Noebe, Ronald; Padula, Santo, II; Bigelow, Glen; Rios, Orlando; Garg, Anita; Lerch, Brad; [2006]; 13 pp.; In English; SPIE Conference: Smart Structures and Materials 2006: Active Materials; Behavior and Mechanics, 26 Feb. - 2 Mar. 2006, San Diego, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 033.01.03.02; Copyright; Avail.: CASI: A03, Hardcopy

Potential applications involving high-temperature shape memory alloys have been growing in recent years. Even in those cases where promising new alloys have been identified, the knowledge base for such materials contains gaps crucial to their maturation and implementation in actuator and other applications. We begin to address this issue by characterizing the mechanical behavior of a Ni19.5Pd30Ti50.5 high-temperature shape memory alloy in both uniaxial tension and compression at various temperatures. Differences in the isothermal uniaxial deformation behavior were most notable at test temperatures below the martensite finish temperature. The elastic modulus of the material was very dependent on strain level; therefore, dynamic Young#s Modulus was determined as a function of temperature by an impulse excitation technique. More importantly, the performance of a thermally activated actuator material is dependent on the work output of the alloy. Consequently, the strain-temperature response of the Ni19.5Pd30Ti50.5 alloy under various loads was determined in both tension and compression and the specific work output calculated and compared in both loading conditions. It was found that

the transformation strain and thus, the specific work output were similar regardless of the loading condition. Also, in both tension and compression, the strain-temperature loops determined under constant load conditions did not close due to the fact that the transformation strain during cooling was always larger than the transformation strain during heating. This was apparently the result of permanent plastic deformation of the martensite phase with each cycle. Consequently, before this alloy can be used under cyclic actuation conditions, modification of the microstructure or composition would be required to increase the resistance of the alloy to plastic deformation by slip.
Author
Shape Memory Alloys; Heat Resistant Alloys; Microstructure; Modulus of Elasticity; Tension; Compression Tests

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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*.

20060013305 Tennessee Univ. Space Inst., Tullahoma, TN, USA, Oak Ridge National Lab., TN USA
High Energy Density Coating of High Temperature Advanced Materials for Energy Efficient Performance. (Final Report for October 1. 2001-December 31, 2004)
Dahotre, N. B.; Sikka, V. K.; Blue, C. A.; Mar. 31, 2005; 56 pp.; In English
Report No.(s): DE2006-838863; No Copyright; Avail.: National Technical Information Service (NTIS)

The project involved development of the technique and materials systems for coatings on ferrous (steel) and nonferrous (Al-alloy) structural alloys for high temperature wear and corrosion applications. Such coatings were ceramic-based (TiC, and TiB2) and intermetallic (Fe-Al) materials systems. The laser-based and infrared plasma-based techniques were developed to deposit coatings on metal substrates. The use of laser, infrared plasma and combination allows coating of various surface geometries in selective manner with generation of novel and nontraditional microstructures within the coating and subsurface region. Due to control on processing parameters during both laser and infrared processing, various thermal conditions ranging from equilibrium to near- or non-equilibrium can be achieved to tailor the microstructure and both chemical and physical properties of the coatings.
NTIS
Coating; Refractory Materials

20060013346 NASA Glenn Research Center, Cleveland, OH, USA
Mechanically Strong Lightweight Materials for Aerospace Applications (x-aerogels)
Leventis, Nicholas; [2005]; 8 pp.; In English; 56th International Astronautical Congress, 17-21 Oct. 2005, Fukuoka, Japan; Original contains black and white illustrations
Contract(s)/Grant(s): 22-066-10-11
Report No.(s): IAC-05-C2.7.09; No Copyright; Avail.: CASI: A02, Hardcopy

The X-Aerogel is a new NASA-developed strong lightweight material made by reacting the mesoporous surfaces of 3-D networks of inorganic nanoparticles with polymeric crosslinkers. Since the relative amount of the crosslinker and the backbone are comparable, X-Aerogels can be viewed either as aerogels modified by templated accumulation of polymer on the skeletal nanoparticles, or as nanoporous polymers made by templated casting of polymeric precursors on a nanostructured framework. The most striking feature of X-Aerogels is that for a nominal 3-fold increase in density (still a ultralightweight material), the mechanical strength can be up to 300 times higher than the strength of the underlying native aerogel. Thus, X-Aerogels combine a multiple of the specific compressive strength of steel, with the thermal conductivity of styrofoam. XAerogels have been demonstrated with several polymers such as polyurethanes/polyureas, epoxies and polyolefins, while crosslinking of approximately 35 different oxide aerogels yields a wide variety of dimensionally stable, porous lightweight materials with interesting structural, magnetic and optical properties. X-Aerogels are evaluated for cryogenic rocket fuel storage tanks and for Advanced EVA suits, where they will play the dual role of the thermal insulator/structural material. Along the same lines, major impact is also expected by the use of X-Aerogels in structural components/thermal protection for small satellites, spacecrafts, planetary vehicles and habitats.
Author
Aerogels; Aerospace Engineering; Mechanical Properties; Porous Materials

20060013347 NASA Glenn Research Center, Cleveland, OH, USA

Polymer Crosslinked 3-D Assemblies of Nanoparticles: Mechanically Strong Lightweight Porous Materials

Leventis, Nicholas; [2005]; 1 pp.; In English; 13th National Science Foundation Workshop on Materials Chemistry and Nanoscience, 28-31 Oct. 2005, Alexandria, VA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 22-066-10-11

Report No.(s): E-15504; No Copyright; Avail.: CASI: A01, Hardcopy

In analogy to supramolecular assemblies, which are pursued because of properties above and beyond those of the individual molecules, self-standing monolithic three-dimensional assemblies of nanoparticles also have unique properties attributed to their structure. For example, ultra low-density 3-D assemblies of silica nanoparticles, known as silica aerogels, are characterized by large internal void space, high surface area and very low thermal conductivity. Aerogels, however, are also extremely fragile materials, limiting their application to a few specialized environments, e.g., in nuclear reactors as Cerenkov radiation detectors, in space (refer to NASA's Stardust Program) and aboard certain planetary vehicles (thermal insulators on Mars Rovers in 1997 and 2004). The fragility problem is traced to well-defined weak points in the aerogel skeletal framework, the interparticle necks. Using the surface functionality of the nanoparticle building blocks as a focal point, we have directed attachment of a conformal polymer coating over the entire framework, rendering all necks wider. Thus, although the bulk density may increase only by 3x, the mesoporosity (pores in the range 2-50 nm) remains unchanged, while the strength of the material increases by up to 300... Having addressed the fragility problem, aerogels are now robust materials, and a variety of applications, ranging from thermal/acoustic insulators to catalyst supports, to platform for sensors, and dielectrics are all within reach. Our approach employs molecular science to manipulate nanoscopic matter for achieving useful macroscopic properties, and in our view it resides at the core of what defines nanotechnology. In that spirit, this technology is expandable in three directions. Thus, we have already crosslinked successfully amine-modified silica, and we anticipate that more rich chemistry will be realized by been creative with the nanoparticle surface modifiers. On the other hand, although we do not expect orders-of-magnitude increase in strength, nevertheless, by varying the polymer we expect to impart other properties such as hydrophobicity, thermal stability and perhaps electrical conductivity. Besides polymers, crosslinkers will include metals and ceramics (e.g., through POSS precursors). Finally, network morphology directs load dissipation, and of approximately 30 different crosslinked oxide aerogels, vanadia, whose structure is fibrous rather than particulate, yields a much stronger (by 4..) material than silica of the same density. It seems imperative to implement control of network morphology, even through templating.

Author

Crosslinking; Nanoparticles; Porous Materials; Three Dimensional Models; Polymers; Mechanical Properties

20060013423 NASA Langley Research Center, Hampton, VA, USA

Potential Polymeric Sphere Construction Materials for a Spacecraft Electrostatic Shield

Smith, Joseph G., Jr.; Smith, Trent; Williams, Martha; Youngquist, Robert; Mendell, Wendell; April 2006; 31 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 612-10-04-23

Report No.(s): NASA/TM-2006-214303; L-19251; No Copyright; Avail.: CASI: A03, Hardcopy

An electrostatic shielding concept for spacecraft radiation protection under NASA s Exploration Systems Research and Technology Program was evaluated for its effectiveness and feasibility. The proposed shield design is reminiscent of a classic quadrupole with positively and negatively charged spheres surrounding the spacecraft. The project addressed materials, shield configuration, power supply, and compared its effectiveness to that of a passive shield. The report herein concerns the identification of commercially available materials that could be used in sphere fabrication. It was found that several materials were needed to potentially construct the spheres for an electrostatic shield operating at 300 MV.

Author

Spacecraft Construction Materials; Radiation Protection; Radiation Shielding; Electrostatic Shielding; Tensile Strength

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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*.

20060013243 NASA Johnson Space Center, Houston, TX, USA

Flight Data Update on Long-Term Compound Stability in Dual Sorbent Tubes

James, John T.; Limero, Thomas; Beck, Steve; Cheng, Patti; deVera, Vanessa; [2006]; 1 pp.; In English; 36th International Conference on Environmental Systems, 17-20 Jul. 2006, Norfolk, VA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Dual Sorbent Tubes (DSTs) are currently the primary method for collecting volatile organic compounds in the cabin air of the International Space Station (ISS). Data from groundbased analysis of these archival air samplers provide a major component of the assessment of ISS air quality by the NASA toxicologist. At the 2005 ICES conference data from the positive control DSTs, returned on Soyuz 7S and 8S, were presented. Positive control tubes are dosed, preflight, with known concentrations of representative contaminant compounds and they are launched to ISS in the DST kit as trip controls. Upon return of the DST kit to the ground, results from analysis of the trip (positive) and laboratory control tubes are used to determine the recoveries: concentration of dosed compounds retained in the tube. Results from positive controls, returned on 7S and 8S showed substantial losses of some compounds dosed into the tubes 156 to 240 days prior to the analysis. Low recoveries are expected for spacecraft air contaminants with similar properties to the poorly recovered dosed compounds. It was shown that compound losses in the control tubes were consistent, which led to the generation of acceptable correction factors for spacecraft air contaminants. Correction factors decrease the accuracy of derived compound concentrations and substantial error could arise under some conditions. An investigation into the mechanism for compound loss is necessary before design modifications can be implemented to improve the DST performance. This paper will update results from the DSTs returned on Soyuz 9S and 10S missions during the latter part of 2005. The data acquired from these returned DSTs will be compared to the 7S and 8S data presented last year. Discussion will focus on the reliability of correction factors and identify any trends in the data. This paper will describe the experimental design and plans to identify the compound loss mechanism. Author

Sorbents; Stability; Pipes (Tubes); Volatile Organic Compounds; Experiment Design

20060013415 NASA Glenn Research Center, Cleveland, OH, USA

The Boiling eXperiment Facility (BXF) for the Microgravity Science Glovebox (MSG)

McQuillen, John; Chao, David; Vergilii, Frank; [2006]; 14 pp.; In English; Habitation 2006, 5-8 Feb. 2006, Orlando, FL, USA; Original contains black and white illustrations

Contract(s)/Grant(s): 572.04.02; No Copyright; Avail.: CASI: A03, Hardcopy

Boiling is an effective means of cooling by removing heat from surfaces through vaporization of a working fluid. It is also affected by both the magnitude and direction of gravity. By conducting pool boiling tests in microgravity, the effect of buoyancy n the overall boiling process and the relative magnitude of other phenomena can be assessed. The Boiling eXperiment Facility (BXF) is being built for the Microgravity Science Glovebox. This facility will conduct two pool boiling studies. The first study the Microheater Array Boiling Experiment (MABE) uses two 96 element microheater arrays, 2.7 mm and 7.0 mm in size, to measure localized hear fluxes while operating at a constant temperature. The other experiment, the Nucleate Pool Boiling eXperiment (NPBX) uses a 85 mm diameter heater wafer that has been 'seeded' with five individually-controlled nucleation sites to study bubble nucleation, growth, coalescence and departure. The BXF uses normal-perfluorohexane as the test fluid and will operate between pressures of 60 to 244 Pa. and temperatures of 35 to 60 C. Both sets of experimental heaters are highly instrumented. Pressure and bulk fluid temperature measurements will be made with standard rate video. A high speed video system will be used to visualize the boiling process through the bottom of the MABE heater arrays. The BXF is currently scheduled to fly on Utilization Flight-13A.1 to the ISS with facility integration into the MSG and operation during Increment 15

Author

Microgravity; Nucleate Boiling; Spaceborne Experiments; International Space Station

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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*.

20060013293 National Academy of Sciences - National Research Council, Washington, DC, USA
Development of Interactive Web site
Bishop, L.; Jul. 15, 2005; 8 pp.; In English
Report No.(s): DE2006-859192; No Copyright; Avail.: Department of Energy Information Bridge

Tribal Cultural Resources Web Site: Purpose: Interactive forum and communications tool for obtaining and reviewing documents; Understand timely materials are important; Recognize obligation to protect culturally sensitive data; Password protected - each Tribe will have unique login and password; and Access also provided to SHPO and BLM.
NTIS
American Indians; Websites

20060013339 Research and Technology Organization, Neuilly-sur-Seine, France
Use of Speech and Language Technology in Military Environments
December 2005; 106 pp.; In English; Use of Speech and Language Technology in Military Environments, 20-21 Nov. 2003, Montreal, Canada; Original contains color and black and white illustrations
Report No.(s): RTO-TR-IST-037; AC/323(IST-037)TP/22; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

Communications, command and control, intelligence and training systems are making more and more use of speech and language technology components: i.e. speech coders, voice controlled C2 systems, speaker and language recognition, translation systems and automated training suites. Implementation of these technologies requires an understanding of what performance is possible with the products that are available today and those that will likely to be available in the next few years. As speech and language technology become more available for integration into military systems, it is important that those involved in system design and program management be aware of the capabilities and the limitations of present speech systems. They must also be aware of the current state of research in order to be able to consider what will be possible in the future. This will be very important when considering future military systems upgrades. This lecture series includes presentations of the current state of the art and the current research topics in selected speech and language technology areas: assessment techniques and standards, speech recognition, speaker and language identification, and translation.
Author
Speech Recognition; Automatic Control; Voice Communication; Military Technology; Words (Language)

20060013343 NASA Glenn Research Center, Cleveland, OH, USA
RF Technologies for Advancing Space Communication Infrastructure
Romanofsky, Robert R.; Bibyk, Irene K.; Wintucky, Edwin G.; [2006]; 9 pp.; In English; 2006 IEEE Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-041-20-02
Report No.(s): IEEEAC Paper 1552; No Copyright; Avail.: CASI: A02, Hardcopy

This paper will address key technologies under development at the NASA Glenn Research Center designed to provide architecture-level impacts. Specifically, we will describe deployable antennas, a new type of phased array antenna and novel power amplifiers. The evaluation of architectural influence can be conducted from two perspectives where said architecture can be analyzed from either the top-down to determine the areas where technology improvements will be most beneficial or from the bottom-up where each technology s performance advancement can affect the overall architecture s performance. This paper will take the latter approach with focus on some technology improvement challenges and address architecture impacts. For example, using data rate as a performance metric, future exploration scenarios are expected to demand data rates possibly exceeding 1 Gbps. To support these advancements in a Mars scenario, as an example, Ka-band and antenna aperture sizes on the order of 10 meters will be required from Mars areostationary platforms. Key technical challenges for a large deployable antenna include maximizing the ratio of deployed-to-packaged volume, minimizing aerial density, maintaining RMS surface accuracy to within 1/20 of a wavelength or better, and developing reflector rigidization techniques. Moreover, the high frequencies and large apertures manifest a new problem for microwave engineers that are familiar to optical communications

specialists: pointing. The fine beam widths and long ranges dictate the need for electronic or mechanical feed articulation to compensate for spacecraft attitude control limitations.
Author
Radio Frequencies; Space Communication; Technology Utilization; Antenna Design; Large Space Structures

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*.

20060013180 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Topside sounders as mobile ionospheric heaters
Benson, R. F.; [2006]; 1 pp.; In English; 12th Annual RF Ionospheric Interactions Workshop, 25-28 Apr. 2006, Santa Fe, NM, USA; No Copyright; Avail.: Other Sources; Abstract Only

There is evidence that satellite-borne RF sounders can act as mobile ionospheric heaters in addition to performing topside sounding. The main objective of topside sounding is to use sounder-generated electromagnetic (em) waves to obtain ionospheric topside vertical electron-density (N(sub e) profiles. These profiles are obtained from mathematical inversions of the frequency vs. delay-time ionospheric reflection traces. In addition to these em reflection traces, a number of narrowband intense signals are observed starting at zero delay times after the transmitted pulses. Some of these signals, termed plasma resonances, appear at characteristic frequencies of the ambient medium such as at the electron cyclotron frequency f(sub ce), the harmonics nf(sub ce), the electron plasma frequency f(sub pe) and the upper-hybrid frequency f(sub uh), where (f(sub uh))(exp 2) = (f(sub ce))(exp 2) + (f(sub pe))(exp 2) . These signals have been attributed to the oblique echoes of sounder-generated electrostatic (es) waves. These resonances provide accurate in situ f(sub pe) and f(sub ce) values which, in turn, lead to accurate N(sub e) and [B] values where B is the ambient magnetic field. Resonances are also observed between the nf(sub ce) harmonics both above and below f(sub uh). The former, known as the Qn plasma resonances, are mainly attributed to the matching of the wave group velocity of sounder-generated (Bernstein-mode) es waves to the satellite velocity. The frequency spectrum of these waves in the magnetosphere can be used to detect non-Maxwellian electron velocity-distributions. In addition, these resonances also exhibit components that appear to be the result of plasma emissions stimulated by the sounder pulses. The plasma resonances observed between the nf(sub ce) harmonics and below f(sub uh), known as the Dn plasma resonances, are entirely attributed to such sounder-stimulated plasma emissions. There are other sounder-stimulated plasma phenomena that also fall into this category, e.g., ion affects on electron-resonant phenomena, proton-cyclotron echoes and N(sub e) field-aligned irregularities (FAI). Some of these phenomena are more pronounced when f(sub pe)/f(sub ce) approx. = n where n is an integer significantly greater than one. The observations suggest that the sounder-stimulated plasma phenomena are stimulated, or enhanced, on a time scale much less than one second. The purpose of this presentation is to review the above topics with particular emphasis on the sounder-stimulated plasma phenomena.
Author
Radio Frequencies; Sounding; Electromagnetic Radiation; Electrostatic Waves; Electron Density Profiles; Plasma Resonance; Harmonics; Ionospheric Propagation; Frequency Distribution; Electron Distribution

20060013441 NASA Johnson Space Center, Houston, TX, USA
Screening Li-Ion Batteries for Internal Shorts
Darcy, Eric; [2006]; 4 pp.; In English; International Meeting on Screening Li-Ion Batteris for Internal Shorts, 19-23 Jun. 2006, Biarritx, France; Original contains color illustrations
Contract(s)/Grant(s): 769-06-06-01-02-09; No Copyright; Avail.: CASI: A01, Hardcopy

The extremely high cost of aerospace battery failures due to internal shorts makes it essential that their occurrence be very rare, if not eliminated altogether. With Li-ion cells/batteries, the potentially catastrophic safety hazard that some internal shorts present adds additional incentive for prevention. Prevention can be achieved by design, manufacturing measures, and testing. Specifically for NASA s spacesuit application, a Li-ion polymer pouch cell battery design is in its final stages of production. One of the 20 flight batteries fabricated and tested developed a cell internal short, which did not present a safety hazard, but has required revisiting the entire manufacturing and testing process. Herein are the details of the failure investigation that

followed to get to root cause of the internal short and the corrective actions that will be taken. The resulting lessons learned are applicable to most Li-ion battery applications.
Author
Lithium Batteries; Space Suits; Electric Batteries; Costs; Prevention

20060013508 NASA Dryden Flight Research Center, Edwards, CA, USA
Development and Ground-Test Validation of Fiber Optic Sensor Attachment Techniques for Hot Structures Applications
Piazza, Anthony; Hudson, Larry D.; Richards, W. Lance; [2005]; 21 pp.; In English; SensorsGov Expo and Conference, 6-8 Dec. 2005, Hampton, VA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Fiber Optic Strain Measurements: a) Successfully attached silica fiber optic sensors to both metallics and composites; b) Accomplished valid EFPI strain measurements to 1850 F; c) Successfully attached EFPI sensors to large scale hot-structures; and d) Attached and thermally validated FBG bond and epsilon(sub app). Future Development a) Improve characterization of sensors on C-C and C-SiC substrates; b) Apply application to other composites such as SiC-SiC; c) Assist development of interferometer based Sapphire sensor currently being conducted under a Phase II SBIR; and d) Complete combined thermal/mechanical testing of FBG on composite substrates in controlled laboratory environment.
Derived from text
Fiber Optics; Interferometers; Strain Measurement; Silicon Dioxide; Joints (Junctions); Ground Tests

20060013529 Katholieke Univ. te Leuven, Belgium
Electrical Motors/Generator Technology
Driesin, Johan; Belmans, Ronnie; Micro Gas Turbines; December 2005, pp. 11-1 - 11-28; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Devices, transforming energy by electromagnetic processes are understood as electrical machines. There are three types of devices for energy conversion that can be distinguished: Transformers are converters transforming electrical energy into another form of electrical energy with different properties (voltage, current); Motors where the electrical energy is converted into mechanical energy; and Generators for generating electrical energy from mechanical energy. Motors and generators are in fact the same devices as electromagnetic-electromechanical energy conversion is reversible. So when a motor brakes, it will reverse the power consumption and try to put power back into the supply. The vast majority of electrical machines uses magnetic force principles to achieve the conversion. Electrical forces, based upon the attraction of charges, are in general too weak for practical applications and are only used in (silicon) micromachines or microphones. Magnetic forces arise due to the minimization of magnetic field energy. For instance, when a permanent magnet is close to a piece of ferromagnetic iron, it is attracted as the field energy is minimized when the air gap between the two pieces is as small as possible. In fact this sort of force, called reluctance1 force, is induced in movable or deformable structures by a single magnetic field until a minimum of field energy is attained. This force causes all sorts of attraction and alignment, for instance in machines with (magnetic) asymmetrical shapes.
Derived from text
Electromechanics; Energy Conversion; Microelectromechanical Systems; Transformers; Ferromagnetic Materials; Magnetic Fields; Electricity; Electric Potential

20060013530 Katholieke Univ. te Leuven, Belgium
Specific Problems of High-Speed Electrical Drives
Driesen, Johan; Belmans, Ronnie; Micro Gas Turbines; December 2005, pp. 12-1 - 12-16; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Electrical machines exist for different speed ranges. However, what a high speed is for one type, for instance a stepper motor, could be a low speed for another type, such as a permanent magnet synchronous machine. In brief: there is in fact no clear definition of a high-speed machine. In general, a machine is considered high-speed when its design needs to be adapted mechanically or electrically from that of the conventional machine in order to achieve the desired speed range. High-speed machines may be required or become beneficial is certain applications such as gas compressors, pumps, centrifuges, distributed generation units (microturbines) and flywheel energy storage. It is actually better to talk of high-speed drives since high-speed machines rarely can be operated open loop from the electricity grid. At least a power electronic converter is

required to supply the necessary high-frequency voltages. This is further completed by a controller with sensor-equipped feedback loops. In general the transmission to the mechanical load or power source is as simple as possible, a shaft, as high-speed machines are often introduced to omit more complicated transmissions, more in particular gears. There can be different reasons to opt for a high-speed drive. Some typical advantages are: The presence of a gear can be avoided. Since every gear represents some transmission losses (efficiencies are around 95%) this may positively affect the total system efficiency if the high-speed motor does not exhibit relatively more losses. Noise and non-linearities (e.g. vibrations caused by hysteresis) of high-speed gears is an important issue. A high-speed motor is more compact than a geared low-speed equivalent. It can be proven that for most machines, the torque rating determines the size over the speed rating, so for an equal power rating, a smaller size is obtained. This is important when the electrical machine is to be integrated with the mechanical load or source. The cost of a high-speed motor may be lower than the cost of a low-speed motor of equal shaft power with a transmission.
Derived from text
Turbocompressors; Stepping Motors; High Speed; Power Converters; Energy Storage; Electric Potential; Electricity; Controllers

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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*.

20060013301 California Univ., Santa Barbara, CA, USA
Fundamental Studies of Fluid Mechanics: Stability in Porous Media. (Final Report)
Homsy, G. M.; Apr. 2005; 12 pp.; In English
Report No.(s): DE2006-839241; No Copyright; Avail.: Department of Energy Information Bridge

The work has been concerned with theoretical, computational and experimental studies of a variety of flow and transport problems that are of generic interest and applicability in energy-related and energy-intensive processes. These include the following: (1) Problems associated with oil recovery: the global economy continues to be dependent on the stable and predictable supply of oil and fossil fuels; (2) Small scale and Stokes flows: flows in microgeometrics and involving interfaces and surfactants are of interest in a myriad of energy-related contexts; and (3) Coating flows: these are of interest in information technologies, including the manufacture of integrated circuits and data storage and retrieval devices.
NTIS
Fluid Mechanics; Porosity; Porous Materials; Stability

20060013344 NASA Glenn Research Center, Cleveland, OH, USA
Multiphase Flow Technology Impacts on Thermal Control Systems for Exploration
McQuillen, John; Sankovic, John; Lekan, Jack; [2006]; 11 pp.; In English; 44th AIAA Aerospace Sciences Meeting and Exhibit, 9-12 Jan. 2006, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 572.08.02; No Copyright; Avail.: CASI: A03, Hardcopy

The Two-Phase Flow Facility (TPHIFFy) Project focused on bridging the critical knowledge gap by developing and demonstrating critical multiphase fluid products for advanced life support, thermal management and power conversion systems that are required to enable the Vision for Space Exploration. Safety and reliability of future systems will be enhanced by addressing critical microgravity fluid physics issues associated with flow boiling, condensation, phase separation, and system stability. The project included concept development, normal gravity testing, and reduced gravity aircraft flight campaigns, in preparation for the development of a space flight experiment implementation. Data will be utilized to develop predictive models that could be used for system design and operation. A single fluid, two-phase closed thermodynamic loop test bed was designed, assembled and tested. The major components in this test bed include: a boiler, a condenser, a phase separator and a circulating pump. The test loop was instrumented with flow meters, thermocouples, pressure transducers and both high speed and normal speed video cameras. A low boiling point surrogate fluid, FC-72, was selected based on scaling analyses using preliminary designs for operational systems. Preliminary results are presented which include flow regime transitions and some observations regarding system stability.
Author
Multiphase Flow; Temperature Control; Technology Utilization; Control Systems Design; Space Exploration

20060013523 Naples Univ., Italy

Combustion and Combustors for MGT Applications

Tuccillo, R.; Cameretti, M. C.; Micro Gas Turbines; December 2005, pp. 5-1 - 5-56; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An introductory overview of the micro and small-scale devices for the combustion in micro-gas turbines is presented at the beginning of this paper in order to identify and select the main topics to be discussed in the following. The wide variety of combustion systems for this particular application, together with the different strategies and design concepts that are proposes for setting up efficient MGT combustors, suggests the opportunity of outlining the several levels of approach to the studies on this subject. Therefore, the paper proceeds with a general thermo-kinetic analysis of the combustion conditions which are expected for both different fuel supplies and variable MGT load levels. The successive step is the comparison of different combustor concepts for a small-case turbine of the 100 kW range, and the CFD analysis gives indications on the behaviour of the several combustion systems. The same computational tool is finally employed for an exhaustive analysis of a lean-premixed combustor also when operated with low BTU fuels or under part-load conditions.

Author

Combustion Chambers; Computational Fluid Dynamics; Gas Turbines; Premixing; Combustion; Exhausting

20060013535 Tokyo Univ., Japan

Cycles and Thermal System Integration Issues of Ultra-Micro Gas Turbines

Nagashima, Toshio; Okamoto, Koji; Ribaud, Yves; Micro Gas Turbines; December 2005, pp. 4-1 - 4-66; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A synthesis of elementary heat balances along the gas path to establish a global energetic on the PowerMEMS type ultra-micro gas turbines (UMGT) is discussed, emphasizing, in particular, a new formulation of turbo-component performance in the presence of intense heat transfer. A potential benefit to integrate a wave rotor into UMGT system will be also presented to demonstrate the design feasibility according to numerical and experimental studies on a scaled-up model.

Author

Gas Turbines; Heat Transfer; Systems Integration; Component Reliability

36
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*.

20060013369 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Landmine detection using laser vibrometry

vandenHeuvel, J. C.; vanKoersel, A. C.; vanutten, F. J. M.; Schleijpen, H. M. A.; January 2006; 61 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): A01/KL/876; TNO Proj. 015.31606

Report No.(s): TD2005-0382; TNO-DVI-2005-A044; Copyright; Avail.: Other Sources

Acoustic Landmine Detection (ALD) using a laser vibrometry was studied using two acoustic ground excitation methods: acoustic (loudspeaker) excitation (AE) and laser excitation (LE). AE is suitable for detecting buried landmines but is a slow technique. A faster AE method based on a CMOS camera was proposed but not studied further. LE is potentially a faster technique but suffers from surface effects. An important surface effect is the relaxation of the surface after the disturbance by the laser excitation pulse. This relaxation lasts for more than 4 ms in the vicinity of the laser-excitation spot. Due to these surface effects, LE does not seem to be a viable technique in combination with laser vibrometry.

Author

Acoustic Excitation; Mine Detectors; Sound Detecting and Ranging; Vibration Measurement; Pulsed Lasers; Mines (Ordnance)

20060013395 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Qualification and Issues with Space Flight Laser Systems and Components

Ott, Melanie N.; Coyle, D. Barry; Canham, John S.; Leidecker, Henning W.; [2006]; 15 pp.; In English; The International Society for Optical Engineering (SPIE), 21-26 Jan. 2006, San Jose, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The art of flight quality solid-state laser development is still relatively young, and much is still unknown regarding the best procedures, components, and packaging required for achieving the maximum possible lifetime and reliability when deployed in the harsh space environment. One of the most important issues is the limited and unstable supply of quality, high power diode arrays with significant technological heritage and market lifetime. Since Spectra Diode Labs Inc. ended their involvement in the pulsed array business in the late 1990's, there has been a flurry of activity from other manufacturers, but little effort focused on flight quality production. This forces NASA, inevitably, to examine the use of commercial parts to enable space flight laser designs. System-level issues such as power cycling, operational derating, duty cycle, and contamination risks to other laser components are some of the more significant unknown, if unquantifiable, parameters that directly effect transmitter reliability. Designs and processes can be formulated for the system and the components (including thorough modeling) to mitigate risk based on the known failures modes as well as lessons learned that GSFC has collected over the past ten years of space flight operation of lasers. In addition, knowledge of the potential failure modes related to the system and the components themselves can allow the qualification testing to be done in an efficient yet, effective manner. Careful test plan development coupled with physics of failure knowledge will enable cost effect qualification of commercial technology. Presented here will be lessons learned from space flight experience, brief synopsis of known potential failure modes, mitigation techniques, and options for testing from the system level to the component level.

Author

Yag Lasers; Flight Operations; Solid State Lasers; Reliability; Contamination; Aerospace Environments

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*.

20060013525 Ishikawajima-Harima Heavy Industries Co. Ltd., Tokyo, Japan

Study of Micro-High Speed Bearings and Rotor Dynamics for Micromachine Gas Turbines

Isomura, Kousuke; Togo, Shin-ichi; Tanaka, Shuji; Micro Gas Turbines; December 2005, pp. 7-1 - 7-62; In English; See also 20060013522; Original contains color and black and white illustrations

Contract(s)/Grant(s): F62562-03-T-0452; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Micromachine gas turbines require extremely high rotor speed to realize the same impeller tip speed to the large gas turbines, by very small diameter of the impellers. Hence, the rotordynamics is one of the critical issues. Especially, the bearing speed will exceed the range of experience in any existing turbomachines, and hence the method to achieve the stable operation at the required design speed has not established, yet. The characteristics of variety of bearings will be reviewed, and the issues of the bearing selection and the rotordynamic design will be addressed.

Author

Turbomachinery; Gas Turbines; Microelectromechanical Systems; Rotor Dynamics; Rotor Speed; High Speed

20060013533 Southampton Univ., UK

Key Processes for Fabrication of the MIT Microengine

Spearing, S. Mark; Micro Gas Turbines; December 2005, pp. 9-1 - 9-18; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

These lecture notes address issues of the processes required to fabricate the MIT microengine. Three key process steps are examined: Deep reactive ion etching, silicon direct wafer bonding and the fabrication process chain for Si/SiC hybrid structures. A design of experiments approach was taken to characterize the deep reactive ion etching process. A mechanics framework was established for wafer bonding. Key factors in the fabrication of Si/SiC hybrid structures have been identified

as: deposition of low residual stress SiC, planarization by polishing processes, and use of a SiO2 interlayer to permit bonding. Author

Fabrication; Experiment Design; Silicon Dioxide; Hybrid Structures; Residual Stress; Reactivity; Bonding

20060013534 Southampton Univ., UK

Materials Selection, Modeling and Mechanical Design

Spearing, S. mark; Micro Gas Turbines; December 2005, pp. 8-1 - 8-16; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

These lecture notes address materials and structures issues associated with the MIT Microfabricated gas turbine engine. An overview of the project and the performance goals is provided. These are translated into requirements for the materials and structural design. Particular emphasis is provided on the approaches taken to designing with brittle materials at low temperatures and designing with ductile creeping materials at high temperature. A novel approach to structural reinforcement using SiC in combination with Si is introduced.

Author

Gas Turbine Engines; Materials Selection; Mechanical Engineering; Structural Design; High Temperature

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 structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20060013417 NASA Glenn Research Center, Cleveland, OH, USA

Magneto-thermo-elastokinetics of geometrically nonlinear laminated composite plates. Part 2: vibration and wave propagation

Qin, Zhanming; Hasanyan, Davresh; Librescu, Liviu; Ambur, Damodar R.; Journal of Sound and Vibration; 2005; ISSN 0022-460X; Volume 287, pp. 177-201; In English

Contract(s)/Grant(s): NAG1-01101; 581.02.08.03; Copyright; Avail.: Other Sources

In Part 1 of this paper, the governing equations of geometrically nonlinear, anisotropic composite plates incorporating magneto-thermo-elastic effects have been derived. In order to gain insight into the implications of a number of geometrical and physical features of the system. three special cases are investigated: (i) free vibration of a plate strip immersed in a transversal magnetic field; (ii) free vibration of the plate strip immersed in an axial magnetic field; (iii) magneto-elastic wave propagations of an infinite plate. Within each of these cases, a prescribed uniform thermal field is considered. Special coupling characteristics between the magnetic and elastic fields are put into evidence. Extensive numerical investigations are conducted and pertinent conclusions which highlight the various effects induced by the magneto-elastic couplings and the finite electroconductivity, are outlined.

Author

Free Vibration; Anisotropic Plates; Magnetic Field Configurations; Elastic Waves; Nonlinear Equations; Plates (Structural Members); Magnetic Fields

20060013434 NASA Langley Research Center, Hampton, VA, USA

Dynamic Snap-Through of Thin-Walled Structures by a Reduced Order Method

Przekop, Adam; Rizzi, Stephen A.; [2006]; 11 pp.; In English; 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 1-4 May 2006, Newport, RI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 23-781-20-11

Report No.(s): AIAA Paper 2006-1745; Copyright; Avail.: CASI: A03, Hardcopy

The goal of this investigation is to further develop nonlinear modal numerical simulation methods for application to geometrically nonlinear response of structures exposed to combined high intensity random pressure fluctuations and thermal loadings. The study is conducted on a flat aluminum beam, which permits a comparison of results obtained by a reduced-order analysis with those obtained from a numerically intensive simulation in physical degrees-of-freedom. A uniformly distributed thermal loading is first applied to investigate the dynamic instability associated with thermal buckling. A uniformly distributed

random loading is added to investigate the combined thermal-acoustic response. In the latter case, three types of response characteristics are considered, namely: (i) small amplitude vibration around one of the two stable buckling equilibrium positions, (ii) intermittent snap-through response between the two equilibrium positions, and (iii) persistent snap-through response between the two equilibrium positions. For the reduced order analysis, four categories of modal basis functions are identified including those having symmetric transverse (ST), anti-symmetric transverse (AT), symmetric in-plane (SI), and anti-symmetric in-plane (AI) displacements. The effect of basis selection on the quality of results is investigated for the dynamic thermal buckling and combined thermal-acoustic response. It is found that despite symmetric geometry, loading, and boundary conditions, the AT and SI modes must be included in the basis as they participate in the snap-through behavior.
Author
Thin Walls; Mathematical Models; Direct Numerical Simulation; Dynamic Structural Analysis; Structural Design

20060013457 NASA Langley Research Center, Hampton, VA, USA
Multiscale Modeling of Grain-Boundary Fracture: Cohesive Zone Models Parameterized From Atomistic Simulations
Glaessgen, Edward H.; Saether, Erik; Phillips, Dawn R.; Yamakov, Vesselin; [2006]; 13 pp.; In English; 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 1-4 May 2006, Newport, RI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS1-00135; NCC1-02043; WBS 23-064-20-32
Report No.(s): AIAA Paper 2006-1674; No Copyright; Avail.: CASI: A03, Hardcopy

A multiscale modeling strategy is developed to study grain boundary fracture in polycrystalline aluminum. Atomistic simulation is used to model fundamental nanoscale deformation and fracture mechanisms and to develop a constitutive relationship for separation along a grain boundary interface. The nanoscale constitutive relationship is then parameterized within a cohesive zone model to represent variations in grain boundary properties. These variations arise from the presence of vacancies, intersticies, and other defects in addition to deviations in grain boundary angle from the baseline configuration considered in the molecular dynamics simulation. The parameterized cohesive zone models are then used to model grain boundaries within finite element analyses of aluminum polycrystals.
Author
Cohesion; Fracturing; Molecular Dynamics; Deformation; Polycrystals; Defects

20060013507 NASA Langley Research Center, Hampton, VA, USA
Application of Video Image Correlation Techniques to the Space Shuttle External Tank Foam Materials
Hilburger, Mark W.; Nemeth, Michael P.; [2006]; 18 pp.; In English; 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 1-4 May 2006, Newport, RI, USA; Original contains color illustrations
Contract(s)/Grant(s): 759.07.11; No Copyright; Avail.: CASI: A03, Hardcopy

Results that illustrate the use of a video-image-correlation-based displacement and strain measurement system to assess the effects of material nonuniformities on the behavior of the sprayed-on foam insulation (SOFI) used for the thermal protection system on the Space Shuttle External Tank are presented. Standard structural verification specimens for the SOFI material with and without cracks and subjected to mechanical or thermal loading conditions were tested. Measured full-field displacements and strains are presented for selected loading conditions to illustrate the behavior of the foam and the viability of the measurement technology. The results indicate that significant strain localization can occur in the foam because of material nonuniformities. In particular, elongated cells in the foam can interact with other geometric or material discontinuities in the foam and develop large-magnitude localized strain concentrations that likely initiate failures. Furthermore, some of the results suggest that continuum mechanics and linear elastic fracture mechanics might not adequately represent the physical behavior of the foam, and failure predictions based on homogeneous linear material models are likely to be inadequate.
Author
External Tanks; Foams; Displacement Measurement; Strain Measurement; Insulation; Thermal Protection; Image Correlators

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 42 through 48*.

20060013438 NASA Johnson Space Center, Houston, TX, USA
Kinetic Controls on Formation of Textures in Rapidly Cooled Rocks
Lofgren, Gary E.; [2006]; 1 pp.; In English; American Geophysical Union Joint Assembly, 23-26 May 2006, Baltimore, MD, USA; No Copyright; Avail.: Other Sources; Abstract Only

The crystallization of silicate melts is a complex process involving melts usually produced by partial melting and cooling environments that are rapid in volcanic lavas or so slow as to be auto-metamorphic in plutonic regimes. The volcanic lavas are amenable to laboratory study as are chondrules that comprise the bulk of chondritic meteorites. Dynamic crystallization studies of basalt and chondrule melts have shown that nucleation has a more profound effect on the final texture than the cooling or crystal growth rates. The sequence of crystal shapes grown at increasing degrees of supercooling (DELTA T) or cooling rate demonstrates the effect of increasing growth rate. Equant or euhedral crystals become skeletal, then dendritic and ultimately spherulitic indicating the nucleation temperature and the DELTA T when growth began. Because crystals cannot grow until they nucleate, cooling rate does not always correlate with crystal growth rate and thus crystal shape. Silicate melts cooled at the same rate can have drastically different textures depending on the temperature of nucleation. A dynamic crystallization study of basaltic rocks shows that basaltic lavas must erupt with sufficient crystals present in the melt to act as nuclei and foster growth. With nuclei present, growth will begin when the temperature drops below the liquidus temperature and typical basaltic textures such as intersertal, intergranular or subophitic will form. If nuclei are not present, crystallization will not begin immediately and the DELTA T will increase until embryos in the melts become nuclei. The DELTA T present when grow begins dictates the growth rate and the crystal shapes and thus the rock texture. If nucleation is delayed, growth will take place at high DELTA T and the crystals will favor skeletal or dendritic shapes. Chondrules are usually considered crystallized melt droplets and clearly some are, but most are not. Most chondrules have porphyritic textures that cannot develop from totally melted droplets because nucleation is delayed during cooling and growth occurs at high DELTA T and the resulting textures are dendritic or spherulitic. The porphyritic textures will develop only if the chondrule is partially molten and begins to crystallize immediately upon cooling. Chondrule compositions are close to komatiites and these studies bear on the origin of their textures as well.
Author
Igneous Rocks; Metamorphism (Geology); Textures; Supercooling; Kinetics

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20060013167 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mission Operations Insights
Littman, Dave; Parksinson, Lou; Feb. 16, 2006; 51 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

The mission description Polar Operational Environmental Satellites (POES): I) Collect and disseminate worldwide meteorological and environmental data: a) Provide day and night information (AVHRR): 1) cloud cover distribution and type; 2) cloud top temperature; 3) Moisture patterns and ice/snow melt. b) Provide vertical temperature and moisture profiles of atmospheres (HIRS, AMSU, MHS. c) Measure global ozone distribution and solar UV radiation (SBUV). d) Measure proton, electro, and charged particle density to provide solar storm warnings (SEM). d) Collect environmental data (DCS): 1) Stationary platforms in remote locations; 2) Free floating platforms on buoys, balloons, migratory animals. II) Provide Search and Rescue capabilities (SARR, SARP): a) Detection and relay of distress signals. b) Has saved thousands of lives around the world.
Derived from text
Satellite Sounding; Atmospheric Temperature; Remote Sensing; Signal Detection; Ultraviolet Radiation; Solar Radiation; Cloud Cover; Ozone

20060013176 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Tamarisk Habitat Suitability Map for the Continental US

Morisette, Jeffrey T.; Jernevich, Catherine S.; Ullah, Asad; Cai, Weijie; Pedelty, Jeffrey A.; Gentle, Jim; Stohlgren, Thomas J.; Schnase, John L.; [2005]; 2 pp.; In English

Contract(s)/Grant(s): EOS/03-0551-0642; Copyright; Avail.: CASI: A01, Hardcopy

This paper presents a national-scale map of habitat suitability for a high-priority invasive species, Tamarisk (Tamarisk spp., salt cedar). We successfully integrate satellite data and tens of thousands of field sampling points through logistic regression modeling to create a habitat suitability map that is 90% accurate. This interagency effort uses field data collected and coordinated through the US Geological Survey and nation-wide environmental data layers derived from NASA s MODerate Resolution Imaging Spectroradiometer (MODIS). We demonstrate the utilization of the map by ranking the lower 48 US states (and the District of Columbia) based upon their absolute, as well as proportional, areas of highly likely and moderately likely habitat for Tamarisk. The interagency effort and modeling approach presented here could be applied to map other harmful species in the US and globally.

Author

Habitats; MODIS (Radiometry); Conifers; Mapping; United States; Suitability

20060013193 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Landsat Ecosystem Disturbance Adaptive Processing System (LEDAPS)

Masek, Jeffrey G.; January 2006; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The Landsat Ecosystem Disturbance Adaptive Processing System (LEDAPS) project is creating a record of forest disturbance and regrowth for North America from the Landsat satellite record, in support of the carbon modeling activities. LEDAPS relies on the decadal Landsat GeoCover data set supplemented by dense image time series for selected locations. Imagery is first atmospherically corrected to surface reflectance, and then change detection algorithms are used to extract disturbance area, type, and frequency. Reuse of the MODIS Land processing system (MODAPS) architecture allows rapid throughput of over 2200 MSS, TM, and ETM+ scenes. Initial ('Beta') surface reflectance products are currently available for testing, and initial continental disturbance products will be available by the middle of 2006.

Author

Landsat Satellites; Forests; Surface Properties; Ecosystems; MODIS (Radiometry); Imaging Spectrometers; Satellite Imagery

20060013202 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Scientific and Societal Need for Accurate Global Remote Sensing of Marine Suspended Sediments

Acker, James G.; [2006]; 1 pp.; In English; American Geophysical Union Ocean Sciences Meeting, 20-24 Feb. 2006, Honolulu, HI, USA

Contract(s)/Grant(s): NAS5-00220; No Copyright; Avail.: Other Sources; Abstract Only

Population pressure, commercial development, and climate change are expected to cause continuing alteration of the vital oceanic coastal zone environment. These pressures will influence both the geology and biology of the littoral, nearshore, and continental shelf regions. A pressing need for global observation of coastal change processes is an accurate remotely-sensed data product for marine suspended sediments. The concentration, delivery, transport, and deposition of sediments is strongly relevant to coastal primary production, inland and coastal hydrology, coastal erosion, and loss of fragile wetland and island habitats. Sediment transport and deposition is also related to anthropogenic activities including agriculture, fisheries, aquaculture, harbor and port commerce, and military operations. Because accurate estimation of marine suspended sediment concentrations requires advanced ocean optical analysis, a focused collaborative program of algorithm development and assessment is recommended, following the successful experience of data refinement for remotely-sensed global ocean chlorophyll concentrations.

Author

Remote Sensing; Sediments; Climate Change; Sediment Transport; Oceans; Coastal Water; Coasts; Erosion; Hydrology

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*.

20060013271 National Renewable Energy Lab., Golden, CO USA
Tritiated Amorphous Silicon: Insights into the Staebler-Wronski Mechanism
Strandins, P.; Branz, H. M.; Whitaker, J.; Viner, J.; Johnson, E.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860694; NREL/CP-520-37023; No Copyright; Avail.: Department of Energy Information Bridge

Hydrogen, though essential for device-quality amorphous silicon, likely contributes to the light-induced degradation process (Staebler-Wronski effect) that reduces the solar cell efficiency by about 4 absolute percent. We are testing the role of hydrogen by using its isotope tritium. When tritium bonded to Si spontaneously decays into inert helium-3, it should leave behind the Si dangling bond defect. We have studied degradation due to tritium and note its resemblance to the Staebler-Wronski effect. Surprisingly, 100x fewer defects are created than expected from the tritium decay rate, suggesting a mechanism that heals most of the defects, even at temperatures down to 4 k.
NTIS
Amorphous Materials; Amorphous Silicon; Solar Cells

20060013273 National Renewable Energy Lab., Golden, CO USA
PV Manufacturing R&D Project--Trends in the U.S. PV Industry
Brown, K. E.; Mitchell, R. L.; Bower, R. I.; King, R.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860692; NREL/CP-520-37030; No Copyright; Avail.: Department of Energy Information Bridge

To foster continued growth in the U.S. Photovoltaic (PV) industry, the U.S. Department of Energy initiated the PV Manufacturing R&D (PVMR&D) Project-a partnership with U.S. PV industry participants to perform cost-shared manufacturing research and development. Throughout FY 2004, PVMR&D managed fourteen subcontracts across the industry. The impact of PVMR&D is quantified by reductions in direct module manufacturing costs, scale-up of existing PV production capacity, and accrual of cost savings to the public and industry. An analysis of public and industry investment shows that both recaptured funds by mid-1998 based on estimated manufacturing cost savings from PVMR&D participation. Since project inception, total PV manufacturing capacity has increased from 14 MW to 201 MW at the close of 2003, while direct manufacturing costs declined from $5.55/W to $2.49/W.
NTIS
Industries; Manufacturing; Trends; United States

20060013275 National Renewable Energy Lab., Golden, CO USA
Quantum Dot Solar Cells: High Efficiency through Multiple Exciton Generation
Hanna, M. C.; Ellingson, R. J.; Beard, M.; Yu, P.; Micic, O. I.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860690; NREL/CP-590-37036; No Copyright; Avail.: Department of Energy Information Bridge

Impact ionization is a process in which absorbed photons in semiconductors that are at least twice the bandgap can produce multiple electron-hole pairs. For single-bandgap photovoltaic devices, this effect produces greatly enhanced theoretical thermodynamics conversion efficiencies that range from 45-85%, depending upon solar concentration, the cell temperature, and the number of electron-hole pairs produced per photon. For quantum dots (QDs), electron-hole pairs exist as excitons.
NTIS
Excitons; Quantum Dots; Solar Cells

20060013277 National Renewable Energy Lab., Golden, CO USA
NREL PV System Performance and Standards Technical Progress
Osterwald, C. R.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860689; NREL/CP-520-37024; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper presents a brief overview of the status and accomplishments during Fiscal Year (FY)2004 of the Photovoltaic (PV) System Performance & Standards Subtask, which is part of PV Systems Engineering Project (a joint NREL-Sandia project).
NTIS
Photovoltaic Conversion; Renewable Energy; Thin Films

20060013279 National Renewable Energy Lab., Golden, CO USA
Electron Microscopy Studies of GaP(N,As) Grown on Si
Norman, A. G.; Geisz, J.; Olson, J.; Jones, K.; Al-Jassim, M.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860687; NREL/CP-520-37035; No Copyright; Avail.: Department of Energy Information Bridge
The objective of this work is to perform transmission electron microscopy (TEM) studies of CaP(N,As) alloys grown by metal-organic chemical vapor deposition (MOCVD) on Si substrates. These alloys are of interest for the fabrication of high-efficiency tandem solar cells based on Si. The results indicated that the nucleation and growth conditions used are critical for obtaining planar epitaxial layers with a low defect density. In particular, antiphase domains are eliminated using a low growth temperature. TEM studies of these alloy layers, which contain only a few percent N, revealed no phase separation. However, electron diffraction studies revealed the first evidence of CuPt-type atomic ordering in these P-rich, dilute nitride alloy layers.
NTIS
Electron Microscopy; Metalorganic Chemical Vapor Deposition; Electron Diffraction; Nucleation

20060013284 National Renewable Energy Lab., Golden, CO USA
XPS and UPS Studies of Thin Film PV Materials Modified by Reactions in Liquids
Perkins, C. L.; Hasoon, F. S.; Al-Thani, H. A.; Asher, S. E.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860683; NREL/CP-520-57034; No Copyright; Avail.: Department of Energy Information Bridge
Water-based processing steps are ubiquitous in the semiconductor industry, and the field of photovoltaics (PV) is no exception. During chemical bath deposition (CBD) of CdS, complex chemical reactions occurring at surfaces and in solution are poorly understood, yet have been shown to have powerful effects on the performance in terms of reliability and efficiency of finished PV devices. In the past, electron spectroscopic studies of these reactions have been hampered by the conflicting requirements of ultra-high vacuum and exposure of samples to liquid water. In this paper we present initial results from a new tool at NREL that allows one to conduct atmospheric pressure, liquid phase chemical processes on thin film PV materials and subsequent examination via core and valence level electron spectroscopies without exposing samples to air contamination.
NTIS
Atmospheric Pressure; Liquids; Photoelectron Spectroscopy; Photovoltaic Conversion; Thin Films; X Ray Spectroscopy

20060013286 National Renewable Energy Lab., Golden, CO USA, Georgia Inst. of Tech., Atlanta, GA USA
Hydrogenated Amorphous Silicon Emitter and Back-Surface-Field Contacts for Crystalline Silicon Solar Cells
Wang, T. H.; Iwaniczko, E.; Page, M. R.; Yelundur, V.; Wang, Q.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860682; NREL/CP-520-37033; No Copyright; Avail.: Department of Energy Information Bridge
Thin hydrogenated amorphous silicon (a-Si:H) layers deposited by hot-wire chemical vapor deposition (HWCVD) are investigated as emitters and back-surface-field (BSF) contacts to make silicon heterojunction solar cells on p-type crystalline silicon wafers. A common requirement for excellent emitter and BSF quality is minimization of interface recombination. Best results require immediate a-Si:H deposition and an abrupt and flat interface to the c-Si substrate. We obtain record 16.9% and 14.8% efficiencies on p-type planar float-zone (FZ) and Czochralski (CZ) silicon substrates, respectively, with HWCVD a-Si:H(n) emitters and Al-BSF contacts. Initial efforts with p-type HWCVD Si thin films as the BSF have yielded 12.5% efficiency on p-type CZ-Si.
NTIS
Amorphous Silicon; Crystallinity; Emitters; Hydrogenation; Solar Cells

20060013288 National Renewable Energy Lab., Golden, CO USA
Raman Studies of Nanocrystalline CdS:O Film
Zhang, Y.; Wu, X.; Dhere, R.; Zhou, J.; Yan, Y.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860681; NREL/CP-590-37026; No Copyright; Avail.: Department of Energy Information Bridge
Oxygenated nanocrystalline Cds films show improved solar cell performance, but the physics and mechanism underlying

this are not yet clearly understood. Raman study provides complementary information to the understanding obtained from other experimental investigations. A comprehensive analysis of the existing experimental data (including x-ray diffraction, transmission, transmission electron microscopy, and Raman) has led to the following conclusions: (1) The O-incorporation forms CdS1-xOx alloy nano-particles. (2) The observed evolution of the electronic structure is the result of the interplay between the alloy and quantum confinement effect. (3) The blue-shift of the LO phonon Raman peak is primarily due to the alloying effect. (4) Some oxygen atoms have taken the intersititial sites.
NTIS
Solar Cells; Thin Films

20060013290 National Renewable Energy Lab., Golden, CO USA
XPS and AES Studies of Cu/CdTe(111)-B
Teeter, G.; Gessert, T. A.; Asher, S. E.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860680; NREL/CP-520-37038; No Copyright; Avail.: Department of Energy Information Bridge

Copper is frequently used as a p-type dopant to improve the performance of back contacts in CdTe thin-film solar cells. In this study, surface-analysis techniques are used to probe fundamental interactions between Cu and the CdTe(11)-B surface. The results presented here were facilitated by the newly constructed surface-analysis cluster tool in the Measurement and Characterization Division at NREL; they reveal a host of fundamental phenomena that occur in the Cu/CdTe system.
NTIS
Copper; Photoelectron Spectroscopy; Solar Cells; X Ray Spectroscopy

20060013311 National Renewable Energy Lab., Golden, CO USA
Workshop on Crystalline Silicon Solar Cells and Modules (15th): Materials and Processes. Extended Abstracts and Papers
Al-Jassim, M.; Kalejs, J.; Rand, J.; Saitoh, T.; Nov. 2005; 242 pp.; In English
Report No.(s): DE2006-861051; NREL/BK-520-38573; No Copyright; Avail.: National Technical Information Service (NTIS)

The silicon photovoltaic (PV-Si) industry has undergone rapid growth in the last few years, leading to new production capabilities that will exceed GW/yr and take us to multi-GW production in the near future. This rapid growth was fostered by many technical achievements and breakthroughs in the science and technology of photovoltaics. Some of these technologies were developed by the industry itself while others were adopted from R&D performed at various universities and academic institutions. These technical and scientific advances have occurred around the globe and, in many cases, were prompted by strong government assistance. In the USA, NREL/DOE offers many programs that support Si research and development. One of them is the Silicon Workshop, which is geared to help the PV-Si industry by (1) bringing together the industry, research, and academic communities, (2) disseminating scientific and technical information by nurturing collective views on critical research areas, and (3) providing feedback to NREL/DOE on important research tasks, as seen by the community.
NTIS
Abstracts; Crystallinity; Modules; Solar Cells

20060013349 National Renewable Energy Lab., Golden, CO USA
Improved Performance in CulnSe2 and Surface-Modified CuGaSe2 Solar Cells
AbuShama, J.; Noufi, R.; Johnston, S.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860989; NREL/CP-520-37614; No Copyright; Avail.: Department of Energy Information Bridge

In this paper, we present an update and review on the progress made in the development of low-bandgap CuInSe(sub 2) (CIS) and wide-bandgap CuGaSe(sub 2) (CGS) solar cells. Our research project is primarily concerned with the optimization of the bottom and top cells of the tandem solar cell. This past year, we achieved new world record total-area efficiencies of 15.0% and 10.2% for CIS and surface-modified CGS solar cells, respectively. These achievements were possible by modifying the growth process for CIS and CGS absorbers. We attempt to modify the surface region of the CGS absorber to be CIGS-like in composition. In the mean time, we are designing a mechanical-stacked tandem solar cell where the CIS cell serves as the bottom cell.
NTIS
Solar Cells; Energy Gaps (Solid State); Efficiency

20060013351 National Renewable Energy Lab., Golden, CO USA
Direct-Write Contacts for Solar Cells
Kaydanova, T.; van Hest, M.; Miedaner, A.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860930; NREL/CP-520-37080; No Copyright; Avail.: National Technical Information Service (NTIS)

We report on our project to develop inkjet printable contacts for solar cells. Ag, Cu, and Ni metallizations were inkjet printed with near vacuum deposition quality. Thick, highly conducting lines of Ag and Cu demonstrating good adhesion to glass, Si, and PCB have been printed at 100-200 deg C in air and N(sub 2), respectively. Ag grids were inkjet-printed on Si solar cells and fired through silicon nitride AR layer at 850 deg C resulting in 8% cells. Next-generation multicomponent inks (including etching agents) have also been developed with improved fire-through contacts leading to higher cell efficiencies. The approach developed can be easily extended to other conductors such as Pt, Pd, and Au, etc. In addition, PEDOT-PSS polymer-based conductors were inkjet-printed with the conductivity as good or better than those of spin-coated films.
NTIS
Deposition; Solar Cells

20060013354 National Renewable Energy Lab., Golden, CO USA
Solar Decathlon 2005
King, R.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2006-860841; NREL/CP-520-37076; No Copyright; Avail.: Department of Energy Information Bridge

Solar Decathlon 2005 is a U.S. Department of Energy and National Renewable Energy Laboratory competition involving 19 colleges and universities from the USA, Canada, and Spain. These teams will compete to design, build, and demonstrate solar homes. In fall 2005, teams will transport their competition solar houses to Washington, D.C., where they will construct a solar village on the National Mall. When the houses are assembled, the teams will compete against each other in 10 contests (hence, a decathlon) for about a week. The contests range from design to comfort to energy performance. Each team must provide an aesthetically pleasing entry that produces sufficient solar energy for space conditioning, hot water, lighting, appliances, and an electric car. The Solar Decathlon is co-sponsored by BP, The Home Depot, the American Institute of Architects, the National Association of Home Builders, and the DIY Network.
NTIS
Competition; Solar Energy

20060013527 Ishikawajima-Harima Heavy Industries Co. Ltd., Tokyo, Japan
Development of Micromachine Gas Turbines at Tohoku University
Isomura, Kousuke; Tanaka, Shuji; Togo, Shin-ichi; Micro Gas Turbines; December 2005, pp. 10-1 - 10-34; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Development of micromachine gas turbines is underway at a group lead by Tohoku University in Japan. The goal is to develop a light-weight power source to replace the heavy batteries that may limit the progress of humanoid robots. Internal combustion engines have advantages of both high power density and high energy density, so it can be the best choice for the power source for mobile machines. The project is currently challenging to develop the smallest possible gas turbine of three-dimensional geometry to be fabricated by machining. The micro-combustor has already been completed the validation test, and experimental validation of the turbo-unit and the generator of the diameter 10mm is underway. Current major technical challenges are the development of the bearings to sustain the high-speed rotation of the rotors and the technologies to fabricate the bearings within the required tolerance.
Author
Microelectromechanical Systems; Gas Turbines; Fabrication; Robots; Machining; Combustion Chambers; Internal Combustion Engines

20060013528 Technische Hochschule, Aachen, Germany
Micro Gas Turbine and Fuel Cell - A Hybrid Energy Conversion System with High Potential
Bohn, Dieter; Micro Gas Turbines; December 2005, pp. 13-1 - 13-46; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper reports an assessment of coupling micro gas turbine and high temperature fuel cell (SOFC) as a possibility to

realize power plant with an efficiency of 75%. The application of such a technology will be in the decentralized feed-in of housing estates and buildings with electricity, heat and cooling energy. Nowadays the first implemented prototypes reach efficiencies among 57- 58% /1/. The paper shows the necessity of further developments to be able to reach an efficiency of 75%. The developments include improvements in all components of the system like compressor, turbine, bearing and the increasing of the operating temperature.
Author
Gas Turbines; Fuel Cells; Efficiency; Energy Conversion; Compressors; Electricity; Cooling

20060013531 Royal Military Academy, Brussels, Belgium
Micro Turbines from the Standpoint of Potential Users
Decuypere, Roland; Verstraete, Dries; Micro Gas Turbines; December 2005, pp. 15-1 - 15-14; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes some micro turbine aspects from the standpoint of potential users. First, some of the pros and the cons of small gas turbines compared to other competing technologies are given. The discussed aspects are mainly focussed on technical advantages and disadvantages as it is hard to predict how fast and to what extent the different technologies (including that of mini gas turbines) will mature. Even though the final applications will obviously strongly depend upon the economical benefits that the technology would offer, an economical comparison is not made here. Therefore the comparison made throughout this contribution remains relatively general. Once the pros and the cons are discussed, some potential applications are described. The possible applications are divided into two different categories: power generation for portable devices and vehicle propulsion. For each class of applications some examples are given. Finally, then, some conclusions are drawn.
Author
Gas Turbines; Propulsion; Turbines

20060013532 Rochester Inst. of Tech., NY, USA
Compact Heat Exchangers for Microturbines
Shah, R. K.; Micro Gas Turbines; December 2005, pp. 2-1 - 2-18; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With distributed power generation market, the most economical solution today is to generate power through small gas turbine systems, arbitrarily categorized as microturbines (5 200 kW) and miniturbines (200 500 kW). The thermal efficiency of such microturbines is about 20% or less if no recuperator is used in the system. Using a recuperator (regenerator can also be considered but has a number of problems) operating at 87% effectiveness, the efficiency of the gas turbine system increases to about 30%, a substantial performance improvement. However, cost of the recuperator is about 25 30% of the total power plant. This means that the heat exchanger (recuperator) must be designed to get high performance with minimum cost. While the offset strip fin geometry is one of the highest performing surface it is also quite expensive to manufacture. This necessitates the use of all prime surface heat exchangers with no brazing. In this paper, after providing the necessary concise information on microturbines, the discussion is presented on various types of heat exchanger surfaces and novel designs considered for the cost effective heat exchangers and packaging in the system. For hot fluid inlet temperature of less than about 675 C, stainless steel material can be used for the heat exchanger, which has reasonable cost. However, for higher inlet temperatures in heat exchangers associated with higher turbine inlet temperatures, superalloys are essential which increases the material cost of the exchanger alone by a factor of 4 to 5. The design, material/finished heat exchanger cost, performance, durability, and other related issues of compact heat exchangers for microturbines are covered in this paper. The discussion and coverage is primarily for metal heat exchangers since the ceramic heat exchangers are in infant stage after last 50 years of development associated with the gas turbine applications.
Author
Inlet Temperature; Heat Exchangers; Thermodynamic Efficiency; Regenerators; Heat Resistant Alloys; Gas Turbines

20060013536 Naples Univ., Italy
Performance and Transient Behaviour of MGT Based Energy Systems
Tuccillo, R.; Micro Gas Turbines; December 2005, pp. 6-1 - 6-56; In English; See also 20060013522; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

After a preliminary overview of the multiplicity of solutions for the set up and operation of energy conversion systems based on micro-gas turbines, this paper outlines the method for performance evaluation under both steady state and transient conditions. The cycle analysis aims at the evaluation of thermal efficiency and energy saving indices under different fueling conditions and with variably recuperated cycle. The subsequent component matching simulation extends the MGT analysis to the off-design conditions and it leads to the definition of methods for an efficient fulfillment of variable external loads. Finally, the study of some typical transient developments, of both the full-to-part and the part-to-full load type, introduces to the problem of defining proper fuel control laws as to prevent excesses in both energy consumption and component stresses and instabilities.
Author
Energy Conversion; Fuel Control; Thermodynamic Efficiency; Control Theory; Gas Turbines

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20060013239 Swedish Environmental Protection Agency, Stockholm, Sweden
Towards Robust European Air Pollution Policies: Constraints and Prospects for a Wider Dialogue between Scientists, Experts, Decision-Makers, and Citizens
Grennfelt, P.; Lidskog, R.; Lindau, L.; Maas, R.; Raes, F.; Dec. 2005; 70 pp.; In English
Report No.(s): PB2006-107252; IVL-B-1671; Copyright; Avail.: National Technical Information Service (NTIS)
The international regulation of transboundary air pollution in Europe is often considered a success story. The success is usually explained by a close relationship between scientists and policy makers. When looking into other international environmental areas (e.g. climate change, marine pollution), there have generally been larger obstacles in the science-policy relationships. Social scientists have for many years studied the international policy development processes for air pollution and pointed to certain factors of importance in for its success. There have however seldom been opportunities for social scientists, policy makers and scientists to discuss together the interrelations between science and policy in the area. In order to further evaluate the science policy interactions and discuss possibilities for social scientists to play a role in the further development of air pollution strategies a workshop was organised in Gothenburg, Sweden 5-7 October 2005.
NTIS
Air Pollution; Policies; International Law

20060013241 Swedish Environmental Protection Agency, Stockholm, Sweden
Workshop on the Importance of Non Technical Measures for Reduction in Emissions of Air Pollutants and How to Consider Them in Integrated Assessment Modelling, held 7-8 December 2005
Sternhufvud, C.; Astrom, S.; Dec. 2005; 78 pp.; In English
Report No.(s): PB2006-107250; IVL-B-1664; Copyright; Avail.: National Technical Information Service (NTIS)
This report compiles the outcome of the workshop on the importance of Non technical measures for reduction in emissions of air pollutants and how to consider them in Integrated Assessment Modelling. The workshop was taking place in Goteborg in Sweden 7-8 December 2005.
NTIS
Air Pollution; Models

20060013251 Department of Energy, Oak Ridge, TN, USA
GROA Airborne Release Dispersion Factor Calculation
Wang, J.; Mar. 21, 2005; 198 pp.; In English
Report No.(s): DE2006-861108; No Copyright; Avail.: Department of Energy Information Bridge
The purpose of this document is to calculate airborne release dispersion factors ((chi)/Q) for the surface and subsurface facilities at the Geological Repository Operations Area (GROA). The calculated (chi)/Q values may be used to estimate radiological consequences to workers for potential releases from normal operations and event sequences for license application. The scope of this document is to provide estimates of (chi)/Q values at potential onsite receptors from facility releases, under normal operating conditions and event sequences.
NTIS
Air Pollution; Radioactive Wastes

20060013274 Bechtel Nevada Corp., Las Vegas, NV, USA
Disruptive Event Biosphere Dose Conversion Factor Analysis
May 2005; 146 pp.; In English
Report No.(s): DE2006-859258; No Copyright; Avail.: Department of Energy Information Bridge

This analysis report is one of the technical reports containing documentation of the Environmental Radiation Model for Yucca Mountain, Nevada (ERMYN), a biosphere model supporting the total system performance assessment (TSPA) for the license application (LA) for the Yucca Mountain repository. This analysis report describes the development of biosphere dose conversion factors (BDCFs) for the volcanic ash exposure scenario, and the development of dose factors for calculating inhalation dose during volcanic eruption. A graphical representation of the documentation hierarchy for the ERMYN is presented in Figure 1 - 1. This figure shows the interrelationships among the products (i.e., analysis and model reports) developed for biosphere modeling and provides an understanding of how this analysis report contributes to biosphere modeling. This report is one of two reports that develop biosphere BDCFs, which are input parameters for the TSPA model. The Biosphere Model Report (BSC) 2004 (DIRS 1694601) describes in detail the ERMYN conceptual model and mathematical model.This report describes biosphere model calculations and their output, the BDCFs, for the volcanic ash exposure scenario.
NTIS
Biosphere; Environment Models; Factor Analysis; Mountains; Radiation Dosage

20060013283 Desert Research Inst., Reno, NV, USA
Assessing Potential Exposure from Truck Transport of Low-Level Radioactive Waste to the Nevada Test Site
Miller, J. J.; Shafer, D. S.; Gray, K. J.; Church, B. W.; Campbell, S. A.; Aug. 2005; 86 pp.; In English
Report No.(s): DE2006-850250; DOE/NV-13609-37; DOE/PUB-45208; No Copyright; Avail.: National Technical Information Service (NTIS)

The USA (U.S.) Department of Energy (DOE) Nevada Test Site (NTS) is one of two regional sites where low-level radioactive waste (LLW) from approved DOE and Department of Defense generators is disposed of by shallow land burial. The Desert Research Institute (DRI) has turned a vague concept, measurement of the actual gamma radiation exposure from truck transporting low-level radioactive waste to the Nevada Test Site, into reality. This document gives the reader an important insight into the complexities associated with the measurement of gamma radiation and how these measurements relate to the exposure to a member of the public. The results of this study indicate that individual truck and cumulative exposure measurements were well below relevant Department of Transportation and Environmental Protection Agency standards.
NTIS
Exposure; Public Health; Radiation Dosage; Radioactive Wastes; Transportation; Trucks

20060013287 Fluor Daniel Hanford, Inc., Richland, WA, USA
Review of Fast Flux Test Facility (FFTF) Fuel Experiments for Storage in Interim Storage Casks (ISCs)
Thielges, J. R.; Oct. 2005; 66 pp.; In English
Report No.(s): DE2006-860881; FFTF-17294-REV-1; No Copyright; Avail.: Department of Energy Information Bridge

Appendix H, Section H.3.3.10.11 of the Final Safety Analysis Report (FSAR), provides the limits to be observed for fueled components authorized for storage in the Fast Flux Test Facility (FFTF) spent fuel storage system. Currently, the authorization basis allows standard driver fuel assemblies (DFA), as described in the FSAR Chapter 17, Section 17.5.3.1, to be stored provided decay power per assembly is equal to 250 watts, post-irradiation time is four years minimum, average assembly burn-up is 150,000 MWD/MTHM maximum and the pre-irradiation enrichment is 29.3% maximum (per H.3.3.10.11). In addition, driver evaluation (DE), core characterizer assemblies (CCA), and run-to-cladding-breach (RTCB) assemblies are included based on their similarities to a standard DFA. Ident-69 pin containers with fuel pins from these DFAs can also be stored. Section H.3.3.10.11 states that fuel types outside the specification criteria above will be addressed on a case-by-case basis. There are many different types of fuel and blanket experiments that were irradiated in the FFTF which now require offload to the spent fuel storage system.
NTIS
Barrels (Containers); Spent Fuels; Test Facilities

20060013289 Fluor Daniel Hanford, Inc., Richland, WA, USA
Criticality Safety Control of Legacy Fuel Found at 105-KW Fuel Storage Basin
Aug. 2005; 22 pp.; In English
Report No.(s): DE2006-860878; KBC-24353-FP; No Copyright; Avail.: Department of Energy Information Bridge

In August 2004, two sealed canisters containing spent nuclear fuel were opened for processing at the Hanford Site's K West fuel storage basin. The fuel was to be processed through cleaning and sorting stations, repackaged into special baskets, placed into a cask, and removed from the basin for further processing and eventual dry storage. The canisters were expected to contain fuel from the old Hanford C Reactor, a graphite-moderated reactor fueled by very low-enriched uranium metal. The expected fuel type was an aluminum-clad slug about eight inches in length and with a weight of about eight pounds. Instead of the expected fuel, the two canisters contained several pieces of thin tubes, some with wire wraps. The material was placed into unsealed canisters for storage and to await further evaluation.
NTIS
Safety; Spent Fuels

20060013291 Fluor Daniel Hanford, Inc., Richland, WA, USA, Tri-Cities University Center, Richland, WA, USA
Impact of Shrinking Hanford Boundaries on Permits for Toxic-Air Pollutant Emissions from the Hanford 200 West Area
Johnson, R. E.; Nov. 2005; 16 pp.; In English
Report No.(s): DE2006-860875; HNF-28030-REV-0; No Copyright; Avail.: Department of Energy Information Bridge
This presentation (CE-580, Graduate Seminar) presents a brief description of an approach to use a simpler dispersion modeling method (SCREEN3) in conjunction with joint frequency tables for Hanford wind conditions to evaluate the impacts of shrinking the Hanford boundaries on the current permits for facilities in the 200 West Area. To fulfill requirements for the graduate student project (CE-702, Master's Special Problems), this evaluation wiIl be completed and published over the next two years. Air toxic emissions play an important role in environmental quality and require a state approved permit. One example relates to containers of waste that are designated as Transuranic Waste (TRU), which are required to have venting devices due to hydrogen generation. The Washington State Department of Ecology (Ecology) determined that the filters used did not meet the definition of a 'pressure relief device' and that a permit application would have to be submitted by the Central Waste Complex (CWC) for criteria pollutant and toxic air pollutant (TAP) emissions in accordance with Washington Administrative Code (WAC) 173-400 and 173-460.
NTIS
Air Pollution; Contaminants; Exhaust Emission; Toxicity

20060013300 Colorado Univ., Boulder, CO USA
Advective Flux in Relation to Net Ecosystem CO2 Exchange at the Niwot Ridge Ameriflux Site (Final Report)
Monson, R. K.; January 2005; 8 pp.; In English
Report No.(s): DE2006-840705; No Copyright; Avail.: Department of Energy Information Bridge
This report describes the final progress made on measurements of advective carbon dioxide flux to the overall forest carbon budget at the Niwot Ridge Ameriflux site in Colorado.
NTIS
Advection; Carbon Dioxide; Ecosystems; Gas Exchange

20060013312 Case Western Reserve Univ., Cleveland, OH, USA
Proposed Yucca Mountain Repository from a Corrosion Perspective
Payer, J. H.; January 2005; 12 pp.; In English
Report No.(s): DE2006-859267; No Copyright; Avail.: Department of Energy Information Bridge
In this paper, the proposed Yucca Mountain Repository is viewed from a corrosion perspective. A major component of the long-term strategy for safe disposal of nuclear waste at the Yucca Mountain Repository is first to completely isolate the radionuclides in the waste packages for long times and to greatly retard the egress and transport of radionuclides from penetrated packages. Therefore, long-lived waste packages are important. The corrosion resistance of the waste package outer canister is reviewed, and a framework for the analysis of localized corrosion processes is presented. An overview is presented of the Materials Performance targeted thrust of the U.S. Department of Energy/Office of Civilian Radioactive Waste Management's Office of Science and Technology and International. The thrust program strives for increased scientific understanding, enhanced process models and advanced technologies for corrosion control.
NTIS
Corrosion; Mountains; Radioactive Wastes

20060013326 National Inst. for Occupational Safety and Health, Washington, DC, USA
NIOSH Health Hazard Evaluation Report: HETA No. 2005-0271-2996, Threemile Canyon Farms, Columbia River Dairy, Boardman, Oregon, April 2006
Apr. 2006; 20 pp.; In English
Report No.(s): PB2006-109058; HETA-2005-0271-2996; No Copyright; Avail.: CASI: A03, Hardcopy

On June 14, 2005, the National Institute for Occupational Safety and Health (NIOSH) received a confidential request by employees of Threemile Canyon Farms in Boardman, Oregon regarding concerns about exposure to ammonia, hydrogen sulfide, and dust. NIOSH investigators conducted an investigation in August 2005.

NTIS
Canyons; Hazards; Health; Rivers; Safety

20060013350 Environmental Protection Agency, Research Triangle Park, NC USA
Air Quality Criteria for Ozone and Related Photochemical Oxidants. Volume 2 of 3
Feb. 2006; 878 pp.; In English
Report No.(s): PB2006-110278; EPA/600/R-05/004BF; No Copyright; Avail.: CASI: A99, Hardcopy

National Ambient Air Quality Standards (NAAQS) are promulgated by the USA Environmental Protection Agency (EPA) to meet requirements set forth in Sections 108 and 109 of the U.S. Clean Air Act (CAA). Sections 108 and 109 require the EPA Administrator (1) to list widespread air pollutants that reasonably may be expected to endanger public health or welfare; (2) to issue air quality criteria for them that assess the latest available scientific information on nature and effects of ambient exposure to them; (3) to set primary NAAQS to protect human health with adequate margin of safety and to set secondary NAAQS to protect against welfare effects (e.g., effects on vegetation, ecosystems, visibility, climate, manmade materials, etc); and (5) to periodically review and revise, as appropriate, the criteria and NAAQS for a given listed pollutant or class of pollutants.

NTIS
Air Quality; Atmospheric Chemistry; Ozone; Photochemical Oxidants; Photochemical Reactions

20060013352 Environmental Protection Agency, Research Triangle Park, NC USA
Air Quality Criteria for Ozone and Related Photochemical Oxidants. Volume 1 of 3
Feb. 2006; 826 pp.; In English
Report No.(s): PB2006-110277; EPA/600/R-05/004AF; No Copyright; Avail.: CASI: A99, Hardcopy

Tropospheric or surface-level ozone (O3) is one of six major air pollutants regulated by National Ambient Air Quality Standards (NAAQS) under the U.S. Clean Air Act. As mandated by the Clean Air Act, the U.S. Environmental Protection Agency (EPA) must periodically review the scientific bases (or criteria) for the various NAAQS by assessing newly available scientific information on a given criteria air pollutant. This document, Air Quality Criteria for Ozone and Other Photochemical Oxidants, is an updated revision of the 1996 Ozone Air Quality Criteria Document (O3 AQCD) that provided scientific bases for the current O3 NAAQS set in 1997.

NTIS
Air Quality; Atmospheric Chemistry; Ozone; Photochemical Oxidants; Photochemical Reactions

20060013353 Environmental Protection Agency, Research Triangle Park, NC USA
Air Quality Criteria for Ozone and Related Photochemical Oxidants. Volume 3 of 3
Feb. 2006; 428 pp.; In English
Report No.(s): PB2006-110279; EPA/600/R-05/004CF; No Copyright; Avail.: CASI: A19, Hardcopy

National Ambient Air Quality Standards (NAAQS) are promulgated by the USA Environmental Protection Agency (EPA) to meet requirements set forth in Sections 108 and 109 of the U.S. Clean Air Act (CAA). Sections 108 and 109 require the EPA Administrator (1) to list widespread air pollutants that reasonably may be expected to endanger public health or welfare; (2) to issue air quality criteria for them that assess the latest available scientific information on nature and effects of ambient exposure to them; (3) to set primary NAAQS to protect human health with adequate margin of safety and to set secondary NAAQS to protect against welfare effects (e.g., effects on vegetation, ecosystems, visibility, climate, manmade materials, etc); and (5) to periodically review and revise, as appropriate, the criteria and NAAQS for a given listed pollutant or class of pollutants.

NTIS
Air Quality; Atmospheric Chemistry; Ozone; Photochemical Oxidants; Photochemical Reactions

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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*.

20060013170 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Dynamics of Thermospheric Composition and Ionospheric Total Electron Content During Geomagnetic Storms

Sigwarth, John B.; Foster, John C.; [2005]; 1 pp.; In English; 2005 American Geophysical Union Meeting, 5-10 Dec. 2005, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The geomagnetic storms of April 17-21,2002 and May 29-30,2003 caused large decreases in the O/N2 column density ratio in the thermosphere. For these storms, O/N2 column density decreases of greater than 50% were observed to extend to mid-to-low latitudes with the FUV sensitive Earth Camera of the Visible Imaging System (VIS) on the Polar spacecraft. Simultaneously in these same regions, the ground-based GPS network observed approximately 80% reductions in the Total Electron Content (TEC) of the ionosphere. The reduction in the O/N2 column density ratio is due mainly to increases in the molecular species that have welled-up into the thermosphere from the lower levels of the atmosphere due to auroral heating. The geomagnetic-storm driven increase in molecular densities at typical ionospheric heights rapidly charge exchange with the ambient ionized atoms and subsequently dissociatively recombine with the ionospheric electrons leading to a reduction in the total charge density. The transition boundaries between high and low regions of O/N2 as well as TEC can be tracked in the images and the thermospheric winds may be inferred from the motion of the boundaries. The motion of these boundaries during the development of the geomagnetic storm will be discussed.

Author

Ionospheric Electron Density; Thermosphere; Magnetic Storms; Geodynamics

20060013185 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Principle Component Analysis of the Evolution of the Saharan Air Layer and Dust Transport: Comparisons between a Model Simulation and MODIS Retrievals

Wong, S.; Colarco, P. R.; Dessler, A.; [2006]; 35 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The onset and evolution of Saharan Air Layer (SAL) episodes during June-September 2002 are diagnosed by applying principal component analysis to the NCEP reanalysis temperature anomalies at 850 hPa, where the largest SAL-induced temperature anomalies are located. The first principal component (PC) represents the onset of SAL episodes, which are associated with large warm anomalies located at the west coast of Africa. The second PC represents two opposite phases of the evolution of the SAL. The positive phase of the second PC corresponds to the southwestward extension of the warm anomalies into the tropical-subtropical North Atlantic Ocean, and the negative phase corresponds to the northwestward extension into the subtropical to mid-latitude North Atlantic Ocean and the southwest Europe. A dust transport model (CARMA) and the MODIS retrievals are used to study the associated effects on dust distribution and deposition. The positive (negative) phase of the second PC corresponds to a strengthening (weakening) of the offshore flows in the lower troposphere around 10deg - 20degN, causing more (less) dust being transported along the tropical to subtropical North Atlantic Ocean. The variation of the offshore flow indicates that the subseasonal variation of African Easterly Jet is associated with the evolution of the SAL. Significant correlation is found between the second PC time series and the daily West African monsoon index, implying a dynamical linkage between West African monsoon and the evolution of the SAL and Saharan dust transport.

Author

MODIS (Radiometry); Principal Components Analysis; Time Series Analysis; Anomalies; Dust

20060013337 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Electric field measurements of DC and long wavelength structures associated with sporadic-E layers and QP radar echoes

Pfaff, R.; Freudenreich, H.; Yokoyama, T.; Yamamoto, M.; Fukao, S.; Mori, H.; Ohtsuki, S.; Iwagami, N.; Annales Geophysicae: Part of Special Issue 'SEEK-2 (Sporadic-E Experiment over Kyushu 2'; October 13, 2005; Volume 23; 17 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Electric field and plasma density data gathered on a sounding rocket launched from Uchinoura Space Center, Japan, reveal a complex electrodynamics associated with sporadic-E layers and simultaneous observations of quasiperiodic radar echoes. The electrodynamics are characterized by spatial and temporal variations that differed considerably between the rocket's up-leg and down-leg traversals of the lower ionosphere. Within the main sporadic-E layer (95- 110 km) on the up-leg, the

electric fields were variable, with amplitudes of 2 4 mV1m that changed considerably within altitude intervals of 1-3 km. The identification of polarization electric fields coinciding with plasma density enhancements and/or depletions is not readily apparent. Within this region on the down-leg, however, the direction of the electric field revealed a marked change that coincided precisely with the peak of a single, narrow sporadic-E plasma density layer near 102.5 km. This shear was presumably associated with the neutral wind shear responsible for the layer formation. The electric field data above the sporadic-E layer on the upleg, from 110 km to the rocket apogee of 152 km, revealed a continuous train of distinct, large scale, quasi-periodic structures with wavelengths of 10-15 km and wavevectors oriented between the NE-SW quadrants. The electric field structures had typical amplitudes of 3-5 mV/m with one excursion to 9mV/m, and in a very general sense, were associated with perturbations in the plasma density. The electric field waveforms showed evidence for steepening and/or convergence effects and presumably had mapped upwards along the magnetic field from the sporadic-E region below.
Author
Apogees; Radar Echoes; Electric Fields; Electrical Measurement; Waveforms; Sporadic E Layer; Plasma Density; Spatial Distribution

20060013340 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Combinations of Earth Orientation Measurements: SPACE2004, COMB2004, and POLE2004
Gross, Richard R.; July 2005; 30 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS7-03001
Report No.(s): JPL-Publ-05-6; No Copyright; Avail.: CASI: A03, Hardcopy

Independent Earth orientation measurements taken by the space-geodetic techniques of lunar and satellite laser ranging, very long baseline interferometry, and the global positioning system have been combined using a Kalman filter. The resulting combined Earth orientation series, SPACE2004, consists of values and uncertainties for Universal Time, polar motion, and their rates that span from September 28, 1976, to January 22, 2005, at daily intervals and is available in versions whose epochs are given at either midnight or noon. The space-geodetic measurements used to generate SPACE2004 have then been combined with optical astrometric measurements to form two additional combined Earth orientation series: (1) COMB2004, consisting of values and uncertainties for Universal Time, polar motion, and their rates that span from January 20, 1962, to January 22, 2005, at daily intervals and which is also available in versions whose epochs are given at either midnight or noon, and (2) POLE2004, consisting of values and uncertainties for polar motion and its rate that span from January 20, 1900, to January 20, 2005, at 30.4375-day intervals.
Author
Earth Orientation; Time Measurement; Astrometry; Very Long Base Interferometry; Satellite Laser Ranging; Universal Time

20060013398 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Recent Changes in High-Latitude Glaciers, Ice Caps, and Ice Sheets
Abdalati, Waleed; [2006]; 25 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The glaciers and ice sheets of the world contain enough ice to raise sea level by approximately 70 meters if they were to disappear entirely, and most of this ice is located in the climatically sensitive polar regions. Fortunately changes of this magnitude would probably take many thousands of years to occur, but recent discoveries indicate that these ice masses are responding to changes in today s climate more rapidly than previously thought. These responses are likely to be of great societal significance, primarily in terms of their implications for sea level, but also in terms of how their discharge of freshwater, through melting or calving, may impact ocean circulation. For millions of years, oceans have risen and fallen as the Earth has warmed and cooled, and ice on land has shrunk and grown. Today is no different in that respect, as sea levels have been rising at a rate of nearly 2 m per year during the last century (Miller and Douglas 2004), and 3 mm/yr in the last 12 years (Leuliette et al. 2004). What is different today, however, is that tens - perhaps hundreds - of millions of people live in coastal areas that are vulnerable to changes in sea level. Rising seas erode beaches, increase flood potential, and reduce the ability of barrier islands and coastal wetlands to mitigate the effects of major storms and hurricanes. The costs associated with a one-meter rise in sea level are estimated to be in the hundreds of billions of dollars in the USA alone. The worldwide costs in human terms would be far greater as some vulnerable low-lying coastal regions would become inundated, especially in poorer nations that do not have the resources to deal with such changes. Such considerations are particularly important in light of the fact that a one meter sea level rise is not significantly outside the 0.09 to 0.88 range of predictions for this century (IPCC 2001), and rises of this magnitude have occurred in the past in as little as 20 years (Fairbanks 1989). While the expansion of the warming oceans is estimated to be about a third of recent sea level rise, (Miller and Douglas 2004) the greatest potential for significantly increasing sea level lies in the Greenland and Antarctic ice sheets. For different reasons, each exhibits

characteristics that suggest they are potentially unstable. In Antarctica, large portions of the ice cover rest on a soft bed that lies below sea level, making it vulnerable to runaway retreat. The Greenland ice sheet experiences considerable melt, which has the potential to rapidly accelerate the flow of ice toward the sea. While smaller ice masses, such as the Alaskan Glaciers and the Canadian ice caps, do not have anywhere near the same potential to impact sea level as the vast ice sheets do, many are melting rapidly, posing a significant near-term threat.
Author
Glaciers; Ice; Climate Change; Sea Level; Polar Regions; Ocean Currents; Melting; Antarctic Regions

20060013471 NASA Johnson Space Center, Houston, TX, USA
Pyroxenes in Martian meteorites as petrogenetic indicators
McKay, Gordon; Le, L.; Mikouchi, T.; Makishima, J.; Schwandt, C.; [2006]; 1 pp.; In English; 19th General Meeting of the International Minearlogical Association, 23-28 Jul. 2006, Kobe, Japan; Copyright; Avail.: Other Sources; Abstract Only

Pyroxenes in Martian meteorites are important recorders of petrogenetic processes. Understanding the details of pyroxene major and minor element compositional variations can provide important insights into those processes. A combination of careful petrographic analysis of natural samples and experimental crystallization studies can lead to better understanding of the processes that gave rise to these samples on Mars. In addition, experimentally determined major, minor and trace element partition coefficients are important for using natural pyroxenes to estimate the compositions of the melts from which they crystallized and the oxidation conditions that prevailed during crystallization. We will report on minor element (Al, Ti, Cr) zoning in nakhlite pyroxenes and in synthetic pyroxenes that we have grown for the purposes of determining pyroxene/melt partition coefficients for Sr and REE. The natural pyroxenes have patchy Al zoning that, by analogy with our experimental pyroxenes, we interpret as sector zoning. The irregular patchy nature of the zoning is probably the result of the vagaries of growth kinetics and local environment during crystal growth. More slowly cooled nakhlites have the most distinct bimodal zoning, with one mode having Al2O3 around 0.5-0.6 wt%, and the other around 0.9 %. Average Al content increases with increasing cooling rate. This feature is puzzling, since the cumulus pyroxenes were almost certainly present at the time of eruption. Al and Ti are strongly correlated, but Cr is completely decoupled from those elements. The synthetic pyroxenes are distinctly sector zoned in Al and Ti, and the sector-to-sector variation in Al within a single crystal has important effects on trace element partition coefficients. Trivalent REE are strongly correlated with Al, while divalent elements (Sr, Eu+2) show a significantly weaker correlation. For example, as the Al2O3 content varies from 0.3 to 0.6 wt % from one sector to another, D(Gd) increases by approx.80% while D(Sr) and D(Eu) only increase by 20-30% at oxygen fugacities near IW. The different Al dependency of D for trivalent REE vs. divalent Eu and Sr considerably complicates the calibration of the Eu oxybarometer.
Author
Pyroxenes; Nakhlites; SNC Meteorites; Trace Elements; Aluminum Oxides; Crystal Growth; Petrography; Single Crystals

20060013483 NASA Johnson Space Center, Houston, TX, USA
Mineralogy and Petrology of COMET WILD2 Nucleus Samples
Zolensky, Michael; Bland, Phil; Bradley, John; Brearley, Adrian; Brennan, Sean; Bridges, John; Brownlee, Donald; Butterworth, Anna; Dai, Zurong; Ebel, Denton, et al.; [2006]; 2 pp.; In English; Ipsc, 11-17 Mar. 2006, Houston, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

The sample return capsule of the Stardust spacecraft will be recovered in northern Utah on January 15, 2006, and under nominal conditions it will be delivered to the new Stardust Curation Laboratory at the Johnson Space Center two days later. Within the first week we plan to begin the harvesting of aerogel cells, and the comet nucleus samples they contain for detailed analysis. By the time of the LPSC meeting we will have been analyzing selected removed grains for more than one month. This presentation will present the first results from the mineralogical and petrological analyses that will have been performed.
Derived from text
Mineralogy; Petrology; Stardust Mission; Sample Return Missions

20060013494 NASA Johnson Space Center, Houston, TX, USA, ARES Corp., Houston, TX, USA
Ar-Ar and I-Xe Ages and the Thermal History of IAB Meteorites
Bogard, Donald D.; Garrison, Daniel H.; Takeda, Hiroshi; [2004]; 1 pp.; In English
Contract(s)/Grant(s): 344-31-30-01; Copyright; Avail.: Other Sources; Abstract Only

Studies of several samples of the large Caddo County IAB iron meteorite reveal andesitic material, enriched in Si, Na, Al and Ca, which is essentially unique among meteorites. This material is believed to have formed from a chondritic source by partial melting and to have further segregated by grain coarsening. Such an origin implies extended metamorphism of the

IAB parent body. New Ar-39-Ar-40 ages for silicate from three different Caddo samples are consistent with a common age of 4.50-4.51 Gyr ago. Less well defined Ar-Ar degassing ages for inclusions from two other IABs, EET8333 and Udei Station, are approx.4.32 Gyr, whereas the age for Campo del Cielo varies considerably over approx.3.23-4.56 Gyr. New I-129-Xe-129 ages for Caddo County and EET8333 are 4561.9+/-0.1 Myr and 4560- 4563 Myr, respectively, relative to an age of 4566 Myr for Shallowater. Considering all reported Ar-Ar ages for IABs and related winonaites, the range is approx.4.32-4.53 Gyr, but several IABs give similar Ar ages of 4.50-4.52 Gyr. We interpret these older ages to represent cooling after the time of last significant metamorphism on the parent body, and the younger ages to represent later Ar-40 diffusion loss. These older Ar-Ar ages are similar to Sm-Nd and Rb-Sr isochron ages reported in the literature for Caddo County. Considering the possibility that IAB parent body formation was followed by impact disruption, reassembly, and metamorphism (e.g., Benedix et al. 2000), the time of the post-assembly metamorphism may have been as late as approx.4.53 Gyr ago. However, precise I-Xe ages reported for some IABs define a range of ages of approx.4560 to approx.4576 Myr. The older I-Xe ages exceed the oldest precise radiometric ages of meteorites, appear unrealistic, and s,uggest a bias in the calibration of all I-Xe ages. But even with such a bias, the I-Xe ages of IABs cannot easily be reconciled with the much younger Ar-Ar and Sm-Nd ages and with cooling rates deduced from Ni concentration profiles in IAB metal (Herpfer et al., 1994). An explanation for the difference in radiometric ages of IABs may reside in combinations of the following: a) I-Xe ages have very high closure temperatures and were not reset during metamorphism; b) a bias exists in the K-40 decay constants; c) the reported Sm-Nd and Rb-Sr ages for Caddo are in error by amounts equal to or exceeding their reported 2-sigma uncertainties; and 4) the IAB parent body may have experienced a mild metamorphism approx.30 Myr after the initial heating that produced differentiation of Caddo silicate and mixing of silicate and metal.
Author
Iron Meteorites; Argon Isotopes; Chondrites; Metamorphism (Geology); Andesite; Degassing; High Temperature

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20060013175 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Aerosol-Water Cycle Interaction: A New Challenge in Monsoon Climate Research
Lau, William K. M.; [2006]; 1 pp.; In English; CLiPAS, 8-13 Jan. 2006, Honolulu, HI, USA; No Copyright; Avail.: Other Sources; Abstract Only

Long recognized as a major environmental hazard, aerosol is now known to have strong impacts on both regional and global climate. It has been estimated that aerosol may reduce by up to 10% of the seasonal mean solar radiation reaching the earth surface, producing a global cooling effect that opposes global warming (Climate Change 2001). This means that the potential perils that humans have committed to global warming may be far greater than what we can detect at the present. As a key component of the Earth climate system, the water cycle is profoundly affected by the presence of aerosols in the atmosphere. Through the so-called direct effect , aerosol scatters and/or absorbs solar radiation, thus cooling the earth surface and changing the horizontal and vertical radiational heating contrast in the atmosphere. The heating contrast drives anomalous atmospheric circulation, resulting in changes in convection, clouds, and rainfall. Another way aerosol can affect the water cycle is through the so-called indirect effects, whereby aerosol increases the number of cloud condensation nuclei, prolongs life time of clouds, and inhibits the growth of cloud drops to raindrops. This leads to more clouds, and increased reflection of solar radiation, and further cooling at the earth surface. In monsoon regions, the response of the water cycle to aerosol forcing is especially complex, not only because of presence of diverse mix of aerosol species with vastly different radiative properties, but also because the monsoon is strongly influenced by ocean and land surface processes, land use, land change, as well as regional and global greenhouse warming effects. Thus, sorting out the impacts of aerosol forcing, and interaction with the monsoon water cycle is a very challenging problem. In this talk, I will offer some insights into how aerosols may impact the Asian monsoon based on preliminary results from satellite observations and climate model experiments. Specifically, I will discuss the elevated heat pump hypothesis, involving atmospheric heating by absorbing aerosols (dust and black carbon) over the southern slopes of the Himalayas, and feedback with the deep convection, in modifying monsoon water cycle over South .and East Asia. The role of aerosol forcing relative to those due to sea surface temperature and land surface processes, as well as observation requirements to verify such a hypothesis will also be discussed.
Author
Aerosols; Climatology; Monsoons; Research and Development; Earth Surface; Hydrological Cycle

20060013177 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Simulated convective systems using a cloud resolving model: Impact of large-scale temperature and moisture forcing using observations and GEOS-3 reanalysis

Shie, C.-L.; Tao, W.-K.; Hou, A.; Lin, X.; [2006]; 1 pp.; In English; 27th Conference on Hurricanes and Tropical Meteorology, 24-28 Apr. 2006, Monterey, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The GCE (Goddard Cumulus Ensemble) model, which has been developed and improved at NASA Goddard Space Flight Center over the past two decades, is considered as one of the finer and state-of-the-art CRMs (Cloud Resolving Models) in the research community. As the chosen CRM for a NASA Interdisciplinary Science (IDS) Project, GCE has recently been successfully upgraded into an MPI (Message Passing Interface) version with which great improvement has been achieved in computational efficiency, scalability, and portability. By basically using the large-scale temperature and moisture advective forcing, as well as the temperature, water vapor and wind fields obtained from TRMM (Tropical Rainfall Measuring Mission) field experiments such as SCSMEX (South China Sea Monsoon Experiment) and KWAJEX (Kwajalein Experiment), our recent 2-D and 3-D GCE simulations were able to capture detailed convective systems typical of the targeted (simulated) regions. The GEOS-3 [Goddard EOS (Earth Observing System) Version-3] reanalysis data have also been proposed and successfully implemented for usage in the proposed/performed GCE long-term simulations (i.e., aiming at producing massive simulated cloud data -- Cloud Library) in compensating the scarcity of real field experimental data in both time and space (location). Preliminary 2-D or 3-D pilot results using GEOS-3 data have generally showed good qualitative agreement (yet some quantitative difference) with the respective numerical results using the SCSMEX observations. The first objective of this paper is to ensure the GEOS-3 data quality by comparing the model results obtained from several pairs of simulations using the real observations and GEOS-3 reanalysis data. The different large-scale advective forcing obtained from these two kinds of resources (i.e., sounding observations and GEOS-3 reanalysis) has been considered as a major critical factor in producing various model results. The second objective of this paper is therefore to investigate and present such an impact of large-scale forcing on various modeled quantities (such as hydrometeors, rainfall, and etc.). A third objective is to validate the overall GCE 3-D model performance by comparing the numerical results with sounding observations, as well as available satellite retrievals.

Author

Simulation; Atmospheric Models; Cumulus Clouds; GEOS 3 Satellite; Moisture; Convection

20060013182 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Characterizing diurnal and seasonal cycles in monsoon systems from TRMM and CEOP observations

Lau, William K. M.; [2006]; 1 pp.; In English; 5th CEOP Implementation Planning Meeting - GEWEX, 27 Feb. - 1 Mar. 2006, Paris, France; No Copyright; Avail.: Other Sources; Abstract Only

The CEOP Inter-Monsoon Study (CIMS) is one of the two main science drivers of CEOP that aims to (a) provide better understanding of fundamental physical processes in monsoon regions around the world, and (b) demonstrate the synergy and utility of CEOP data in providing a pathway for model physics evaluation and improvement. As the data collection phase for EOP-3 and EOP-4 is being completed, two full annual cycles (2003-2004) of research-quality data sets from satellites, reference sites, and model output location time series (MOLTS) have been processed and made available for data analyses and model validation studies. This article presents preliminary results of a CIMS study aimed at the characterization and intercomparison of all major monsoon systems. The CEOP reference site data proved its value in such exercises by being a powerful tool to cross-validate the TRMM data, and to intercompare with multi-model results in ongoing work. We use 6 years (1998-2003) of pentad CEOP/TRMM data with 2deg x 2.5deg latitude-longitude grid, over the domain of interests to define the monsoon climatological diurnal and annual cycles for the East Asian Monsoon (EAM), the South Asian Monsoon (SAM), the West Africa Monsoon (WAM), the North America/Mexican Monsoon (NAM), the South American Summer Monsoon (SASM) and the Australian Monsoon (AUM). As noted, the TRMM data used in the study were cross-validated using CEOP reference site data, where applicable. Results show that the observed diurnal cycle of rain peaked around late afternoon over monsoon land, and early morning over the oceans. The diurnal cycles in models tend to peak 2-3 hours earlier than observed. The seasonal cycles of the EAM and SAM show the strongest continentality, i.e, strong control by continental processes away from the ITCZ. The WAM, and the AUM shows the less continentality, i.e, strong control by the oceanic ITCZ.

Author

Climatology; Time Series Analysis; TRMM Satellite; Monsoons; Diurnal Variations; Latitude; Longitude; Data Acquisition; Rain

20060013184 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Improvement of Raman lidar algorithm for quantifying aerosol extinction

Russo, Felicita; Whiteman, David; Demoz, Belay; Hoff, Raymond; [2005]; 31 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG05GC06A; Copyright; Avail.: CASI: A03, Hardcopy

Aerosols are particles of different composition and origin and influence the formation of clouds which are important in atmospheric radiative balance. At the present there is high uncertainty on the effect of aerosols on climate and this is mainly due to the fact that aerosol presence in the atmosphere can be highly variable in space and time. Monitoring of the aerosols in the atmosphere is necessary to better understanding many of these uncertainties. A lidar (an instrument that uses light to detect the extent of atmospheric aerosol loading) can be particularly useful to monitor aerosols in the atmosphere since it is capable to record the scattered intensity as a function of altitude from molecules and aerosols. One lidar method (the Raman lidar) makes use of the different wavelength changes that occur when light interacts with the varying chemistry and structure of atmospheric aerosols. One quantity that is indicative of aerosol presence is the aerosol extinction which quantifies the amount of attenuation (removal of photons), due to scattering, that light undergoes when propagating in the atmosphere. It can be directly measured with a Raman lidar using the wavelength dependence of the received signal. In order to calculate aerosol extinction from Raman scattering data it is necessary to evaluate the rate of change (derivative) of a Raman signal with respect to altitude. Since derivatives are defined for continuous functions, they cannot be performed directly on the experimental data which are not continuous. The most popular technique to find the functional behavior of experimental data is the least-square fit. This procedure allows finding a polynomial function which better approximate the experimental data. The typical approach in the lidar community is to make an a priori assumption about the functional behavior of the data in order to calculate the derivative. It has been shown in previous work that the use of the chi-square technique to determine the most likely functional behavior of the data prior to actually calculating the derivative eliminates the need for making a priori assumptions. We note that the a priori choice of a model itself can lead to larger uncertainties as compared to the method that is validated here. In this manuscript, the chi-square technique that determines the most likely functional behavior is validated through numerical simulation and by application to a large body of Raman lidar measurements. In general, we show that the chi-square approach to evaluate aerosol extinction yields lower extinction uncertainty than the traditional technique. We also use the technique to study the feasibility of developing a general characterization of the extinction uncertainty that could permit the uncertainty in Raman lidar aerosol extinction measurements to be estimated accurately without the use of the chi-square technique.
Author

Aerosols; Extinction; Raman Spectra; Optical Radar; Radar Measurement; Algorithms; Climate

20060013186 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Chemical Observations of a Polar Vortex Intrusion

Schoeberl, M. R.; Kawa, S. R.; Douglass, A. R.; McGee, T. J.; Browell, E.; Waters, J.; Livesey, N.; Read, W.; Froidevaux, L., et al.; [2006]; 68 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy

An intrusion of vortex edge air in D the interior of the Arctic polar vortex was observed on the January 31,2005 flight of the NASA DC-8 aircraft. This intrusion was identified as anomalously high values of ozone by the AROTAL and DIAL lidars. Our analysis shows that this intrusion formed when a blocking feature near Iceland collapsed, allowing edge air to sweep into the vortex interior. along the DC-8 flight track also shows the intrusion in both ozone and HNO3. Polar Stratospheric Clouds (PSCs) were observed by the DIAL lidar on the DC-8. The spatial variability of the PSCs can be explained using MLS HNO3 and H2O observations and meteorological analysis temperatures. We also estimate vortex denitrification using the relationship between N2O and HNO3. Reverse domain fill back trajectory calculations are used to focus on the features in the MLS data. The trajectory results improve the agreement between lidar measured ozone and MLS ozone and also improve the agreement between the HNO3 measurements PSC locations. The back trajectory calculations allow us to compute the local denitrification rate and reduction of HCl within the filament. We estimate a denitrification rate of about lO%/day after exposure to below PSC formation temperature. Analysis of Aura MLS observations made
Author

Intrusion; Vortices; Polar Meteorology; Optical Radar; Nitrogen Oxides; Ice Clouds; Ozone

20060013188 NASA Goddard Space Flight Center, Greenbelt, MD, USA

View angle dependence of cloud optical thicknesses retrieved by MODIS

Marshak, Alexander; Varnai, Tamas; November 2005; 31 pp.; In English; Original contains black and white illustrations

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This study examines whether cloud inhomogeneity influences the view angle dependence of MODIS cloud optical thickness (tau) retrieval results. The degree of cloud inhomogeneity is characterized through the local gradient in 11 microns brightness temperature. The analysis of liquid phase clouds in a one year long global dataset of Collection 4 MODIS data reveals that while optical thickness retrievals give remarkably consistent results for all view directions if clouds are homogeneous, they give much higher tau-values for oblique views than for overhead views if clouds are inhomogeneous and the sun is fairly oblique. For solar zenith angles larger than 55deg, the mean optical thickness retrieved for the most inhomogeneous third of cloudy pixels is more than 30% higher for oblique views than for overhead views. After considering a variety of possible scenarios, the paper concludes that the most likely reason for the increase lies in three-dimensional radiative interactions that are not considered in current, one-dimensional retrieval algorithms. Namely, the radiative effect of cloud sides viewed at oblique angles seems to contribute most to the enhanced tau-values. The results presented here will help understand cloud retrieval uncertainties related to cloud inhomogeneity. They complement the uncertainty estimates that will start accompanying MODIS cloud products in Collection 5 and may eventually help correct for the observed view angle dependent biases.
Author
MODIS (Radiometry); Inhomogeneity; Clouds (Meteorology); Brightness Temperature; Optical Thickness; Imaging Spectrometers

20060013189 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Aerosol climatology using a tunable spectral variability cloud screening of AERONET data
Kaufman, Yoram J.; Gobbi, Gian Paolo; Koren, Ilan; [2005]; 5 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Can cloud screening of an aerosol data set, affect the aerosol optical thickness (AOT) climatology? Aerosols, humidity and clouds are correlated. Therefore, rigorous cloud screening can systematically bias towards less cloudy conditions, underestimating the average AOT. Here, using AERONET data we show that systematic rejection of variable atmospheric optical conditions can generate such bias in the average AOT. Therefore we recommend (1) to introduce more powerful spectral variability cloud screening and (2) to change the philosophy behind present aerosol climatologies: Instead of systematically rejecting all cloud contaminations, we suggest to intentionally allow the presence of cloud contamination, estimate the statistical impact of the contamination and correct for it. The analysis, applied to 10 AERONET stations with approx. 4 years of data, shows almost no change for Rome (Italy), but up to a change in AOT of 0.12 in Beijing (PRC). Similar technique may be explored for satellite analysis, e.g. MODIS.
Author
Aerosols; Humidity; Clouds (Meteorology); MODIS (Radiometry); Climatology; Imaging Spectrometers; Optical Thickness

20060013199 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Spatial and Temporal Coherence of SeaWiFS Chlorophyll Concentration Anomalies in the North Atlantic Bloom (1998-2005) Examined with Giovanni
Acker, James G.; [2006]; 2 pp.; In English; American Geophysical Union Ocean Sciences Meeting, 20-24 Feb. 2006, Honolulu, HI, USA
Contract(s)/Grant(s): NAS5-00220; No Copyright; Avail.: Other Sources; Abstract Only

The availability of climatological chlorophyll-a concentration data products from the SeaWiFS mission spanning the eight-year mission period allowed the creation of a climatological anomaly analysis function in Giovanni, the GES DISC Interactive Online Visualization and ANalysis Infrastructure. This study utilizes the Giovanni anomaly analysis function to examine mesoscale anomalies in the North Atlantic Ocean during the springtime North Atlantic Bloom. This examination indicates that areas exhibiting positive anomalies and areas exhibiting negative anomalies are coherent over significant spatial scales, with relatively abrupt boundaries between areas with positive and negative anomalies. Year-to-year variability in anomaly 'intensity' can be caused by either variability in the temporal occurrence of the bloom peak or by variability in the peak chlorophyll concentration in a particular area. The study will also discuss the feasibility of combining chlorophyll anomaly analysis with other data types.
Author
Atlantic Ocean; Chlorophylls; Sea-Viewing Wide Field-of-View Sensor; Coherence; Anomalies; Climatology; Earth Sciences; Mesoscale Phenomena; Annual Variations

20060013200 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Precipitation links (PrecipLinks) - a prototype directory for precipitation information

Velanthapillia, Balendran; Stocker, Erich Franz; [2006]; 1 pp.; In English; European Geosciences Union General Assembly 2006, 2-7 Apr. 2006, Vienna, Austria; Copyright; Avail.: Other Sources; Abstract Only

This poster describes a web directory of research oriented precipitation links. In this era of sophisticated search engines and web agents, it might seem counterproductive to establish such a directory of links. However, entering precipitation into a search engine like google will yield over one million hits. To further exacerbate this situation many of the returned links are dead, duplicates of other links, incomplete, or only marginally related to research precipitation or even the broader precipitation area. Sometimes connecting the linked URL causes the browser to lose context and not be able to get back to the original page. Even using more sophisticated search engines query parameters or agents while reducing the overall return doesn't eliminate all of the other issues listed. As part of the development of the measurement-based Precipitation Processing System (PPS) that will support Tropical Rainfall Measuring Mission (TRMM) version 7 reprocessing and the Global Precipitation Measurement (GPM) mission a precipitation links (PrecipLinks) facility is being developed. PrecipLinks is intended to share locations of other sites that contain information or data pertaining to precipitation research. Potential contributors can log-on to the PrecipLinks website and register their site for inclusion in the directory. The price for inclusion is the requirement to place a link back to PrecipLinks on the webpage that is registered. This ensures that users will be able to easily get back to PrecipLinks regardless of any context issues that browsers might have. Perhaps more importantly users while visiting one site that they know can be referred to a location that has many others sites with which they might not be familiar. PrecipLinks is designed to have a very flat structure. This poster summarizes these categories (information, data, services) and the reasons for their selection. Providers may register multiple pages to which they wish to direct users. However, each page may be attached to only one of these categories. Each page to which they refer users will also have a return link to PrecipLinks. The poster describes the operation of the system both the automated and the human processes. It also provides images for the various steps in the registration and use.

Author

Information Systems; Precipitation (Meteorology); Precipitation Measurement; Websites; Directories; Information Retrieval; TRMM Satellite

20060013201 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Spatially Complete Global Surface Albedos Derived from Terra/MODIS Data

King, Michael D.; Moody, Eric G.; Schaaf, Crystal B.; Platnick, Steven; [2006]; 2 pp.; In English; Land Surface Analysis Satellite Applications Facility 2006, 8-10 Mar. 2006, Lisbon, Portugal; Copyright; Avail.: Other Sources; Abstract Only

Spectral land surface albedo is an important parameter for describing the radiative properties of the Earth. Accordingly it reflects the consequences of natural and human interactions, such as anthropogenic, meteorological, and phenological effects, on global and local climatological trends. Consequently, albedos are integral parts in a variety of research areas, such as general circulation models (GCMs), energy balance studies, modeling of land use and land use change, and biophysical, oceanographic, and meteorological studies. , Over five years of land surface anisotropy, diffuse bihemispherical (white-sky) albedo and direct beam directional hemispherical (black-sky) albedo from observations acquired by the MODIS instruments aboard NASA s Terra and Aqua satellite platforms have provided researchers with unprecedented spatial, spectral, and temporal information on the land surface s radiative characteristics. However, roughly 30% of the global land surface, on an annual equal-angle basis, is obscured due to persistent and transient cloud cover, while another 207% is obscured due to ephemeral and seasonal snow effects. This precludes the MOD43B3 albedo products from being directly used in some remote sensing and ground-based applications, climate models, and global change research projects. To provide researchers with the requisite spatially complete global snow-free land surface albedo dataset, an ecosystem-dependent temporal interpolation technique was developed to fill missing or lower quality data and snow covered values from the official MOD43B3 dataset with geophysically realistic values. The method imposes pixel-level and local regional ecosystem-dependent phenological behavior onto retrieved pixel temporal data in such a way as to maintain pixel-level spatial and spectral detail and integrity. The phenological curves are derived from statistics based on the MODIS MOD12Q1 IGBP land cover classification product geolocated with the MOD43B3 data.

Author

Atmospheric General Circulation Models; Classifications; Man Environment Interactions; Remote Sensing; Phenology; MODIS (Radiometry); Climate Models

20060013203 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Inter-calibrating Brightness Temperatures of a Constellation of Radiometers

Stocker, Erich Franz; Berg, Wesley; Kummerow, Christian; Stout, John; [2006]; 1 pp.; In English; European Geosciences Union General Assembly 2006, 2-7 Apr. 2006, Vienna, Austria; Copyright; Avail.: Other Sources; Abstract Only

In 2010, the National Aeronautics and Space Agency (NASA) of the U.S.A. and the Japanese Exploration Agency (JAXA) of Japan in cooperation with other U.S. and international partners will launch the Global Precipitation Measurement (GPM) mission. The mission center-piece is a core U.S. provided satellite holding a scanning microwave imager provided by the U.S. A. and a dual-frequency precipitation radar provided by Japan. The core satellite is in a 65 deg inclination (the current Tropical Rainfall Measuring Mission -TRMM is in a 35 deg inclination). Joining the core satellite are a constellation of approximately 8 satellites containing scanning radiometers. The purpose of the constellation is to increase the global sampling capability of the mission. One constellation satellite will be provided by NASA. Some of the constellation radiometers will provided by other U.S. agencies with existing (e.g. SSMI/S) or planned (NPOESS) radiometer assets. International groups have also expressed interest in contributing to the GPM mission including providing radiometer data for the GPM constellation. The use of a heterogeneous group of scanning radiometers each with its own unique purpose, characteristics and calibration offers a significant challenge for combining brightness temperatures or rain retrievals to create meaningful combined global radiometer products. However, the availability of active dual precipitation radar on the GPM core in combination with a well-calibrated radiometer on the same platform offers the possibility of inter-calibrating the constellation radiometers using the core satellite as a calibrator. This paper describes a joint NASA/GSFC and Colorado State University prototype effort at inter-calibrating existing radiometers using such a core calibrator approach. In the prototype, existing radiometers (i.e. SSM/I and AMSR-E) are intercalibrated, as required, using the TRMM Precipitation Radar (PR) and TRMM Microwave Imager (TMI) as the calibration core. This prototype includes four basic steps: provide the data in a normalized-common logical radiometer format, convert all data to a granule that stops and starts at the southernmost latitude rather than at the equator, perform basic processing and finally inter-calibrate the radiometers with the TRMM core as appropriate. Basic processing includes quality control, cross-track bias correction as well as the core action of converting T(sub a), to T(sub b). The purpose of the inter-calibration step is to provide consistent brightness temperatures for the various SSMA sensors, TMI and AMSR-E. The C appended to the level of the product indicates common brightness temperature (T(sub c)). The paper provides a summary of each of these actions. The details of the processing as well as data format and tools can be obtained by connecting to the website at mrain.atmos.colostate.eduLEVEL1C .

Author

Brightness Temperature; Calibrating; Precipitation (Meteorology); Radiometers; Meteorological Radar

20060013209 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Changes in Tropical Cyclone Intensity Over the Past 30 Years: A Global and Dynamic Perspective

Wu, Liguang; Wang, Bin; Braun, Scott A.; [2006]; 37 pp.; In English

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The hurricane season of 2005 was the busiest on record and Hurricane Katrina (2005) is believed to be the costliest hurricane in U. S. history. There are growing concerns regarding whether this increased tropical cyclone activity is a result of global warming, as suggested by Emanuel(2005) and Webster et al. (2005), or just a natural oscillation (Goldenberg et al. 2001). This study examines the changes in tropical cyclone intensity to see what were really responsible for the changes in tropical cyclone activity over the past 30 years. Since the tropical sea surface temperature (SST) warming also leads to the response of atmospheric circulation, which is not solely determined by the local SST warming, this study suggests that it is better to take the tropical cyclone activities in the North Atlantic (NA), western North Pacific (WNP) and eastern North Pacific (ENP) basins as a whole when searching for the influence of the global-scale SST warming on tropical cyclone intensity. Over the past 30 years, as the tropical SST increased by about 0.5 C, the linear trends indicate 6%, 16% and 15% increases in the overall average intensity and lifetime and the annual frequency. Our analysis shows that the increased annual destructiveness of tropical cyclones reported by Emanuel(2005) resulted mainly from the increases in the average lifetime and annual frequency in the NA basin and from the increases in the average intensity and lifetime in the WNP basin, while the annual destructiveness in the ENP basin generally decreased over the past 30 years. The changes in the proportion of intense tropical cyclones reported by Webster et a1 (2005) were due mainly to the fact that increasing tropical cyclones took the tracks that favor for the development of intense tropical cyclones in the NA and WNP basins over the past 30 years. The dynamic influence associated with the tropical SST warming can lead to the impact of global warming on tropical cyclone intensity that

may be very different from our current assessments, which were mainly based on the thermodynamic theory of tropical cyclone intensity.
Author
Cyclones; Tropical Storms; Sea Surface Temperature; Global Warming; Hurricanes; Atmospheric Circulation; Thermodynamics

20060013227 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Improving Lightning NO(x) Parameterizations for Global Chemical Transport Models
Pickering, Kenneth E.; Ott, Lesley E.; DeCaria, Alex J.; Stenchikov, Georgiy L.; Allen, Dale J.; Tao, Wei-Kuo; [2006]; 1 pp.; In English; American Meteorological Society Meeting, 31 Jan. - 2 Feb. 2006, Atlanta, GA, USA; Copyright; Avail.: Other Sources; Abstract Only

Parameterization of lightning NO(x) in global chemical transport models requires a method to specify the temporal and geographic distribution of flash rates, an estimate of NO production per flash, and a method to specify the effective vertical distribution of NO production. Flash rate parameterizations using the upward convective cloud mass flux have been developed and tested for several GCM and assimilated meteorological data sets. This parameterization and others involving the cloud-top height and convective precipitation provide a generally acceptable climatological distribution of flashes after normalization with satellite data. However, considerable improvement in terms of geographic and temporal variability may be achieved in the future using cloud microphysics data available from next-generation GCMs. Cloud-resolving case-study simulations of convective transport and lightning NO production have yielded results which are directly applicable to the NO production per flash and the vertical NO distribution portions of the global model lightning parameterizations. In this work we have used cloud-resolving models (the Goddard Cumulus Ensemble Model (GCE) and MM5) to drive an off-line cloud-scale chemical transport model (CSCTM). The CSCTM, in conjunction with aircraft measurements of NO(x) in thunderstorms and ground-based lightning observations, has been used to constrain the amount of NO produced per flash. Observed lightning flash rates have been incorporated into the CSCTM, and several scenarios of NO production per intracloud (IC) and per cloud-to-ground (CG) flash have been tested in each of several case study storms. The resulting NO(x) mixing ratios are compared with aircraft measurements taken within the storm (typically the anvil region) to determine the most likely NO production scenario. The range of values of NO production per flash (or per meter of lightning channel length) that have been deduced from the model will be shown and compared with values of production in the literature that have been deduced from observed NO spikes and from anvil flux calculations. Results show that on a per flash basis, IC flashes are nearly as productive of NO as CG flashes. Estimates of mean NO production per flash vary by a factor of three from one simulated storm to another. Vertical profiles of lightning NOx mass at the end of the 3-D storm simulations have been summarized to yield suggested profiles for use in global models. These profiles show a larger percentage of the total lightning NO(x) mass in the free troposphere than those suggested by Pickering et al. (1998).
Author
Lightning; Nitrogen Oxides; Temporal Distribution; Geographic Distribution; Vertical Distribution; Cloud-to-Ground Discharges; Cloud Height Indicators; Thunderstorms; Parameterization; Meteorological Parameters

20060013258 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Weekend Effect' in Summertime U.S. Rainfall: Evidence for Midweek Intensification of Storms by Pollution
Bell, Thomas L.; Rosenfeld, Daniel; Kim, Kyu-Myong; Hahnenberger, Maura; [2006]; 1 pp.; In English; American Geophysical Union Joint Assembly, 23-26 May 2006, Baltimore, MD, USA; No Copyright; Avail.: Other Sources; Abstract Only

Persistent and strong dependence of rain rate on the day of the week has been found in Tropical Rainfall Measuring Mission (TRMM) satellite estimates of summer afternoon rainfall over the southeast U.S. and the nearby Atlantic from 1998 to 2005. Midweek (Tue-Thu) rain rates and rain area appear to increase over land, and this increase is accompanied by a corresponding diminution of rainfall over nearby waters. Reanalysis data from atmospheric models, suggest that there is a corresponding weekly variation in atmospheric winds consistent with the changes in rainfall. These variations are almost certainly caused by weekly variations in human activity. The most likely cause of the observed changes in rainfall is the well documented weekly variation in atmospheric pollution. Particulate pollution is highest in the middle of the week. Considerable observational and modeling evidence has accumulated concerning the effects of aerosols on precipitation. Most of this evidence relates to the suppression of precipitation by aerosols, but it has been argued that storms in highly unstable moist environments can be invigorated by aerosols, and some modeling studies seem to confirm this. The strong weekly cycle in rainfall observed over the southeast U.S. along with what appears to be dynamical suppression of rainfall over the nearby

Atlantic, and the lack of an observable cycle over the southwest U.S., are consistent with this theory.
Author
Air Pollution; Rain; Storms; Wind (Meteorology); Atmospheric Models; Atmospheric Circulation

20060013260 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Status and Plans for the WCRP/GEWEX Global Precipitation Climatology Project (GPCP)
Adkerm Robert F.; [2006]; 1 pp.; In English; IGOS Water Cycle Observations Planning Workshop - UNESCO/WCRP, 1-4 Mar. 2006, Paris, France; No Copyright; Avail.: Other Sources; Abstract Only

Status and plans for GPCP are presented along with scientific findings from the current data set. Global and large regional rainfall variations and possible long-term changes are examined using the 26-year (1979-2004) monthly dataset from the Global Precipitation Climatology Project (GPCP). One emphasis is to discriminate among the variations due to ENSO, volcanic events and possible long-term changes. Although the global change of precipitation in the data set is near zero, the data set does indicate an upward trend (0.13 mm/day/25yr) and a downward trend (-0.06 mm/day/25yr) over tropical oceans and lands (25S-25N), respectively. This corresponds to a 4% increase (ocean) and 2% decrease (land) during this time period. Simple techniques are derived to attempt to eliminate variations due to ENSO and major volcanic eruptions in the Tropics. Using only annual values two 'volcano years' are determined by examining ocean-land coupled variations in precipitation related to ENSO and other phenomena. The outlier years coincide with Pinatubo and El Chicon eruptions. The ENSO signal is reduced by deriving mean ocean and land values for El Nino, La Nina and neutral conditions based on Nino 3.4 SST and normalizing the annual ocean and land precipitation to the neutral set of cases. The impact of the two major volcanic eruptions over the past 25 years is estimated to be about a 5% reduction in tropical rainfall. The modified data set (with ENSO and volcano effect at least partially removed) retains the same approximate linear change slopes over the data set period, but with reduced variance leading to significance tests with results in the 90-95% range. Intercomparisons between the GPCP, SSM/I (1988-2004), and TRMM (1998-2004) satellite rainfall products and alternate gauge analyses over land are made to attempt to increase or decrease confidence in the changes seen in the GPCP analysis.
Author
Precipitation (Meteorology); Climatology; Rain; Volcanoes; Statistical Tests; Southern Oscillation

20060013263 NASA Goddard Space Flight Center, Greenbelt, MD, USA, Science Applications International Corp., Greenbelt, MD, USA
TRMM On-Orbit Performance Reassessed After Control Change
Bilanow, Stephen; [2006]; 3 pp.; In English; ISSFD, International Symposium on Space Flight Dynamics (19th), 4-11 Jun. 2006, Kanazawa, Japan; Original contains black and white illustrations
Contract(s)/Grant(s): NASA Order S-67496-X; No Copyright; Avail.: CASI: A01, Hardcopy

The Tropical Rainfall Measuring Mission (TRMM) spacecraft, a joint mission between the U.S. and Japan, launched onboard an H-I1 rocket on November 27, 1997, and transitioned in August, 2001, from an average operating altitude of 350 kilometers to 402.5 kilometers. Due to problems using the Earth Sensor Assembly (ESA) at the higher altitude, TRMM switched to a backup attitude control mode. Prior to the orbit boost TRMM controlled pitch and roll to the local vertical using ESA measurements while using gyro data to propagate yaw attitude between yaw updates from the Sun sensors. After the orbit boost, a Kalman filter used 3-axis gyro data with Sun sensor and magnetometers to estimate onboard attitude. While originally intended to meet a degraded attitude accuracy of 0.7 degrees, the new control mode met the original 0.2 degree attitude accuracy requirement after improving onboard ephemeris prediction and adjusting the magnetometer calibration onboard. Independent roll attitude checks using a science instrument, the Precipitation Radar (PR) which was built in Japan, provided a novel insight into the pointing performance. The PR data helped identify the pointing errors after the orbit boost, track the performance improvements, and show subtle effects from ephemeris errors and gyro bias errors. It also helped identify average bias trends throughout the mission. Roll errors tracked by the PR from sample orbits pre-boost and post-boost are shown in Figure 1. Prior to the orbit boost, the largest attitude errors were due to occasional interference in the ESA. These errors were sometime larger than 0.2 degrees in pitch and roll, but usually less, as estimated from a comprehensive review of the attitude excursions using gyro data. Sudden jumps in the onboard roll show up as spikes in the reported attitude since the control responds within tens of seconds to null the pointing error. The PR estimated roll tracks well with an estimate of the roll history propagated using gyro data. After the orbit boost, the attitude errors shown by the PR roll have a smooth sine-wave type signal because of the way that attitude errors propagate with the use of gyro data. Yaw errors couple at orbit period to roll with 1/4 orbit lag. By tracking the amplitude, phase, and bias of the sinusoidal PR roll error signal, it was shown that the average pitch rotation axis tends to be offset from orbit normal in a direction perpendicular to the Sun direction, as shown in Figure 2 for a 200 day period following the orbit boost. This is a result of the higher accuracy and stability of the Sun sensor measurements

relative to the magnetometer measurements used in the Kalman filter. In November, 2001 a magnetometer calibration adjustment was uploaded which improved the pointing performance, keeping the roll and yaw amplitudes within about 0.1 degrees.
Author
TRMM Satellite; Attitude Control; Accuracy; Attitude (Inclination); Gyroscopes; Ephemerides; Error Signals

20060013294 Nevada Univ., Reno, NV, USA
Representation of the Microphysical and Radiative Properties of Ice Clouds in SCMs and GCMs
Mitchell, D. L.; Arnott, W. P.; Grubisic, V.; January 2005; 26 pp.; In English
Report No.(s): DE2006-842226; No Copyright; Avail.: Department of Energy Information Bridge

The goal of this project was (1) to characterize the ice particle size distribution as a function of temperature and ice water content (IWC) for mid-latitude and tropical anvil cirrus clouds; (2) to predict the ice mass sedimentation rates for these cirrus clouds; (3) to test and possibly improve upon a treatment of ice cloud radiative properties, developed during the previous ARM project. Once realized, these accomplishments would provide Global Climate Models (GCMs) with accurate parameterizations regarding ice cloud size distributions, ice sedimentation rates and radiative properties. This would be done in such a way that the treatments for ice particle size distributions (PSD), fall velocities and optical properties would use the same analytical formalism. For example, a gamma distribution was used for characterizing the PSD and predicting the sedimentation rates and radiative properties; the sedimentation and radiation schemes relate ice particle mass and projected area to ice particle maximum dimension using power-law expressions. This allows the cloud optical properties to be fully coupled with the cloud microphysics; something never achieved before.
NTIS
Climate Models; Climatology; Ice; Ice Clouds

20060013295 Meteorological Satellite Center, Kiyose, Japan
Monthly Report of the Meteorological Satellite Center: January 2006
January 2006; In English; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail.: Other Sources

The CD-ROM concerning the January 2006 Monthly Report of the Meteorological Satellite Center (MSC) Contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the polar orbital meteorological satellites operated by NOAA. The CD-ROM contains following observation data. FuII Disk Earth's Cloud, Cloud Image of Japan and its Vicinity, Cloud Amount, Sea Surface Temperature, Cloud Motion Wind, Water Vapor Motion Wind, Equivalent Blackbody Temperature, OLR (Out-going Longwave Radiation), Solar Irradiation, Snow and Ice Index, Orbit Data, Attitude Data, VISSR Image Data Catalog, (Cartridge Magnetic Tape (CMT), Micro Film), TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water, TOVS Total Ozone Amount. Although this user' s guide is revised yearly, it may happen that a change of contents of the Monthly Report is not reflected in the user's guide, if the change is carried out between revisions of the user's guide. The latest contents of the Monthly Report and the detailed information of the contents are described in document files which are contained in the CD-ROM, Please read the document files.
Author
Satellite Observation; Satellite Sounding; Atmospheric Sounding; Japan; Satellite Imagery

20060013298 Meteorological Satellite Center, Kiyose, Japan
Monthly Report of the Meteorological Satellite Center: February 2006
February 2006; In English; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail.: Other Sources

The CD-ROM concerning the February 2006 Monthly Report of the Meteorological Satellite Center (MSC) Contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the polar orbital meteorological satellites operated by NOAA. The CD-ROM contains following observation data. FuII Disk Earth's Cloud, Cloud Image of Japan and its Vicinity, Cloud Amount, Sea Surface Temperature, Cloud Motion Wind, Water Vapor Motion Wind, Equivalent Blackbody Temperature, OLR (Out-going Longwave Radiation), Solar Irradiation, Snow and Ice Index, Orbit Data, Attitude Data, VISSR Image Data Catalog, (Cartridge Magnetic Tape (CMT), Micro Film), TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water, TOVS Total Ozone Amount. Although this user' s guide is revised yearly, it may happen that a change of contents of the Monthly Report is not reflected in the user's guide, if the change is carried out between revisions of the user's guide. The latest contents of the Monthly Report and the detailed information

of the contents are described in document files which are contained in the CD-ROM, Please read the document files.
Author
Atmospheric Sounding; Satellite Observation; Satellite Sounding; Satellite Imagery; Japan

20060013304 Stanford Univ., CA, USA
Multiresolution Feature Analysis and Other Techniques for Understanding and Modeling Turbulence in Stable Atmospheres. (Report for September 1, 1999-October 31, 2004)
Street, R. L.; Ludwig, F. L.; Chen, Y.; Apr. 11, 2005; 12 pp.; In English
Report No.(s): DE2006-838515; No Copyright; Avail.: Department of Energy Information Bridge

Our DOE project is one of the efforts comprising the Vertical Transport and Mixing Program of the Environmental Sciences Division of the Office of Biological and Environmental Research in Department of Energy. We used Advanced Regional Prediction System (ARPS) to simulate flow in the Salt Lake Valley. We simulated the physical processes more accurately so that we can better understand the physics of flow in complex terrain and its effects at larger scales. The simulations provided evidence that atmospheric forcing interacts with the Jordan Narrows, the Traverse Range and other complex mountain terrain at the south end of the Salt Lake Valley to produce lee rotors, hydraulic jumps and other effects. While we have successfully used ARPS to simulate VTMX 2000 flows, we have also used observed data to test the model and identify some of its weaknesses. Those are being addressed in a continuation project supported by DOE.
NTIS
Atmospheric Circulation; Image Resolution; Turbulence

20060013314 Geological Survey, Reston, VA USA
Summary of Significant Floods in the USA and Puerto Rico, 1994 Through 1998 Water Years
Perry, C. A.; January 2005; 376 pp.; In English
Report No.(s): PB2006-111056; USGS-SIR-2005-5194; No Copyright; Avail.: National Technical Information Service (NTIS)

This volume is a compilation of significant floods that occurred at streamgages throughout the USA and Puerto Rico from October 1, 1993, through September 30, 1998. A significant flood in this report refers to a peak-flow discharge (instantaneous or time averaged) that is in the top 5 percent of all the annual peak flows recorded at streamgages during their total period of record. Most of these floods are approximately equal to or greater than the 20-year recurrence interval flood (0.05 probability of occurrence in any 1 year) for that streamgage. A summary of the most devastating floods according to number of lives lost and amount of damage is provided for each water year from 1994 through 1998. Significant interstate floods also are described. For each year, national maps are provided showing percentage of streamgages in each State recording the significant floods and standardized deviations from long-term (195095) mean precipitation. Compilations arranged by State for each of the 50 USA and Puerto Rico also are presented. Each State compilation includes: (1) State maps to locate the streamgages recording significant floods and (2) tables of data that allow the reader to compare each significant flood during water years 1994 through 1998 with the maximum flood for the entire period of record at each streamgage.
NTIS
Floods; Puerto Rico; United States; Virgin Islands; Water

20060013396 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Coupled GCM-Cloud Resolving Modeling System, and a Regional Scale Model to Study Precipitation Processes
Tao, Wei-Kuo; [2006]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Recent GEWEX Cloud System Study (GCSS) model comparison projects have indicated that cloud-resolving models (CRMs) agree with observations better than traditional single-column models in simulating various types of clouds and cloud systems from different geographic locations. Current and future NASA satellite programs can provide cloud, precipitation, aerosol and other data at very fine spatial and temporal scales. It requires a coupled global circulation model (GCM) and cloud-scale model (termed a super-parameterization or multi-scale modeling framework, MMF) to use these satellite data to improve the understanding of the physical processes that are responsible for the variation in global and regional climate and hydrological systems. The use of a GCM will enable global coverage, and the use of a CRM will allow for better and more sophisticated physical parameterization. NASA satellite and field campaign cloud related datasets can provide initial conditions as well as validation for both the MMF and CFWs. The Goddard MMF is based on the 2D Goddard Cumulus Ensemble (GCE) model and the Goddard finite volume general circulation model (fvGCM), and it has started production runs with two years results (1 998 and 1999). In this talk, I will present: (1) A brief review on GCE model and its applications on

precipitation processes (microphysical and land processes), (2) The Goddard MMF and the major difference between two existing MMFs (CSU MMF and Goddard MMF), and preliminary results (the comparison with traditional GCMs), and (3) A discussion on the Goddard WRF version (its developments and applications).
Author
Clouds (Meteorology); Atmospheric General Circulation Models; Aerosols; Cumulus Clouds; Atmospheric Models; Atmospheric Circulation; Climatology

20060013427 ENSCO, Inc., Cocoa Beach, FL, USA
Effect of Clouds on Shuttle Imaging
Short, David A.; Lane, Robert E., Jr.; January 2005; 36 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS10-01052
Report No.(s): NASA/CR-2005-211538; Rept-05-001; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes the results of the AMU's task for determining the effect of clouds on optical imaging of the Space Shuttle launch vehicle during its ascent phase from lift-off to Solid Rocket Booster (SRB) Separation. This effort was motivated by Recommendation R3.4-1 from the Columbia Accident Investigation Board Report. The AMU developed a 3-dimensional (3D) model to forecast the probability that at any time from lift-off to SRB separation, at least three of the ascent imaging cameras would have a view of the Shuttle unobstructed by cloud. Because current observational and modeling capabilities do not permit accurate forecasts of cloud morphology and location, the AMU simulated obscuration of the lines-of-sight (LOS) from a network of cameras to the Shuttle by idealized cloud-fields placed randomly within the 3D domain. For each random realization of numerous cloud-field scenarios the number of simultaneous views of the Shuttle was computed from the LOS data between lift-off and SRB separation. The percent of time with 3 simultaneous views was averaged from 100 random realizations of each scenario. Analyses of the percent of time viewable were made to determine its sensitivity to cloud amount, cloud base height, cloud thickness, cloud horizontal dimensions, and an upgrade of the camera network.
Author
Space Shuttles; Launch Vehicles; Imaging Techniques; Three Dimensional Models; Probability Theory; Line of Sight; Cloud Cover; Stage Separation; Ascent; Field of View

20060013431 ENSCO, Inc., Cocoa Beach, FL, USA, NASA Kennedy Space Center, Cocoa Beach, FL, USA
RSA/Legacy Wind Sensor Comparison, Part 1, Western Range
Short, David A.; Wheeler, Mark M.; March 2006; 26 pp.; In English; Original contains poor quality, truncated or crooked pages
Contract(s)/Grant(s): NAS10-01052
Report No.(s): NASA/CR-2006-214200; Rept-06-300; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes a comparison of data from ultrasonic and cup-and-vane anemometers on 5 wind towers at Vandenberg AFB. The ultrasonic sensors are scheduled to replace the Legacy cup-and-vane sensors under the Range Standardization and Automation (RSA) program. Because previous studies have noted differences between peak wind speeds reported by mechanical and ultrasonic wind sensors, the latter having no moving parts, the 30th and 45th Weather Squadrons wanted to understand possible differences between the two sensor types. The period-of-record was 13-30 May 2005. A total of 153,961 readings of I-minute average and peak wind speed/direction from each sensor type were used. Statistics of differences in speed and direction were used to identify 18 out of 34 RSA sensors having the most consistent performance, with respect to the Legacy sensors. Data from these 18 were used to form a composite comparison. A small positive bias in the composite RSA average wind speed increased from +0.5 kts at 15 kts, to +1 kt at 25 kts. A slightly larger positive bias in the RSA peak wind speed increased from +1 kt at 15 kts, to +2 kts at 30 kts.
Author
Anemometers; Wind Velocity; Wind Measurement; Vanes

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*.

20060013390 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Generic therapy after exposure to biological warfare agents: Immune activation by pathogens in an in vitro dendritic cell culture system
vanderKleij, D.; December 2005; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A01/D4/AL; TNO Proj. 014.12849
Report No.(s): TNO-DV2 2005 A204; Copyright; Avail.: Other Sources

The threat of the use of biological weapons, including bacteria, has increased. Bacterial resistance to antibiotics increasingly becomes a problem. Vaccination of military personnel against biothreat agents may be an option, however there is a broad range of biothreat agents, which may become even broader as a result of genetic engineering. Moreover, vaccination against multiple agents may cause undesired effects. A more generic approach to prevent the effects of a broad spectrum of bacteria via immunomodulation seems more effective. To be able to select potential broad-spectrum therapeutics, the development of immune responses against bio-threat bacteria was studied in an iri vitro dendritic cell culture system, since dendritic cells play a central role in the development of immune responses. To be able to test high-risk pathogens in this system, inactivation of bacteria was required. UV-irradiation was selected as inactivation method, since this method hardly affected the immunological parameters used in the dendritic cell culture system. All bacterial species tested were found to induce activation of dendritic cells, although gram-negative bacteria induced maturation of these cells much more effectively than gram-positive bacteria. Induction of maturation was found to result for a significant part from activation of the so-called receptor Toll-like receptor-4
Author
Biological Weapons; Exposure; Therapy; Physiological Responses; In Vitro Methods and Tests; Immunology; Genetic Engineering

20060013446 NASA Johnson Space Center, Houston, TX, USA
Morphing: A Novel Approach to Astronaut Suit Sizing
Margerum, Sarah; Clowers, Kurt; Rajulu, Sudhakar; [2006]; 1 pp.; In English; 36th International Conference on Environmental, 17-20 Jul. 2006, Norfolk, VA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The fitting of a spacesuit to an astronaut is an iterative process consisting of two parts. The first uses anthropometric data to provide an approximation of the suit components that will fit the astronaut. The second part is the subjective fitting, where small adjustments are made based on the astronaut s preference. By providing a better approximation of the correct suit components, the entire fit process time can be reduced significantly. The goals of this project are twofold: (1) To evaluate the effectiveness of the existing sizing algorithm for the Mark III Hybrid suit and (2) to determine what additional components are needed in order to provide adequate sizing for the existing astronaut population. A single subject was scanned using a 3D whole-body scanner (VITUS 3D) in the Mark III suit in eight different poses and four subjects in minimal clothing were also scanned in similar poses. The 3D external body scans of the suit and the subject are overlaid and visually aligned in a customized MATLAB program. The suit components were contracted or expanded linearly along the subjects limbs to match the subjects segmental lengths. Two independent measures were obtained from the morphing program on four subjects and compared with the existing sizing information. Two of the four subjects were in correspondence with the sizing algorithm and morphing results. The morphing outcome for a third subject, incompatible with the suit, suggested that an additional arm element at least 6 inches smaller than the existing smallest suit component would need to be acquired. The morphing result of the fourth subject, deemed incompatible with the suit using the sizing algorithm, indicated a different suit configuration which would be compatible. This configuration matched with the existing suit fit check data.
Author
Astronauts; Space Suits; Anthropometry; Fitting

20060013448 NASA Johnson Space Center, Houston, TX, USA
Comparison of Interstitial Fluid pH, PCO2, PO2 with Venous Blood Values During Repetitive Handgrip Exercise
Hagan, Ronald Donald; Soller, Babs R.; Shear, Michael; Walz, Matthias; Landry, Michelle; Heard, Stephen; [2006]; 1 pp.; In English; 52nd Annual American College of Sports Medicine, 1-4 Jun. 2004, Nashville, TN, USA
Contract(s)/Grant(s): NCC9-58; No Copyright; Avail.: CASI: A01, Hardcopy

We evaluated the use of a small, fiber optic sensor to measure pH, PCO2 and PO2 from forearm muscle interstitial fluid (IF) during handgrip dynamometry. PURPOSE: Compare pH, PCO2 and PO2 values obtained from venous blood with those from the IF of the flexor digitorum superficialis (FDS) during three levels of exercise intensity. METHODS: Six subjects (5M/1F), average age 29+/-5 yrs, participated in the study. A venous catheter was placed in the retrograde direction in the antecubital space and a fiber optic sensor (Paratrend, Diametrics Medical, Inc.) was placed through a 22 G catheter into the FDS muscle under ultrasound guidance. After a 45 min rest period, subjects performed three 5-min bouts of repetitive handgrip exercise (2s contraction/1 s relaxation) at attempted levels of 15%, 30% and 45% of maximal voluntary contraction. The order of the exercise bouts was random with the second and third bouts started after blood lactate had returned to baseline. Venous blood was sampled every minute during exercise and analyzed with an I-Stat CG-4+ cartridge, while IF fiber optic sensor measurements were obtained every 2 s. Change from pre-exercise baseline to end of exercise was computed for pH, PCO2 and PO2. Blood and IF values were compared with a paired t-test. RESULTS: Baseline values for pH, PCO2 and PO2 were 7.37+/-0.02, 46+/-4 mm Hg, and 36+/-6 mm Hg respectively in blood and 7.39+/-0.02, 44+/-6 mm Hg, and 35+/-14 mm Hg in IF. Average changes over all exercise levels are noted in the Table below. For each parameter the exercise-induced change was at least twice as great in IF as in blood. In blood and IF, pH and PCO2 increases were directly related to exercise intensity. Change in venous PO2 was unrelated to exercise intensity, while IF PO2 decreased with increases in exercise intensity. CONCLUSIONS: Measurement of IF pH, PCO2 and PO2 is more sensitive to exercise intensity than measurement of the same parameters in venous blood and provides continuous assessment during and after exercise.
Author
Interstitials; Blood; Fiber Optics; pH ; Muscles; Physical Exercise; Forearm

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 Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20060013240 NASA Johnson Space Center, Houston, TX, USA
Modification of Eye Movements and Motion Perception during Off-Vertical Axis Rotation
Wood, S. J.; Reschke, M. F.; Denise, P.; CLement, G.; [2006]; 2 pp.; In English; Seventh Symposium on the Role of the Vestibular Organs in Space Exploration, 7-9 Jun. 2006, Noordwijk, Netherlands
Contract(s)/Grant(s): Proj. DSO499; Copyright; Avail.: CASI: A01, Hardcopy

Constant velocity Off-Vertical Axis Rotation (OVAR) imposes a continuously varying orientation of the head and body relative to gravity. The ensuing ocular reflexes include modulation of both torsional and horizontal eye movements as a function of the varying linear acceleration along the lateral plane, and modulation of vertical and vergence eye movements as a function of the varying linear acceleration along the sagittal plane. Previous studies have demonstrated that tilt and translation otolith-ocular responses, as well as motion perception, vary as a function of stimulus frequency during OVAR. The purpose of this study is to examine normative OVAR responses in healthy human subjects, and examine adaptive changes in astronauts following short duration space flight at low (0.125 Hz) and high (0.5 Hz) frequencies. Data was obtained on 24 normative subjects (14 M, 10 F) and 14 (13 M, 1F) astronaut subjects. To date, astronauts have participated in 3 preflight sessions (n=14) and on R+0/1 (n=7), R+2 (n= 13) and R+4 (n= 13) days after landing. Subjects were rotated in darkness about their longitudinal axis 20 deg off-vertical at constant rates of 45 and 180 deg/s, corresponding to 0.125 and 0.5 Hz. Binocular responses were obtained with video-oculography. Perceived motion was evaluated using verbal reports and a two-axis joystick (pitch and roll tilt) mounted on top of a two-axis linear stage (anterior-posterior and medial-lateral translation). Eye responses were obtained in ten of the normative subjects with the head and trunk aligned, and then with the head turned relative to the trunk 40 deg to the right or left of center. Sinusoidal curve fits were used to derive amplitude, phase and bias of the responses over several cycles at each stimulus frequency. Eye responses during 0.125 Hz OVAR were dominated by modulation of torsional and vertical eye position, compensatory for tilt relative to gravity. While there is a bias horizontal slow phase velocity (SPV), the modulation of horizontal and vergence SPV is negligible at this lower stimulus frequency. Eye responses during 0.5 Hz OVAR; however, are characterized by modulation of horizontal and vergence SPV, compensatory for translation in the lateral and sagittal planes, respectively. Neither amplitude nor bias velocities were significantly altered by head-on-trunk position. The phases of the ocular reflexes, on the other hand, shifted towards alignment with the head. During the lower frequency OVAR, subjects reported the perception of progressing along the edge of a cone. During higher frequency OVAR, subjects reported the perception of progressing along the edge of an upright cylinder. In contrast to the eye movements, the

phase of both perceived tilt and translation motion is not altered by stimulus frequency. Preliminary results from astronaut data suggest that the ocular responses are not substantially altered by short-duration spaceflight. However, compared to preflight averages, astronauts reported greater amplitude of both perceived tilt and translation at low and high frequency, respectively, during early post-flight testing. We conclude that the neural processing to distinguish tilt and translation linear acceleration stimuli differs between eye movements and motion perception. The results from modifying head-on-trunk position are consistent with the modulation of ocular reflexes during OVAR being primarily mediated by the otoliths in response to the sinusoidally varying linear acceleration along the interaural and naso-occipital head axis. While the tilt and translation ocular reflexes appear to operate in an independent fashion, the timing of perceived tilt and translation influence each other. We conclude that the perceived motion path during linear acceleration in darkness results from a composite representation of tilt and translation inputs from both vestibular and somatosensory systems.
Author
Eye Movements; Motion Perception; Vertical Motion; Eye (Anatomy); Rotation

20060013245 NASA Johnson Space Center, Houston, TX, USA
What Happens to bone health during and after spaceflight?
Sibonga, Jean D.; Evans, Harlan J.; Spector, Elisabeth R.; Maddocks, Mary J.; Smith, Scott A.; Shackelford, Linda C.; LeBlanc, Adrian D.; 2006; 12 pp.; In English; Bone Loss During Spaceflight, 23-24 Jun. 2005, Cleveland, OH, USA; Copyright; Avail.: CASI: A03, Hardcopy

Weightless conditions of space flight accelerate bone loss. There are no reports to date that address whether the bone that is lost during spaceflight could ever be recovered. Spaceinduced bone loss in astronauts is evaluated at the Johnson Space Center (JSC) by measurement of bone mineral density (BMD) by Dual-energy x-ray absorptiometry (DXA) scans. Astronauts are routinely scanned preflight and at various time points postflight (greater than or equal to Return+2 days). Two sets of BMD data were used to model spaceflight-induced loss and skeletal recovery in crewmembers following long-duration spaceflight missions (4-6 months). Group I was from astronauts (n=7) who were systematically scanned at multiple time points during the postflight period as part of a research protocol to investigate skeletal recovery. Group II came from a total of 49 sets of preflight and postflight data obtained by different protocols. These data were from 39 different crewmembers some of whom served on multiple flights. Changes in BMD (between pre- and postflight BMD) were plotted as a function of time (days-after-landing); plotted data were fitted to an exponential equation which enabled estimations of i) BMD change at day 0 after landing and ii) the number of days by which 50% of the lost bone is recovered (half-life). These fits were performed for BMD of the lumbar spine, trochanter, pelvis, femoral neck and calcaneus. There was consistency between the models for BMD recovery. Based upon the exponential model of BMD restoration, recovery following long-duration missions appears to be substantially complete in crewmembers within 36 months following return to Earth.
Author
Bone Demineralization; Public Health; Long Duration Space Flight; Aerospace Medicine

20060013501 Wyle Labs., Inc., Houston, TX, USA
Soluble Protein Analysis using a Compact Bench-top Flow Cytometer
Pappas, Dimitri; Kao, Shib-Hsin; Cyr, Johnathan; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAS9-02078
Report No.(s): W04-009; No Copyright; Avail.: Other Sources; Abstract Only

Future space exploration missions will require analytical technology capable of providing both autonomous medical care to the crew and investigative capabilities to researchers. While several promising candidate technologies exist for further development, flow cytometry is an attractive technology as it offers both crew health (blood cell count, leukocyte differential, etc.) and a wide array of biochemistry and immunology assays. research settings, the application of this technique to soluble protein analysis is also possible. Proteomic beads using fluorescent dyes for optical encoding were used to monitor six cytokines simultaneously in cell medium of cell cultures in stationary and rotating cell culture systems. The results of this work demonstrate that a compact flow cytometer, such as a system proposed for space flight, can detect a variety of soluble proteins for crew health and biotechnology experiments during long-term missions.
Author
Aerospace Medicine; Cytometry; Blood Cell Count; Leukocytes; Assaying; Biochemistry; Immunology; Proteins

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20060013249 NASA Johnson Space Center, Houston, TX, USA
Advanced Resistive Exercise Device (ARED) Man-In-The-Loop Test (MILT)
Bentley, Jason R.; Leach, Mark A.; McCleary, Frank; Smith, Cassie; Norcross, Jason; Hagan, R. Donald; May 2006; 46 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TP-2006-213717; S-974; Copyright; Avail.: CASI: A03, Hardcopy

The interim Resistive Exercise Device (iRED) is currently being flown aboard the International Space Statrion to mitigate the loss of muscle mass and muscular strength associated with long-duration exposure to microgravity. However, iRED is limited in the maximal loads that it can provide, and thus, is viewed as an interim solution to the loss of muscular strength. Thus, NASA has initiated the design and construction of the Advanced Resistive Exercise Device (ARED as a long-term solution to the preservation of muscle strength during extended habitation of microgravity environments. The ARED is designed to provide greater exercise capability than iRED. The primary resistance mechanism in the ARED is a pair of vacuum cylinders containing pistons. Preliminary life cycle testing indicates that the ARED will endure over one million cycles without critical failure. However, life cycle testing is much different than human subject testing. Often, humans put unique forces on devices that are not present during machine testing. Thus, the purpose of this evaluation was to test the functionality durability and reliability of the ARED during exercise executed by human subjects.
Author
Human Factors Engineering; Physical Exercise; Muscular Strength; Microgravity; Durability; Human Beings

20060013389 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
The role of operator state assessment in adaptive automation
Veltman, J. A.; Jansen, C.; January 2006; 54 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 014.63063
Report No.(s): TD2005-0450; TNO-DV3-2005-A245; Copyright; Avail.: Other Sources

Computer systems are capable to take over more and more tasks from human operators, but this does not always improve the performance of the human-machine system. Automation of which the level is made dependent on the situation may be an improvement for the performance. One of the parameters that might be used for this so-called adaptive automation is the state of the operator that can be estimated with physiological parameters. This report provides a literature review on physiological measures and adaptive automation, and a model that describes the relation between the state of the operator, the human information processing and the interaction with the outside world. Furthermore, the results of a laboratory experiment are discussed. In this experiment, several physiological measures were monitored during the task performance of operators from the Netherlands Navy. The literature review shows that physiological measures are promising for adaptive automation. The model is used to argue that there are many situations in which state estimators might not be useful for adaptive automation. Moreover, the results of the experiment show that it is difficult to measure the state within small time segments which is necessary for adaptive automation.
Author
Automatic Control; Adaptation; Human Performance; Man Machine Systems

20060013445 NASA Johnson Space Center, Houston, TX, USA
A Mathematical Model to Predict and Maintain the Neutral Buoyancy of Suited Astronauts
Clowers, Kurt; Jaramillo, Marcos; Nguyen, Daniel; Sweet, Robert; Rajulu, Sudhakar; [2006]; 2 pp.; In English; 36th International Conference on Environmental, 17-20 Jul. 2006, Norfolk, VA, USA; No Copyright; Avail.: Other Sources; Abstract Only

A previous study reported that inadequate weigh outs of suited subjects contribute to fatigue and the risk of injury during training in the Neutral Buoyancy Laboratory (NBL). Another study suggested that shoulder injuries observed in suited subjects who train in the NBL may be attributed to excessive righting moments caused by a non-optimal weigh out. The purpose of this study was to develop a mathematical model to predict and maintain the neutral buoyancy of suited subjects during training operations at the NBL. Due to time constraints, one certified NBL support diver served as a subject (height: 66.54 in; weight: 182 lbs) for this study and only one complete test was conducted. The study was divided into two runs for which the first run required the NBL divers to perform a weigh out similar to a suited astronaut on a scuba diver wearing a mock Portable Life

Support System and a Displays and Control Module. For the second run, the same subject and equipment were weighed out according to the mathematical model. The objective of each run was to achieve a neutrally buoyant subject floating 450 to the pool floor. Motion data was collected using two underwater cameras and analyzed using Dartfish video analysis software while force and moment data were recorded using an AMTI force plate. The results from the NBL divers visual run indicate that the subject was floating at an angle of 29.50 while the resultant force and moment data were 1.139 lb and 1.125 ft-lb respectively. The mathematical model s weigh out resulted in the subject floating at an angle of 37.40 and a resultant force of 0.765 lb and resultant moment of 1.248 ft-lb. The mathematical model was better able to orient the subject and reduce resultant moment and force as compared to the NBL divers.
Author
Life Support Systems; Diving (Underwater); Buoyancy; Display Devices; Mathematical Models; Floating

55
EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20060013442 NASA Johnson Space Center, Houston, TX, USA
IRON-TOLERANT CYANOBACTERIA: IMPLICATIONS FOR ASTROBIOLOGY
Brown, Igor I.; Allen, Carlton C.; Mummey, Daniel L.; Sarkisova, Svetlana A.; McKay, David S.; [2006]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

The review is dedicated to the new group of extremophiles - iron tolerant cyanobacteria. The authors have analyzed earlier published articles about the ecology of iron tolerant cyanobacteria and their diversity. It was concluded that contemporary iron depositing hot springs might be considered as relative analogs of Precambrian environment. The authors have concluded that the diversity of iron-tolerant cyanobacteria is understudied. The authors also analyzed published data about the physiological peculiarities of iron tolerant cyanobacteria. They made the conclusion that iron tolerant cyanobacteria may oxidize reduced iron through the photosystem of cyanobacteria. The involvement of both Reaction Centers 1 and 2 is also discussed. The conclusion that iron tolerant protocyanobacteria could be involved in banded iron formations generation is also proposed. The possible mechanism of the transition from an oxygenic photosynthesis to an oxygenic one is also discussed. In the final part of the review the authors consider the possible implications of iron tolerant cyanobacteria for astrobiology.
Author
Bacteria; Exobiology; Photosynthesis; Iron

20060013506 NASA Johnson Space Center, Houston, TX, USA
Siderophilic Cyanobacteria: Implications for Early Earth.
Brown, I. I.; Mummey, D.; Sarkisova, S.; Shen, G.; Bryant, D. A.; Lindsay, J.; Garrison, D.; McKay, D. S.; [2006]; 1 pp.; In English; 12th International Symposium on Phototrophic Prokaryotes, 27 Aug. - 1 Sep. 2006, Pau, France; No Copyright; Avail.: Other Sources; Abstract Only

Of all extant environs, iron-depositing hot springs (IDHS) may exhibit the greatest similarity to late Precambrian shallow warm oceans in regards to temperature, O2 gradients and dissolved iron and H2S concentrations. Despite the insights into the ecology, evolutionary biology, paleogeobiochemistry, and astrobiology examination of IDHS could potentially provide, very few studies dedicated to the physiology and diversity of cyanobacteria (CB) inhabiting IDHS have been conducted. Results. Here we describe the phylogeny, physiology, ultrastructure and biogeochemical activity of several recent CB isolates from two different greater Yellowstone area IDHS, LaDuke and Chocolate Pots. Phylogenetic analysis of 16S rRNA genes indicated that 6 of 12 new isolates examined couldn't be placed within established CB genera. Some of the isolates exhibited pronounced requirements for elevated iron concentrations, with maximum growth rates observed when 0.4-1 mM Fe(3+) was present in the media. In light of 'typical' CB iron requirements, our results indicate that elevated iron likely represents a salient factor selecting for 'siderophilicM CB species in IDHS. A universal feature of our new isolates is their ability to produce thick EPS layers in which iron accumulates resulting in the generation of well preserved signatures. In parallel, siderophilic CB show enhanced ability to etch the analogs of iron-rich lunar regolith minerals and impact glasses. Despite that iron deposition by CB is not well understood mechanistically, we recently obtained evidence that the PS I:PS II ratio is higher in one of our isolates than for other CB. Although still preliminary, this finding is in direct support of the Y. Cohen hypothesis that PSI can

directly oxidize Fe(2+). Conclusion. Our results may have implications for factors driving CB evolutionary relationships and biogeochemical processes on early Earth and probably Mars.
Derived from text
Bacteria; Biogeochemistry; Biological Evolution; Hydrogen Sulfide; Minerals; Ecology

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*.

20060013269 NASA Ames Research Center, Moffett Field, CA, USA
Distributed Evaluation Functions for Fault Tolerant Multi-Rover Systems
Agogino, Adrian; Turner, Kagan; 2005; 8 pp.; In English; Genetic and Evolutionary Computation Conference (GEECO '06), 8-12 Jul. 2006, Seattle, WA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The ability to evolve fault tolerant control strategies for large collections of agents is critical to the successful application of evolutionary strategies to domains where failures are common. Furthermore, while evolutionary algorithms have been highly successful in discovering single-agent control strategies, extending such algorithms to multiagent domains has proven to be difficult. In this paper we present a method for shaping evaluation functions for agents that provide control strategies that both are tolerant to different types of failures and lead to coordinated behavior in a multi-agent setting. This method neither relies of a centralized strategy (susceptible to single point of failures) nor a distributed strategy where each agent uses a system wide evaluation function (severe credit assignment problem). In a multi-rover problem, we show that agents using our agent-specific evaluation perform up to 500% better than agents using the system evaluation. In addition we show that agents are still able to maintain a high level of performance when up to 60% of the agents fail due to actuator, communication or controller faults.
Author
Fault Tolerance; Failure; Algorithms; Systems Analysis; Neural Nets; Artificial Intelligence; Domains

20060013313 Geological Survey, Reston, VA USA, Aeronautical Systems Div., Wright-Patterson AFB, OH, USA
Analyses and Estimates of Hydraulic Conductivity from Slug Tests in Alluvial Aquifer Underlying Air Force Plant 4 and Naval Air Station-Joint Reserve Base Carswell Field, Fort Worth, Texas
Houston, N. A.; Braun, C. L.; January 2004; 34 pp.; In English
Report No.(s): PB2006-110441; USGS-SIR-2004-5225; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes the collection, analyses, and distribution of hydraulic-conductivity data obtained from slug tests completed in the alluvial aquifer underlying Air Force Plant 4 and Naval Air Station-Joint Reserve Base Carswell Field, Fort Worth, Texas, during October 2002 and August 2003 and summarizes previously available hydraulic-conductivity data. The U.S. Geological Survey, in cooperation with the U.S. Air Force, completed 30 slug tests in October 2002 and August 2003 to obtain estimates of horizontal hydraulic conductivity to use as initial values in a ground-water-flow model for the site. The tests were done by placing a polyvinyl-chloride slug of known volume beneath the water level in selected wells, removing the slug, and measuring the resulting water-level recovery over time. The water levels were measured with a pressure transducer and recorded with a data logger. Hydraulic-conductivity values were estimated from an analytical relation between the instantaneous displacement of water in a well bore and the resulting rate of head change. Although nearly two-thirds of the tested wells recovered 90 percent of their slug-induced head change in less than 2 minutes, 90-percent recovery times ranged from 3 seconds to 35 minutes. The estimates of hydraulic conductivity range from 0.2 to 200 feet per day. Eighty-three percent of the estimates are between 1 and 100 feet per day.
NTIS
Alluvium; Aquifers; Data Bases; Estimates; Hydrogeology

20060013325 Caliber Associates, Fairfax, VA, USA
I-SAFE Evaluation
Chibnall, S.; Wallace, M.; Leicht, C.; Lunghofer, L.; Apr. 2006; 226 pp.; In English
Contract(s)/Grant(s): DOJ-2003-JN-FX-1004
Report No.(s): PB2006-109333; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2001 NIJ awarded Caliber Associates a contract to conduct a quasi-experimental, longitudinal study of the effectiveness of the i-SAFE curriculum in teaching children about Internet safety. The design was implemented in 18 schools (12 treatment and 6 comparison schools) in six sites with more than 2000 children. The evaluation had two key components: a process evaluation (including a cost component), and an outcome evaluation. Data were collected through document reviews, interviews with principals and teachers, focus groups with students, and an online survey of Internet knowledge and behavior administered to students in grades five through eight, six times throughout the study period. Findings from the outcome evaluation noted positive and significant changes in knowledge between the treatment and comparison groups, both on average and over time. For the most part, there were no significant changes in behavior between the treatment and comparison groups on all scales.
NTIS
Computer Information Security; Education; Internets; Safety

20060013439 NASA Johnson Space Center, Houston, TX, USA
Recent trends in digital human modeling and the concurrent issues that face human modeling approach
Rajulu, Sudhakar; Gonzalez, L. Javier; Margerum, Sarah; Clowers, Kurt; Moreny, Richard; Abercomby, Andrew; Velasquez, Luis; [2006]; 1 pp.; In English; Department of Defense Human Factors Engineering Meeting, 15-18 May 2006, Las Vegas, NV, USA; No Copyright; Avail.: Other Sources; Abstract Only

Tremendous strides have been made in the recent years to digitally represent human beings in computer simulation models ranging from assembly plant maintenance operations to occupants getting in and out of vehicles to action movie scenarios. While some of these tools are being actively pursued by the engineering communities, there is still a lot of work that remains to be done for the newly planned planetary exploration missions. For example, certain unique and several common challenges are seen in developing computer generated suited human models for designing the next generation space vehicle. The purpose of this presentation is to discuss NASA s potential needs for better human models and to show also many of the inherent yet not too obvious pitfalls that still are left unresolved in this new arena of digital human modeling. As part of NASA s Habitability and Human Factors Branch, the Anthropometry and Biomechanics Facility has been engaged in studying the various facets of computer generated human physical performance models; for instance, it has been engaged in utilizing three-dimensional laser scan data along with three dimensional video based motion and reach data to gather suited anthropometric and shape and size information that are not available yet in the form of computer mannequins. Our goal is to bring in new approaches to deal with heavily clothed humans (such as, suited astronauts) and to overcome the current limitations of wrongly identifying humans (either real or virtual) as univariate percentiles. We are looking at whole-body posture based anthropometric models as a means to identify humans of significantly different shapes and sizes to arrive at mathematically sound computer models for analytical purposes.
Author
Human Factors Engineering; Three Dimensional Motion; Biodynamics; Computerized Simulation; Human Beings; Space Exploration; Anthropometry

20060013447 NASA Johnson Space Center, Houston, TX, USA
Refinement of Methods for Evaluation of Near-Hypersingular Integrals in BEM Formulations
Fink, Patricia W.; Khayat, Michael A.; Wilton, Donald R.; [2006]; 1 pp.; In English; IEEE Antenna and Propagation International Symposium, 9-14 Jul. 2006, Albuquerque, NM, USA; Copyright; Avail.: CASI: A01, Hardcopy

In this paper, we present advances in singularity cancellation techniques applied to integrals in BEM formulations that are nearly hypersingular. Significant advances have been made recently in singularity cancellation techniques applied to 1 R type kernels [M. Khayat, D. Wilton, IEEE Trans. Antennas and Prop., 53, pp. 3180-3190, 2005], as well as to the gradients of these kernels [P. Fink, D. Wilton, and M. Khayat, Proc. ICEAA, pp. 861-864, Torino, Italy, 2005] on curved subdomains. In these approaches, the source triangle is divided into three tangent subtriangles with a common vertex at the normal projection of the observation point onto the source element or the extended surface containing it. The geometry of a typical tangent subtriangle and its local rectangular coordinate system with origin at the projected observation point is shown in Fig. 1. Whereas singularity cancellation techniques for 1 R type kernels are now nearing maturity, the efficient handling of near-hypersingular kernels still needs attention. For example, in the gradient reference above, techniques are presented for computing the normal component of the gradient relative to the plane containing the tangent subtriangle. These techniques, summarized in the transformations in Table 1, are applied at the sub-triangle level and correspond particularly to the case in which the normal projection of the observation point lies within the boundary of the source element. They are found to be highly efficient as z approaches zero. Here, we extend the approach to cover two instances not previously addressed. First, we consider the case in which the normal projection of the observation point lies external to the source element. For such cases,

we find that simple modifications to the transformations of Table 1 permit significant savings in computational cost. Second, we present techniques that permit accurate computation of the tangential components of the gradient; i.e., tangent to the plane containing the source element.
Author
Singular Integral Equations; Triangles; Tangents; Gradients; Coordinates; Integrals

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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.

20060013449 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
IMPLEMENTING SCIENTIFIC SIMULATION CODES HIGHLY TAILORED FOR VECTOR ARCHITECTURES USING CUSTOM CONFIGURABLE COMPUTING MACHINES
Rutishauser, David K.; [2006]; 1 pp.; In English; MAPLD International Conference, 26-28 Sep. 2006, Washington, DC, USA; No Copyright; Avail.: Other Sources; Abstract Only

The motivation for this work comes from an observation that amidst the push for Massively Parallel (MP) solutions to high-end computing problems such as numerical physical simulations, large amounts of legacy code exist that are highly optimized for vector supercomputers. Because re-hosting legacy code often requires a complete re-write of the original code, which can be a very long and expensive effort, this work examines the potential to exploit reconfigurable computing machines in place of a vector supercomputer to implement an essentially unmodified legacy source code. Custom and reconfigurable computing resources could be used to emulate an original application's target platform to the extent required to achieve high performance. To arrive at an architecture that delivers the desired performance subject to limited resources involves solving a multi-variable optimization problem with constraints. Prior research in the area of reconfigurable computing has demonstrated that designing an optimum hardware implementation of a given application under hardware resource constraints is an NP-complete problem. The premise of the approach is that the general issue of applying reconfigurable computing resources to the implementation of an application, maximizing the performance of the computation subject to physical resource constraints, can be made a tractable problem by assuming a computational paradigm, such as vector processing. This research contributes a formulation of the problem and a methodology to design a reconfigurable vector processing implementation of a given application that satisfies a performance metric. A generic, parametric, architectural framework for vector processing implemented in reconfigurable logic is developed as a target for a scheduling/mapping algorithm that maps an input computation to a given instance of the architecture. This algorithm is integrated with an optimization framework to arrive at a specification of the architecture parameters that attempts to minimize execution time, while staying within resource constraints. The flexibility of using a custom reconfigurable implementation is exploited in a unique manner to leverage the lessons learned in vector supercomputer development. The vector processing framework is tailored to the application, with variable parameters that are fixed in traditional vector processing. Benchmark data that demonstrates the functionality and utility of the approach is presented. The benchmark data includes an identified bottleneck in a real case study example vector code, the NASA Langley Terminal Area Simulation System (TASS) application.
Author
Computerized Simulation; Vector Processing (Computers); Parallel Processing (Computers); Massively Parallel Processors; Computation

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20060013268 NASA Ames Research Center, Moffett Field, CA, USA
High Fidelity Simulations for Unsteady Flow Through the Orbiter LH2 Feedline Flowliner
Kiris, Cetin C.; Kwak, Dochan; Chan, William; Housman, Jeffrey; [2005]; 9 pp.; In English; 53rd JANNAF Propulsion Meeting, 5-8 Dec. 2005, Monterey, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

High fidelity computations were carried out to analyze the orbiter M2 feedline flowliner. Various computational models

were used to characterize the unsteady flow features in the turbopump, including the orbiter Low-Pressure-Fuel-Turbopump (LPFTP) inducer, the orbiter manifold and a test article used to represent the manifold. Unsteady flow originating from the orbiter LPFTP inducer is one of the major contributors to the high frequency cyclic loading that results in high cycle fatigue damage to the gimbal flowliners just upstream of the LPFTP. The flow fields for the orbiter manifold and representative test article are computed and analyzed for similarities and differences. An incompressible Navier-Stokes flow solver INS3D, based on the artificial compressibility method, was used to compute the flow of liquid hydrogen in each test article.
Author
Flow Distribution; Incompressible Flow; Low Pressure; Navier-Stokes Equation; Turbine Pumps; Unsteady Flow; Compressibility; Feed Systems

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20060013418 NASA Glenn Research Center, Cleveland, OH, USA
A Sub-filter Scale Noise Equation far Hybrid LES Simulations
Goldstein, Marvin E.; January 2006; 19 pp.; In English
Contract(s)/Grant(s): WBS 033.01.03.26; No Copyright; Avail.: CASI: A03, Hardcopy

Hybrid LES/subscale modeling approaches have an important advantage over the current noise prediction methods in that they only involve modeling of the relatively universal subscale motion and not the configuration dependent larger scale turbulence . Previous hybrid approaches use approximate statistical techniques or extrapolation methods to obtain the requisite information about the sub-filter scale motion. An alternative approach would be to adopt the modeling techniques used in the current noise prediction methods and determine the unknown stresses from experimental data. The present paper derives an equation for predicting the sub scale sound from information that can be obtained with currently available experimental procedures. The resulting prediction method would then be intermediate between the current noise prediction codes and previously proposed hybrid techniques.
Author
Noise Prediction; Statistical Analysis; Extrapolation; Turbulence; Prediction Analysis Techniques

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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*.

20060013250 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
White Paper on Ion Beam Transport for ICF: Issues, R&D Needs, and Tri-Lab Plans
Olson, C.; Lee, E.; Langdon, B.; Nov. 16, 1995; 20 pp.; In English
Report No.(s): DE2006-861111; LBNL/PUP-98-HIFAN-1484; No Copyright; Avail.: Department of Energy Information Bridge

To date, most resources for ion beam fusion have been devoted to development of accelerators and target physics; relatively few resources have gone into ion beam transport development. Because of theoretical studies and substantial experience with electron beam transport, the ion beam transport community is now poised to develop and optimize ion beam transport for ICF. Because of this Tri-Lab effort, a path for coordinated development of ion beam transport has been established. The rate of progress along this path will now be determined largely by the availability of resources.
NTIS
Ion Beams; Electron Beams

20060013292 Brookhaven National Lab., Upton, NY USA
FFAG Accelerator Proton Driver for Neutrino Factory
Ruggiero, A. G.; Jun. 2005; 10 pp.; In English
Report No.(s): DE2006-860511; BNL-75141-2005-CP; No Copyright; Avail.: Department of Energy Information Bridge

This paper is the summary of a conceptual study of a Proton Driver for Neutrino Factory based on the use of a Fixed-Field Alternating-Gradient (FFAG) Accelerator.
NTIS
Industrial Plants; Neutrinos; Protons

20060013296 Kansas State Univ., Manhattan, KS, USA
Continuing the Development of a 100 Femtosecond X-Ray Detector
Chang, Z.; Jun. 20, 2005; 10 pp.; In English
Report No.(s): DE2006-840961; No Copyright; Avail.: National Technical Information Service (NTIS)
The grant is a one-year renewal for a two-year grant titled '100 femtosecond X-ray Detector' that was awarded to the PI (Zenghu Chang) in 2000 when he was at the University of Michigan. In 2001, the original grant was transferred to Kansas State University with the PI. The detector is an x-ray streak camera running in accumulation mode for time resolved x-ray studies at the existing third generation synchrotron facilities and will also be used for the development and applications of the fourth generation x-ray sources. We have made significant progress on both the detector development and its applications at Synchrotron facilities.
NTIS
X Ray Detectors; X Rays

20060013297 Cincinnati Univ., OH, USA
Noncontacting Thermoelectric Detection of Material Imperfection in Metals. (Final Report, September 15, 2000-March 15, 2005)
Nagy, P. B.; Nayfeh, A. H.; Faidi, W. I.; Carreon, H.; Lakshminaraya, B.; May 2005; 94 pp.; In English
Report No.(s): DE2006-840905; DOE-45855-2; No Copyright; Avail.: Department of Energy Information Bridge
This project was aimed at developing a new noncontacting thermoelectric method for nondestructive detection of material imperfections in metals. The method is based on magnetic sensing of local thermoelectric currents around imperfections when a temperature gradient is established throughout a conducting specimen by external heating and cooling. The surrounding intact material serves as the reference electrode therefore the detection sensitivity could be very high if a sufficiently sensitive magnetometer is used in the measurements. This self-referencing, noncontacting, nondestructive inspection technique offers the following distinct advantages over conventional methods: high sensitivity to subtle variations in material properties, unique insensitivity to the size, shape, and other geometrical features of the specimen, noncontacting nature with a substantial stand-off distance, and the ability to probe relatively deep into the material. The potential applications of this method cover a very wide range from detection metallic inclusions and segregations, inhomogeneities, and tight cracks to characterization of hardening, embrittlement, fatigue, texture, and residual stresses.
NTIS
Defects; Metals; Nondestructive Tests; Thermoelectric Materials; Thermoelectricity

20060013302 Illinois Univ., Urbana-Champaign, IL, USA
Microstructures and Properties of Materials under Repeated Laser Irradiation. Annual Scientific Report
Averback, R.; Bellon, P.; January 2005; 10 pp.; In English
Report No.(s): DE2006-839091; No Copyright; Avail.: National Technical Information Service (NTIS)
This research program explores the stability of alloys under pulsed laser irradiation. Two directions are under investigation: (1) phase stability during a single energetic shock wave, and (2) phase stability under repeated laser irradiation. The first area is primarily concerned with a crystalline to amorphous phase transition as a precursor to spall in shocked materials. The second project examines the phase evolution during laser pulsing in situations where the laser either induces local melting of the alloy (low-energy laser pulses) or plastic deformation (high-energy laser pulses).
NTIS
Irradiation; Laser Outputs; Lasers; Microstructure

20060013316 Tech-X Corp., Boulder, CO, USA
SBIR Phase II Project, ParSEC - Parallel Simulation of Electron Cooling
Bruhwiler, D.; Sep. 2005; 26 pp.; In English
Report No.(s): DE2006-850178; No Copyright; Avail.: Department of Energy Information Bridge
The Department of Energy has plans, during the next two or three years, to design an electron cooling section for the

collider ring at RHIC (Relativistic Heavy Ion Collider). Located at Brookhaven National Laboratory (BNL), RHIC is the premier nuclear physics facility. The new cooling section would be part of a proposed luminosity upgrade for RHIC. This electron cooling section will be different from previous electron cooling facilities in three fundamental ways. First, the electron energy will be 50 MeV, as opposed to 100's of keV (or 4 MeV for the electron cooling system now operating at Fermilab). Second, both the electron beam and the ion beam will be bunched, rather than being essentially continuous. Third, the cooling will take place in a collider rather than in a storage ring. Analytical work, in combination with the use and further development of the semi-analytical codes BETACOOL and SimCool are being pursued at BNL and at other laboratories around the world. However, there is a growing consensus in the field that high-fidelity 3-D particle simulations are required to fully understand the critical cooling physics issues in this new regime.
NTIS
Cooling; Simulation

20060013317 Gordon Research Conferences, Inc., Kingston, RI, USA
Gordon Research Conference on 2004 Electron Donor Acceptor Interactions, August 8-13, 2004. Final Progress Report
Jones, G.; Sep. 2005; 14 pp.; In English
Report No.(s): DE2006-850157; DOE/ER-15625; No Copyright; Avail.: Department of Energy Information Bridge

The Gordon Research Conference (GRC) on 2004 Electron Donor Acceptor Interactions Gordon Conference - August 8-13, 2004 was held at Salve Regina University, Newport, RI from August 8-13, 2004. The Conference was well-attended with 119 participants. The attendees represented the spectrum of endeavor in this field coming from academia, industry, and government laboratories, both U.S. and foreign scientists, senior researchers, young investigators, and students.
NTIS
Acceptor Materials; Conferences; Donor Materials; Electron Scattering; Electron Transfer

20060013318 San Diego State Univ., San Diego, CA USA
Nuclear Densities for Modeling Nuclear Reactions: An Efficient Approach Using Statistical Spectroscopy. (Annual Report, July 2005)
Johnson, C. W.; Jul. 2005; 10 pp.; In English
Report No.(s): DE2006-842401; No Copyright; Avail.: National Technical Information Service (NTIS)

The general goal of the project is to develop and implement computer codes and input files to compute nuclear densities of state. Such densities are important input into calculations of statistical neutron capture, and are difficult to access experimentally. In particular, we will focus on calculating densities for nuclides in the mass range A nearly equal to 50 - 100. We use statistical spectroscopy, a moments method based upon a microscopic framework, the interacting shell model.
NTIS
Nuclear Structure; Spectroscopy

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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 and Power*.

20060013436 NASA Langley Research Center, Hampton, VA, USA
Parameterizable Library Components for SAW Devices
Wilson, William C.; Atkinson, Gary M.; [2006]; 4 pp.; In English; 9th International Conference on Modeling and Simulation of Microsystem (MSM 2006), 7-11 May 2006, Boston, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 238-08-02-04-03; Copyright; Avail.: CASI: A01, Hardcopy

To facilitate quick fabrication of Surface Acoustic Wave (SAW) sensors we have found it necessary to develop a library of parameterizable components. This library is the first module in our strategy towards a design tool that is integrated into existing Electronic Design Automation (EDA) tools. This library is similar to the standard cell libraries found in digital design packages. The library cells allow the user to input the design parameters which automatically generate a detailed layout of the SAW component. This paper presents the results of our development of parameterizable cells for an InterDigitated Transducer (IDT), reflector, SAW delay line, and both one and two port resonators.
Author
Design Analysis; Surface Waves; Sound Waves; Acoustics; Fabrication

20060013460 NASA Langley Research Center, Hampton, VA, USA

Comparison of a Convected Helmholtz and Euler Model for Impedance Eduction in Flow

Watson, Willie R.; Jones, Michael G.; [2006]; 24 pp.; In English; 12th AIAA/CEAS Aeroacoustics Conference, 8-10 May 2006, Cambridge, MA, USA; Original contains color illustrations

Contract(s)/Grant(s): 581-02-08-07

Report No.(s): AIAA Paper 2006-2643; No Copyright; Avail.: CASI: A03, Hardcopy

Impedances educed from a well-tested convected Helmholtz model are compared to that of a recently developed linearized Euler model using two ceramic test liners under the assumed conditions or uniform flow and a plane wave source. The convected Helmholtz model is restricted to uniform mean flow whereas the linearized Euler model can account for the effect or the shear layer. Test data to educe the impedance is acquired from measurements obtained in the NASA Langley Research Center Grazing Incidence Tube for mean flow Mach numbers ranging from 0.0 to 0.5 and source frequencies ranging from 0.5 kHz to 3.0 kHz. The unknown impedance of the liner b educed by judiciously choo~ingth e impedance via an optimization method to match the measured acoustic pressure on the wall opposite the test liner. Results are presented on four spatial grids using three different optimization methods (contour deformation, Davidon-Fletcher Powell, and the Genetic Algorithm). All three optimization methods converge to the same impedance when used with the same model and to nearly identical impedances when used on different models. h anomaly was observed only at 0.5 kHz for high mean flow speeds. The anomaly is likely due to the use of measured data in a flow regime where shear layer effects are important but are neglected in the math models. Consistency between the impedances educed using the two models provides confidence that the linearized Euler model is ready For application to more realistic flows, such as those containing shear layers.

Author

Impedance; Uniform Flow; Ceramics; Linings; Plane Waves; Shear Layers; Euler Equations of Motion; Grazing Incidence

20060013468 NASA Langley Research Center, Hampton, VA, USA

CDUCT-LaRC Status - Shear Layer Refraction and Noise Radiation

Nark, Douglas M.; Farassat, F.; 2006; 19 pp.; In English; 12th AIAA/CEAS Aeroacoustics Conference, 8-10 May 2006, Cambridge, MA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 23-781-30-14

Report No.(s): AIAA Paper 2006-2587; No Copyright; Avail.: CASI: A03, Hardcopy

A proposed boundary condition accounting for shear layer effects within the Ffowcs Williams-Hawkings radiation module of the CDUCT-LaRC code is investigated. The development and numerical justification of the boundary condition formulation are reviewed. An initial assessment of the effectiveness of the shear layer correction is conducted through comparison with experimental data. Preliminary results indicate that the correction provides physically meaningful modifications of the baseline predicted directivity patterns. Trends of peak directivity steepening and shifting that appeared in predicted patterns were found to follow similar structures in measured data, particularly at higher radiation angles.

Author

Boundary Conditions; Refraction; Shear Layers; Sound Waves; Mathematical Models; Ducted Fans

20060013469 NASA Langley Research Center, Hampton, VA, USA

Airframe Noise Prediction by Acoustic Analogy: Revisited

Farassat, F.; Casper, Jay H.; Tinetti, A.; Dunn, M. H.; [2006]; 24 pp.; In English; 12th AIAA/CEAS Aeroacoustics Conference, 8-10 May 2006, Cambridge, MA, USA; Original contains color illustrations

Contract(s)/Grant(s): 23-781-10-33

Report No.(s): AIAA Paper 2006-2564; Copyright; Avail.: CASI: A03, Hardcopy

The present work follows a recent survey of airframe noise prediction methodologies. In that survey, Lighthill s acoustic analogy was identified as the most prominent analytical basis for current approaches to airframe noise research. Within this approach, a problem is typically modeled with the Ffowcs Williams and Hawkings (FW-H) equation, for which a geometry-independent solution is obtained by means of the use of the free-space Green function (FSGF). Nonetheless, the aeroacoustic literature would suggest some interest in the use of tailored or exact Green s function (EGF) for aerodynamic noise problems involving solid boundaries, in particular, for trailing edge (TE) noise. A study of possible applications of EGF for prediction of broadband noise from turbulent flow over an airfoil surface and the TE is, therefore, the primary topic of the present work. Typically, the applications of EGF in the literature have been limited to TE noise prediction at low Mach numbers assuming that the normal derivative of the pressure vanishes on the airfoil surface. To extend the application of EGF to higher Mach numbers, the uniqueness of the solution of the wave equation when either the Dirichlet or the Neumann boundary condition (BC) is specified on a deformable surface in motion. The solution of Lighthill s equation with either the

Dirichlet or the Neumann BC is given for such a surface using EGFs. These solutions involve both surface and volume integrals just like the solution of FW-H equation using FSGF. Insight drawn from this analysis is evoked to discuss the potential application of EGF to broadband noise prediction. It appears that the use of a EGF offers distinct advantages for predicting TE noise of an airfoil when the normal pressure gradient vanishes on the airfoil surface. It is argued that such an approach may also apply to an airfoil in motion. However, for the prediction of broadband noise not directly associated with a trailing edge, the use of EGF does not appear to offer any advantages over the use of FSGF at the present stage of development. It is suggested here that the applications of EGF for airframe noise analysis be continued. As an example pertinent to airframe noise prediction, the Fast Scattering Code of NASA Langley is utilized to obtain the EGF numerically on the surface of a three dimensional wing with a flap and leading edge slat in uniform rectilinear motion. The interpretation and use of these numerical Green functions are then discussed.
Author
Aerodynamic Noise; Airframes; Aeroacoustics; Green's Functions; Turbulent Flow; Trailing Edges; Leading Edges; Mach Number; Wave Equations; Airfoils

20060013478 NASA Langley Research Center, Hampton, VA, USA
Effects of Geometric Details on Slat Noise Generation and Propagation
Khorrami, Mehdi R.; Lockhard, David P.; [2006]; 26 pp.; In English; 12th AIAA/CEAS Aeroacoustics Conference, 8-10 May 2006, Cambridge, MA, USA; Original contains color illustrations
Contract(s)/Grant(s): 581.02.08; No Copyright; Avail.: CASI: A03, Hardcopy

The relevance of geometric details to the generation and propagation of noise from leading-edge slats is considered. Typically, such details are omitted in computational simulations and model-scale experiments thereby creating ambiguities in comparisons with acoustic results from flight tests. The current study uses two-dimensional, computational simulations in conjunction with a Ffowcs Williams-Hawkings (FW-H) solver to investigate the effects of previously neglected slat 'bulb' and 'blade' seals on the local flow field and the associated acoustic radiation. The computations clearly show that the presence of the 'blade' seal at the cusp significantly changes the slat cove flow dynamics, reduces the amplitudes of the radiated sound, and to a lesser extent, alters the directivity beneath the airfoil. Furthermore, it is demonstrated that a modest extension of the baseline 'blade' seal further enhances the suppression of slat noise. As a side issue, the utility and equivalence of FW-H methodology for calculating far-field noise as opposed to a more direct approach is examined and demonstrated.
Author
Leading Edge Slats; Airfoils; Noise Propagation; Sound Waves; Two Dimensional Models; Flow Distribution; Fluid Dynamics; Noise Generators; Flight Tests

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20060013276 Purdue Univ., West Lafayette, IN, USA
Investigation of Polarization Spectroscopy and Degenerate Four-Wave Mixing for Quantitative Concentration Measurements
Lucht, R. P.; Mar. 2005; 16 pp.; In English
Report No.(s): DE2006-837545; No Copyright; Avail.: Department of Energy Information Bridge

Laser-induced polarization spectroscopy (LIPS), degenerate four-wave mixing (DFWM), and electronic-resonance-enhanced (ERE) coherent anti-Stokes Raman scattering (CARS) are techniques that shows great promise for sensitive measurements of transient gas-phase species, and diagnostic applications of these techniques are being pursued actively at laboratories throughout the world. However, significant questions remain regarding strategies for quantitative concentration measurements using these techniques. The primary objective of this research program is to develop and test strategies for quantitative concentration measurements in flames and plasmas using these nonlinear optical techniques. Theoretically, we are investigating the physics of these processes by direct numerical integration (DNI) of the time-dependent density matrix equations that describe the wave-mixing interaction.
NTIS
Concentration (Composition); Degeneration; Four-Wave Mixing; Lasers; Spectroscopy

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20060013278 Lodestar Research Corp., Boulder, CO, USA
Numerical Computation of Wave-Plasma Interaction in Multi-Dimensional Systems (Final Report, August 1, 2001-December 31, 2004)
D'Ippolito, D. A.; Feb. 21, 2005; 10 pp.; In English
Report No.(s): DE2006-837006; No Copyright; Avail.: Department of Energy Information Bridge

The work under this contract and contributions to the 'rf SciDAC project' in the years 2001 - 2004 covered three related areas of research: (a) developing a theory of rf-generated forces and sheared poloidal flow velocities in tokamak plasmas; (b) development of a wavelet diagnostic for the spatial dependence of the local k-vectors of propagating rf waves; and (c) an initial assessment of the formalism and computational methods for Parametric Decay Instability studies in inhomogeneous plasmas.
NTIS
Plasma Waves; Plasmas (Physics); Wave Interaction

20060013280 California Inst. of Tech., Pasadena, CA USA
Determining How Magnetic Helicity Injection Really Works. (Final Report, February 15, 2005)
Bellan, P. M.; Feb. 15, 2005; 8 pp.; In English
Report No.(s): DE2006-836847; No Copyright; Avail.: National Technical Information Service (NTIS)

This research program involved direct observation of the complicated plasma dynamics underlying spheromak formation. Spheromaks are self-organizing magnetically dominated plasma configurations which potentially offer a simple, low-cost means for confining the plasma in a controlled thermonuclear fusion reactor. The spheromak source used in these studies was a coaxial co-planar magnetized plasma gun which was specifically designed to have the simplest relevant geometry. The simplicity of the geometry facilitated understanding of the basic physics and minimized confusion that would otherwise have resulted from complexities due to the experimental geometry. The coaxial plasma gun was mounted on one end of a large vacuum tank that had excellent optical access so the spheromak formation process could be tracked in detail using ultra-high speed cameras. The main accomplishments of this research program were (1) obtaining experimental data characterizing the detailed physics underlying spheromak formation and the development of new theoretical models motivated by these observations, (2) determining the relationship between spheromak physics and astrophysical jets, (3) developing a new high-speed camera diagnostic for the SSPX spheromak at the Lawrence Livermore National Lab, and (4) training graduate students and postdoctoral fellows.
NTIS
Cosmic Rays; Injection; Plasma Dynamics; Solar Wind; Spheromaks

20060013303 California Univ., Irvine, CA, USA
Theoretical Studies of Drift-Alfven and Energetic-Particle Physics in Fusion Plasmas. (Report for June 1, 2002-November 30, 2004)
Chen, L.; Jul. 2005; 8 pp.; In English
Report No.(s): DE2006-838916; DE/ER-54271; No Copyright; Avail.: Department of Energy Information Bridge

A theoretical model is proposed for the nonlinear saturation of high-m Alfven-ballooning instabilities in in magnetospheric plasmas. Here, m is the azimuthal wave number. In the present model, a broad spectrum of Alfven waves nonlinearly generate ion-sound density perturbations; which, in turn, scatter the Alfven turbulence toward lower frequencies. Balancing the linear instability growth rate with the nonlinear scattering (Landau damping) rate then yield the corresponding saturated spectrum, which tends to peak near the bottom of the eigenmode frequencies. The theory also gives estimates of wave amplitudes at saturation in reasonable agreement with satellite observations.
NTIS
Alpha Particles; Energetic Particles; Magnetohydrodynamic Stability; Magnetohydrodynamic Waves; Plasma Diagnostics; Plasma Waves; Plasmas (Physics)

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20060013370 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Quantitative Risk Assessment of a windturbine in the vicinity of the Marine base SEWACO
vanderVoort, M. M.; January 2006; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 014.16163
Report No.(s): TD2005-02432; TNO-DV2-2005-A227; Copyright; Avail.: Other Sources

On behalf of the Dutch MOD a quantitative risk assessment has been performed, related to the placement of a wind turbine in the vicinity of Marine base SEWACO. No significant increase of the individual or societal risk was observed.
Author
Risk; Wind Turbines; Military Technology

20060013387 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
The Bril
Blokker, J. H. A.; Bastings, I, C. L.; Rasker, P. C.; in'tVeld, Huis; November 2005; 44 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.34016
Report No.(s): TD2005-0354; TNO-DV1-2005-A139; Copyright; Avail.: Other Sources

TNO has developed a tool to analyze complex and dynamic 24/7 organizations like the Directorate Operations of the Ministry of Defense. The tool - called 'the Bril' (Dutch for spectacles) - enables analysts to diagnose these kind of organizations in a structured and unambiguous manner from several points of view and looking at both the performance of an organization and the organization itself. The Bril has been based on existing models and theories in the field of organization diagnoses. The points of view of the Bril are: a) Strategy. b) Organization and structure. c)Cooperation and culture. e) Leadership and management. f) Personnel and training. g) Systems and layout. The Bril can be used as a guideline and checklist when interviewing staff members. The use makes it easier to compare organizations. Next steps will be to validate the Bril and to define performance measures.
Author
Diagnosis; Organizations; Management; Leadership; Personnel Development

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20060013232 Geological Survey, Spokane, WA, USA, Idaho Univ., Moscow, ID, USA
Digital Map of Surficial Geology, Wetlands, and Deepwater Habitats, Coeur d'Alene River Valley, Idaho
Bookstrom, A. A.; Box, S. E.; Jackson, B. L.; Brandt, T. R.; Derkey, P. D.; January 1999; 136 pp.; In English
Report No.(s): PB2006-108463; USGS-OFR-99-548; No Copyright; Avail.: National Technical Information Service (NTIS)

In north Idaho the Coeur dAlene (CdA) River channel and its floodplain are mostly covered by metal-enriched sediments, partially derived from upstream mining, milling and smelting wastes. Relative to uncontaminated sediments of the region, metal enriched sediments are highly enriched in silver, lead, zinc, arsenic, antimony and mercury; and enriched in copper, cadmium, manganese, and iron (Fousek, 1996). Widespread distribution of metal-enriched sediments has resulted from over a century of mining in the CdA mining district (upstream), poor mine-waste containment practices during the first 80 years of mining, and an ongoing series of over-bank floods. Previously deposited metal-enriched sediments continue to be eroded and transported down-valley and onto the floodplain during floods. The centerpiece of this report is a Digital Map Surficial Geology, Wetlands and Deepwater Habitats of the Coeur dAlene (CdA) River valley. The map covers the river, its floodplain, and adjacent hills, from the confluence of the North and South Forks of the CdA River to its mouth and delta front on CdA Lake, 43 linear km (26 mi) to the southwest (river distance 58 km or 36 mi). Also included are the following derivative theme maps: 1. Wetland System Map, 2. Wetland Class Map, 3. Wetland Subclass Map, 4. Floodplain Map, 5. Water Regime Map,

6. Sediment-Type Map, 7. Redox Map, 8. pH Map, and 9. Agricultural Land Map.
NTIS
Digital Data; Geology; Habitats; Maps; Rivers; Valleys; Water Depth; Wetlands

20060013235 Geological Survey, Spokane, WA, USA, Idaho Univ., Moscow, ID, USA
Digital Geologic Map of Part of the Thompson Falls 1:100,000 Quadrangle, Idaho
Lewis, R. S.; Derkey, P. D.; January 1999; 40 pp.; In English
Report No.(s): PB2006-108462; USGS-OFR-99-438; No Copyright; Avail.: National Technical Information Service (NTIS)

The geology of the Thompson Falls 1:100,000 quadrangle, Idaho was compiled by Reed S. Lewis in 1997 onto a 1:100,000-scale greenline mylar of the topographic base map for input into a geographic information system (GIS). The resulting digital geologic map GIS can be queried in many ways to produce a variety of geologic maps. Digital base map data files (topography, roads, towns, rivers and lakes, etc.) are not included: they may be obtained from a variety of commercial and government sources. This database is not meant to be used or displayed at any scale larger than 1:100,000 (e.g., 1:62,500 or 1:24,000). The map area is located in north Idaho. This open-file report describes the geologic map units, the methods used to convert the geologic map data into a digital format, the Arc/Info GIS file structures and relationships, and explains how to download the digital files from the U.S. Geological Survey public access World Wide Web site on the Internet.
NTIS
Digital Data; Idaho; Maps; Geological Surveys; Relief Maps

20060013236 Geological Survey, Spokane, WA, USA, Idaho Univ., Moscow, ID, USA, Washington Univ., Bellingham, WA, USA, University of Eastern Washington, Cheney, WA, USA
Digital Geologic Map of the Wallace 1:100,000 Quadrangle, Idaho
Lewis, R. S.; Burmester, R. F.; McFaddan, M. D.; Derkey, P. D.; Oblad, J. R.; January 1999; 52 pp.; In English
Report No.(s): PB2006-108461; USGS-OFR-99-390; No Copyright; Avail.: National Technical Information Service (NTIS)

The geology of the Wallace 1:100,000 quadrangle, Idaho was compiled by Reed S. Lewis in 1997 primarily from Foster (1983), Harrison (unpublished geologic field maps, 1975 to 1985), Hietenan (1963, 1967, 1968, 1984), Hobbs and others (1965) and Vance (1981) supplemented by eight weeks of field mapping by Reed S. Lewis, Russell F. Burmester and Mark D. McFaddan in 1997 and 1998. This geologic map information was inked onto a 1:100,000-scale greenline mylar of the topographic base map for input into a geographic information system (GIS). The resulting digital geologic map GIS can be queried in many ways to produce a variety of geologic maps. Digital base map data files (topography, roads, towns, rivers and lakes, etc.) are not included: they may be obtained from a variety of commercial and government sources. This database is not meant to be used or displayed at any scale larger than 1:100,000 (e.g., 1:62,500 or 1:24,000). The map area is located in north Idaho. The primary sources of map data are shown and additional sources are given. This open-file report describes the geologic map units, the methods used to convert the geologic map data into a digital format, the Arc/Info GIS file structures and relationships, and explains how to download the digital files from the U.S. Geological Survey public access World Wide Web site on the Internet.
NTIS
Digital Data; Idaho; Maps

20060013237 Geological Survey, Tucson, AZ, USA, Arizona Univ., Tucson, AZ, USA
Geologic Map of the Tucson and Nogales Quadrangles (Arizona, Scale 1:250,000): A Digital Database
Peterson, J. A.; Berquist, J. R.; Reynolds, S. J.; Page-Nedell, S. S.; Oland, G. P.; Aug. 08, 2001; 30 pp.; In English
Report No.(s): PB2006-108460; USGS-OFR-01-275; No Copyright; Avail.: CASI: A03, Hardcopy

The geologic map of the Tucson-Nogales 1:250,000 scale quadrangle (Peterson and others, 1990) was digitized by U.S. Geological Survey staff and University of Arizona contractors at the Southwest Field Office, Tucson, Arizona, in 2000 for input into a geographic information system (GIS). The database was created for use as a basemap in a decision support system designed by the National Industrial Minerals and Surface Processes project. The resulting digital geologic map database can be queried in many ways to produce a variety of geologic maps. Digital base map data files (topography, roads, towns, rivers and lakes, etc.) are not included; they may be obtained from a variety of commercial and government sources. Additionally, point features, such as strike and dip, were not captured from the original paper map and are not included in the database. This database is not meant to be used or displayed at any scale larger than 1:250,000 (for example, 1:100,000 or 1:24,000). The digital geologic map graphics and plot files that are provided in the digital package are representations of the digital database. They are not designed to be cartographic products. The map area is located in Southern Arizona (fig. 1), just north of the border

with Mexico. This report describes the methods used to convert the geologic map data into a digital format, the ArcInfo GIS file structures and relationships, and explains how to download the digital files from the U.S. Geological Survey public access World Wide Web site on the Internet.
NTIS
Data Bases; Digital Data; Maps; Metadata; Minerals

20060013238 Geological Survey, Tucson, AZ, USA, Arizona Univ., Tucson, AZ, USA
Digital Soils Survey Map of the Patagonia Mountains, Arizona
Norman, L.; Wissler, C.; Guertin, D. P.; Gray, F.; January 2002; 28 pp.; In English
Report No.(s): PB2006-108459; USGS-OFR-02-324; No Copyright; Avail.: National Technical Information Service (NTIS)

Historical analog soils data were automated to create a high resolution digital soils survey map of the Patagonia Mountains, Arizona. Preexisting, high-resolution soils data could not be found in digital form. The most accurate soil information for the study area was in hard copy. This was available as 1:20,000 scale maps in the Soil Survey of Santa Cruz and Parts of Cochise and Pima Counties, Arizona (USDA, SCS & FS, 1979), a product of the U.S. Department of Agricultures Soil Conservation Service and Forest Service in cooperation with the Arizona Agricultural Experiment Station. These maps were created according to the site conditions in 1971. Aerial photography was used to accurately map polygonal soil types according to field tests. The 1979 soil maps were automated for incorporation into the hydrologic modeling within a GIS. The resulting digital database can be queried in many ways to produce a variety of soils maps, utilizing attributed polygons. Digital base map data files (topography, roads, towns, rivers and lakes, etc.) are not included. They may be obtained from a variety of commercial and government sources. The soil coverage is not meant to be used or displayed at any scale larger than 1:20,000 (e.g., 1:10,000). The mapped area is located in Southeast Arizona (fig. 1). This open-file report describes the soil map units, the methods used to convert the soils map data into a digital format, the ArcInfo GIS file structures, and methods for downloading the digital files from the U.S. Geological Survey public access World Wide Web site on the Internet. Karen Bolm reviewed manuscript and digital files.
NTIS
Argentina; Digital Data; Maps; Mountains; Soils; Surveys

20060013270 Geological Survey, Spokane, WA, USA
MAS/MILS Arc/Info Point Coverage for the Western U.S. (Excluding Hawaii)
Causey, J. D.; January 1998; 32 pp.; In English
Report No.(s): PB2006-108379; USGS-OFR-99-169; No Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this project was to create a spatial coverage of the western U.S. containing mineral resource information. This coverage includes information for the states of Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. For this report, locations from MAS/MILS were converted to a point coverage using a geographic information system (GIS). All work was done using Arc/Info v. 7.0.4. There are 128,441 points in the coverage. This open-file report discusses the database used to create the coverage, information contained in the digital files, methods used to convert the database into a GIS format, documentation of the file structure, limitations of the data, and explanation of how to download the digital files from the U.S. Geological Survey public access World Wide Web site on the Internet.
NTIS
Data Bases; Industries; Minerals; United States

20060013272 Geological Survey, Spokane, WA, USA
Arc/Info Point Coverage of Mineral Resource Data System (MRDS) Locations in Eleven Western States
Frank, D. G.; January 1999; 18 pp.; In English
Report No.(s): PB2006-108380; USGS-OFR-99-169; No Copyright; Avail.: CASI: A03, Hardcopy

This ARC/Info coverage, derived from the USGS Mineral Resource Data System (MRDS), contains 60,490 records that fall within the states of Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, Wyoming. The dataset has 13 fields containing information on record identification, location, commodity, geology, and deposit type. The data for this report was retrieved from the master database as a tab text file and imported into a Microsoft Access database. The data was then imported into ESRI's ArcView where shape files were created. These shape files were then converted into an ARC/INFO coverage.
NTIS
Data Systems; Geological Surveys; Mineral Deposits; Position (Location); Surveys; United States

20060013320 Agency for International Development, Washington, DC, USA
Knowledge for Development Strategy, FY 2004-2008. (USA Agency for International Development)
Jul. 2004; 60 pp.; In English
Report No.(s): PB2006-110267; No Copyright; Avail.: CASI: A04, Hardcopy

The National Security Strategy (NSS) of the USA of America places great emphasis on the role of international development in securing our nation and helping fight terrorism. The U.S. Agency for International Development (USAID) is faced with an unprecedented opportunity to play a visible and influential role. USAID is an agency spread over the globe, working in some of the most remote, impoverished countries in the world. As knowledge sharing and knowledge generation must be basic precepts of effective development efforts, we have linked what we do with what we need to know to coin the name Knowledge for Development as the Agency's overall knowledge management activity. In essence, the underlying mission of the Knowledge for Development (KfD) strategy is to meet the above stated challenges by getting the right knowledge to the right people at the right time.
NTIS
United States; Strategy; Terrorism; Security

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*.

20060013174 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The SMART Theory and Modeling Team: An Integrated Element of Mission Development and Science Analysis
Hesse, Michael; Birn, J.; Denton, Richard E.; Drake, J.; Gombosi, T.; Hoshino, M.; Matthaeus, B.; Sibeck, D.; [2005]; 2 pp.; In English; 2005 American Geophysical Union Meeting, 4-11 Dec. 2005, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

When targeting physical understanding of space plasmas, our focus is gradually shifting away from discovery-type investigations to missions and studies that address our basic understanding of processes we know to be important. For these studies, theory and models provide physical predictions that need to be verified or falsified by empirical evidence. Within this paradigm, a tight integration between theory, modeling, and space flight mission design and execution is essential. NASA's Magnetospheric MultiScale (MMS) mission is a pathfinder in this new era of space research. The prime objective of MMS is to understand magnetic reconnection, arguably the most fundamental of plasma processes. In particular, MMS targets the microphysical processes, which permit magnetic reconnection to operate in the collisionless plasmas that permeate space and astrophysical systems. More specifically, MMS will provide closure to such elemental questions as how particles become demagnetized in the reconnection diffusion region, which effects determine the reconnection rate, and how reconnection is coupled to environmental conditions such as magnetic shear angles. Solutions to these problems have remained elusive in past and present spacecraft missions primarily due to instrumental limitations - yet they are fundamental to the large-scale dynamics of collisionless plasmas. Owing to the lack of measurements, most of our present knowledge of these processes is based on results from modern theory and modeling studies of the reconnection process. Proper design and execution of a mission targeting magnetic reconnection should include this knowledge and have to ensure that all relevant scales and effects can be resolved by mission measurements. The SMART mission has responded to this need through a tight integration between instrument and theory and modeling teams. Input from theory and modeling is fed into all aspects of science mission design, and theory and modeling activities are tailored to SMART needs during mission development and science analysis. In this presentation, we will present an overview of SMART theory and modeling team activities. In particular, we will provide examples of science objectives derived from state-of-the art models, and of recent research results that continue to be utilized in SMART mission development.
Author
Magnetic Field Reconnection; Space Missions; Models; NASA Space Programs; Systems Integration; Aerospace Sciences; Astrophysics; Research and Development

20060013430 InDyne, Inc., Cocoa Beach, FL, USA
Chronology of KSC and KSC Related Events for 2005
Liston, Elaine E.; February 2006; 271 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2006-214195; Copyright; Avail.: CASI: A12, Hardcopy

This document is intended to serve as a record of KSC events and is a reference source for historians and other researchers. Arrangement is by day and month and individual articles are attributed to published sources. Materials were researched and described by the KSC Library .Archivist for KSC Library Services Contractor, InDyne, Inc.
Author
Chronology; Discovery (Orbiter); Launch Vehicles; External Tanks; Space Shuttle Orbiters; Launching

20060013440 NASA Johnson Space Center, Houston, TX, USA
NASA UTILIZATION of THE INTERNATIONAL SPACE STATION and THE VISION FOR SPACE EXPLORATION
Robinson, Julie A.; Thomas, Donald A.; [2006]; 6 pp.; In English; International Symposium on Space Technology and Science, 4-11 Jun. 2006, Kanazawa, Japan; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

Under U.S. President Bush s Vision for Space Exploration (January 14, 2004), NASA has refocused its utilization plans for the International Space Station (ISS). This use will now focus on: (1) the development of countermeasures that will protect crews from the hazards of the space environment, (2) testing and validating technologies that will meet information and systems needs for future exploration missions.
Author
International Space Station; Aerospace Environments; Information Systems; Space Exploration; Spacecrews

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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.

20060013178 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Elemental and Molecular Relative Abundances in the Ejecta of Eta Carinae
Kober, G. V.; Gull, T. R.; Nielsen, K.; Bruhweiler, F.; Verner, K.; Stahl, O.; Weis, K.; Bomans, D.; Bulletin of the American Astronomical Society; [2006]; Volume 37, No. 4; 1 pp.; In English; American Astronautical Society 207th Meeting, 8-12 Jan. 2006, Washington, DC, USA; Copyright; Avail.: Other Sources; Abstract Only

We are measuring relative elemental abundances for the ejecta in the line of sight from Eta Carinae using high dispersion spectroscopy with the HST/STIS and the VLT/UVES. While multiple velocity components have been identified, we focus on the -513 and -146 km/s components originating from the Homunculus and the Little Homunculus. Complicating factors are the complex nebular structures in the immediate vicinity of the bright, massive star: the very bright emission structures, Weigelt blobs B, C and D, the broad, clumpy structures of the extended wind apparently not photoionized by Eta Car B, and general scattered starlight from the extended wind and the dusty core of the circumstellar material. We have used the 3050 to 3160A region of overlap between STIS and UVES to intercompare equivalent widths of absorption lines to estimate the 'contributing factor', namely the amount of light originating from the star compared to nebular structures. While the extracted STIS spectra are from 0.1' wide aperture, the UVES spectra are limited by the 1' seeing conditions. Curiously we find that the scattering contribution in the UVES spectra changes with time, apparently with orbital phase of the 5.54-year period. This indicates that the dust may be modified by changes in the central source with phase. The noticeable drop in scattered light appears to occur about 1.7 years (phase 0.35) after the spectroscopic minimum. Relative abundances of iron peak elements and some molecules will be estimated. Observations in this study were accomplished with HST through STSci and with VLT through ESO and funded under STIS GTO resources.
Author
Ejecta; Abundance; Massive Stars; Binary Stars; Molecules

20060013181 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Normal and Starburst Galaxies in Deep X-ray Surveys
Cardiff, A. Hornschemeier; [2006]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

This talk will cover progress of the last several years in unraveling the nature of normal and starburst galaxies in deep X-ray surveys. This includes discussion of the normal galaxy X-ray Luminosity Function in deep field and cluster surveys and what it tells us about the binary populations in galaxies. The utility of broad band X-ray emission, especially as compared to other multiwavelength measurements of current/recent star formation, will be reviewed. These broad band X-ray

measurements of star formation are based upon X-ray/Star Formation Rate correlations that span the currently available redshift range (0 \h z \h 1). I will also discuss new efforts underway to systematically characterize the X-ray emission from galaxies in group and cluster environments, including a new effort underway in the Coma cluster of galaxies.
Author
Star Formation; Galactic Clusters; Correlation; Starburst Galaxies; X Rays; Galactic Radiation; Emission

20060013187 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Observed Galactic Annihilation Line: Possible Signature of Accreting Small Mass Black Holes in the Galactic Center
Titarchuk, Lev; Chardonnet, Pascal; Astrophysical Journal 10; [2006]; Volume 639, Issue 2; 23 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): SSHN2004-413077D; Copyright; Avail.: CASI: A03, Hardcopy

Various balloon and satellite observatories have revealed what appears to be an extended source of 0.511 MeV annihilation radiation with flux of approx. 10(exp -3) photons/sq cm/s centered on the Galactic Center. Positrons from radioactive products of stellar explosions can account for a significant fraction of the emission. We discuss an additional source for this emission: namely e(+)e(-) pairs produced when X-rays generated from the approx. 2.6 x 10(exp 6) solar mass Galactic Center Black Hole interact with approx. 10 MeV temperature blackbody emission from 10(exp 17) g black holes within 10(exp 14-l5) cm of the center. The number of such Small Mass Black Holes (SMMBHs) can account for the production of the 10(exp 42) e(+)/s that produces the observed annihilation in the inner Galaxy when transport effects are taken into account. We consider the possibility for confirming the presence of these SMMBHs in the Galactic Center region with future generations of gamma-ray instruments if a blackbody like emission of approx. 10 MeV temperature would be detected by them. Small Mass Black Hole can be a potential candidate for dark (invisible) matter hal
Author
Black Holes (Astronomy); Dark Matter; Stellar Mass; Radiation Dosage; Annihilation Reactions; Black Body Radiation; Gamma Rays

20060013192 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MEASURING the MASS OF 4UO900-40 DYNAMICALLY
Dolan, J. F.; Etzel, Paul B.; Boyd, Patricia T.; January 2006; 24 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

Accurate measurements of neutron star masses are needed to constrain the equation of state of neutron star matter - of importance to both particle physics and the astrophysics of neutron stars - and to identify the evolutionary track of the progenitor stars that form neutron stars. The best measured values of the mass of 4UO900-40 (= Vela XR-l), 1.86 +/- 0.16 Msun (Barziv et al. 2001) and 1.93 +/- 0.20 Msun (Abubekerov et al. 2004), make it a leading candidate for the most massive neutron star known. The direct relationship between the maximum mass of neutron stars and the equation of state of ultra-dense matter makes 4UO900-40 an important neutron star mass to determine accurately. The confidence interval on previous mass estimates, obtained from observations that include parameters determined by non-dynamical methods, are not small enough to significantly restrict possible equations of state. We describe here a purely dynamical method for determining the mass of 4UO900-40, an X-ray pulsar, using the reprocessed UV pulses emitted by its BO.5Ib companion. One can derive the instantaneous radial velocity of each component by simultaneous X-ray and UV observations at the two quadratures of the system. The Doppler shift caused by the primary's rotational velocity and the illumination pattern of the X-rays on the primary, two of the three principal contributors to the uncertainty on the derived mass of the neutron star, almost exactly cancel by symmetry in this method. A heuristic measurement of the mass of 4UO900-40 using observations obtained previously with the High Speed Photometer on HST is given in Appendix A.
Author
Stellar Mass; Neutron Stars; Matter (Physics); Massive Stars; Astrophysics

20060013205 NASA Goddard Space Flight Center, Greenbelt, MD, USA
'Short, Hard Gamma-Ray Bursts - Mystery Solved?????'
Parsons, A.; [2006]; 1 pp.; In English; High Energy Physics/Astrophysics Seminar Society of Women in Physics, 6-7 Mar. 2006, Ann Arbor, MI, USA; No Copyright; Avail.: Other Sources; Abstract Only

After over a decade of speculation about the nature of short-duration hard-spectrum gamma-ray bursts (GRBs), the recent detection of afterglow emission from a small number of short bursts has provided the first physical constraints on possible progenitor models. While the discovery of afterglow emission from long GRBs was a real breakthrough linking their origin

to star forming galaxies, and hence the death of massive stars, the progenitors, energetics, and environments for short gamma-ray burst events remain elusive despite a few recent localizations. Thus far, the nature of the host galaxies measured indicates that short GRBs arise from an old (\g 1 Gyr) stellar population, strengthening earlier suggestions and providing support for coalescing compact object binaries as the progenitors. On the other hand, some of the short burst afterglow observations cannot be easily explained in the coalescence scenario. These observations raise the possibility that short GRBs may have different or multiple progenitors systems. The study of the short-hard GRB afterglows has been made possible by the Swift Gamma-ray Burst Explorer, launched in November of 2004. Swift is equipped with a coded aperture gamma-ray telescope that can observe up to 2 steradians of the sky and can compute the position of a gamma-ray burst to within 2-3 arcmin in less than 10 seconds. The Swift spacecraft can slew on to this burst position without human intervention, allowing its on-board x ray and optical telescopes to study the afterglow within 2 minutes of the original GRB trigger. More Swift short burst detections and afterglow measurements are needed before we can declare that the mystery of short gamma-ray burst is solved.
Author
Gamma Ray Bursts; Afterglows; Swift Observatory; Coalescing; Gamma Ray Telescopes; Actuators

20060013208 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Swift Gamma-ray Burst Explorer: Early views into Black-hole Creation
Hill, Joe; January 2006; 56 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-637; No Copyright; Avail.: CASI: A04, Hardcopy

Swift has exceeded every pre-launch predicted advance in GRB science. It has discovered the farthest GRB ever seen and identified new GRBs at a rate of 100/year. It has also explored a brand new time interval in GRB light curves by revealing unpredicted phenomena of GRB flares and rapid x-ray afterglow declines. Swift has conducted 20,00o successful slews to sources and is predicted to stay in orbit until 2022.
Derived from text
Gamma Ray Bursts; Black Holes (Astronomy); Afterglows

20060013212 NASA Goddard Space Flight Center, Greenbelt, MD, USA
FE K EMISSION and ABSORPTION FEATURES IN the XMM-EPIC SPECTRUM of THE SEYFERT GALAXY IC 4329A
Markowitz, A.; Reeves, J. N.; Braito, V.; [2001]; 27 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-640; No Copyright; Avail.: CASI: A03, Hardcopy

We present a re-analysis of the XMM-Newton long-look of the X-ray bright Seyfert galaxy IC 4329a. The Fe K bandpass is dominated by two peaks, consistent with emission from neutral or near-neutral Fe Ka and KP. A relativistic diskline model whereby both peaks are the result of one doubly-peaked diskline profile is found to be a poor description of the data. Models using two relativistic disklines are found to describe the emission profile well. A low-inclination, moderately-relativistic dual-diskline model is possible if the contribution from narrow components, due to distant material, is small or absent. A high-inclination, moderately relativistic profile for each peak is possible if there are roughly equal contributions from both the broad and narrow components. Upper limits on Fe XXV and Fe XXVI emission and absorption at the systemic velocity of IC 4329a are obtained. We also present the results of RXTE monitoring of this source obtained so far; the combined XMM-Newton and RXTE data sets allow us to explore the time-resolved spectral behavior of this source on time scales ranging from hours to 2 years. We find no strong evidence for variability of the Fe Ka emission line on any time scale probed, likely due to the minimal level of continuum variability. We detect a narrow absorption line, at a energy of 7.68 keV in the rest frame of the source; its significance has been confirmed using Monte Carlo simulations. This feature is most likely due to absorption from Fe XXVI blueshifted to approximately 0.1c relative to the systemic velocity, making IC 4329a the lowest-redshift AGN known with a high-velocity, highly-ionized outflow component. As is often the case with similar outflows seen in high-luminosity quasars, the estimated mass outflow rate is larger than the inflow accretion rate, signaling that the outflow represents a substantial portion of the total energy budget of the AGN. The outflow could arise from a radiatively-driven disk wind, or it may be in the form of a discrete, transient blob of ejected material.
Author
Seyfert Galaxies; XMM-Newton Telescope; Active Galactic Nuclei; K Lines

20060013214 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Swift: Results from the first year of the mission
Krimm, H. A.; [2006]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The Swift gamma-ray burst explorer was launched on Nov. 20,2004 from Cape Canaveral, Florida. The first instrument onboard became fully operational less than a month later. Since that time the Burst Alert Telescope (BAT) on Swift has detected more than one hundred gamma-ray bursts (GRBs), most of which have also been observed within two minutes by the Swift narrow-field instruments: the X-Ray Telescope (XRT) and the Ultra-Violet and Optical Telescope (UVOT). Swift trigger notices are distributed worldwide within seconds of the trigger through the Gamma-ray burst Coordinates Network (GCN) and a substantial fraction of GRBs have been followed up by ground and space-based telescopes, ranging in wavelength from radio to TeV. Results have included the first rapid localization of a short GRB and further validation of the theory that short and long bursts have different origins; detailed observations of the short-term power-law decay of burst afterglows leading to an improved understanding of the fireball model; and detection of the most distant GRB ever found. Swift is also a sensitive X-ray observatory with capabilities to monitor galactic and extragalactic transients on a daily basis, carry out the first all-sky hard X-ray survey since HEAO-1, and study in detail the spectra of X-ray transients. significant results, both in GRB science and in the search for and study of hard X-ray sources. In this talk I will provide a broad overview of the Swift mission and its most significant results, both in GRB science and in the search for and study of hard X-ray sources. Author

Gamma Ray Bursts; X Ray Telescopes; Swift Observatory; Afterglows

20060013216 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Gamma Ray Bursts
Gehrels, Neil; [2006]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Gamma-ray bursts are among the most fascinating occurrences in the cosmos. They are thought to be the birth cries of black holes throughout the universe. There has been tremendous recent progress in our understanding of bursts with the new data from the Swift mission. Swift was launched in November 2004 and is a multiwave length observatory designed to determine the origin of bursts and use them to probe the early Universe. It was developed and is being operated by an international team of scientists from the US, UK and Italian. The first year of findings from the mission will be presented. A large step forward has been made in our understanding of the mysterious short GRBs. High redshift bursts have been detected leading to a better understanding of star formation rates and distant galaxy environments. GRBs have been found with giant X-ray flares occurring in their afterglow. These, and other topics, will be discussed.
Author

Gamma Ray Bursts; Black Holes (Astronomy); X Rays; Observatories

20060013218 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Correlative Analysis of GRBs detected by Swift, Konus and HETE
Krimm, Hans A.; Barthelmy, S. D.; Gehrels, N.; Hullinger, D.; Sakamoto, T.; Donaghy, T.; Lamb, D. Q.; Pal'shin, V.; Golenetskii, S.; Ricker, G. R., et al.; [2005]; 4 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Swift has now detected a large enough sample of gamma-ray bursts (GRBs) to allow correlation studies of burst parameters. Such studies of earlier data sets have yielded important results leading to further understanding of burst parameters and classifications. This work focuses on seventeen Swift bursts that have also been detected either by Konus-Wind or HETE-II, providing high energy spectra and fits to E(sub peak). Eight of these bursts have spectroscopic redshifts and for others we can estimate redshifts using the variability/luminosity relationship. We can also compare E(sub peak) with E(sub iso), and for those bursts for which a jet break was observed in the afterglow we can derive E(sub g) and test the relationship between E(peak) and E(sub gamma). For all bursts we can derive durations and hardness ratios from the prompt emission. Author

Gamma Ray Bursts; Energy Spectra; Red Shift; Classifications; Spectroscopy

20060013219 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Wide-Field Imaging Interferometry Testbed: Recent Results
Rinehart, Stephen; [2006]; 1 pp.; In English; Society of Photo-Optical Instrumentation Engineers, 24-31 May 2006, Orlando, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

We present recent results from the Wide-Field Imaging Interferometry Testbed (WIIT). The data acquired with the WIIT

is ‘double Fourier’ data, including both spatial and spectral information within each data cube. We have been working with this data, and starting to develop algorithms, implementations, and techniques for reducing this data. Such algorithms and tools are of great importance for a number of proposed future missions, including the Space Infrared Interferometric Telescope (SPIRIT), the Submillimeter Probe of the Evolution of Cosmic Structure (SPECS), and the Terrestrial Planet Finder Interferometer (TPF-I)/Darwin. Recent results are discussed and future study directions are described.
Author
Interferometers; Infrared Telescopes; Algorithms; Submillimeter Waves; Interferometry

20060013221 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Hard X-ray 20-40 keV AGN Luminosity Function
Beckmann, V.; Soldi, S.; Shrader, C. R.; Gehrels, N.; Produit, N.; January 2006; 14 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-7385; NAG5-7067; Copyright; Avail.: CASI: A03, Hardcopy

We have compiled a complete, significance limited extragalactic sample based on approximately 25,000 deg(sup 2) to a limiting flux of 3 x 10(exp -11) ergs per square centimeter per second. (approximately 7,000 deg(sup 2)) to a flux limit of 10(exp -11) ergs per square centimeter per second)) in the 20 - 40 keV band with INTEGRAL. We have constructed a detailed exposure map to compensate for effects of non-uniform exposure. The flux-number relation is best described by a power-law with a slope of alpha = 1.66 plus or minus 0.11. The integration of the cumulative flux per unit area leads to f(sub 20-40 keV) = 2.6 x 10(exp -10) ergs per square centimeter per second per sr(sup -1) which is about 1% of the known 20-40 keV X-ray background. We present the first luminosity function of AGN in the 20-40 keV energy range, based on 68 extragalactic objects detected by the imager IBIS/ISGRI on-board INTEGRAL. The luminosity function shows a smoothly connected two power-law form, with an index of gamma (sub 1) = 0.9 below, and gamma (sub 2) = 2.2 above the turn-over luminosity of L(sub *), = 4.6 x 10(sup 43) ergs per second. The emissivity of all INTEGRAL AGNs per unit volume is W(sub 20-40keV)(greater than 10(sup 41) ergs per second) = 2.8 x 10(sup 38) ergs per second h(sup 3)(sub 70) Mpc(sup -3). These results are consistent with those derived in the 2-20keV energy band and do not show a significant contribution by Compton-thick objects. Because the sample used in this study is truly local (z(raised bar) = 0.022)), only limited conclusions can be drawn for the evolution of AGNs in this energy band. But the objects explaining the peak in the cosmic X-ray background are likely to be either low luminosity AGN (L(sub x) less than 10(sup 41) ergs per second) or of other type, such as intermediate mass black holes, clusters, and star forming regions.
Author
Active Galactic Nuclei; Luminosity; X Ray Astronomy; Gamma Ray Astronomy; Energy Bands

20060013224 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GLAST Observations of Pulsars and their Environments
Thompson, David J.; [2006]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Pulsars and pulsar wind nebulae seen at gamma-ray energies offer insight into particle acceleration to very high energies. Pulsed emission provides information about the geometry and interaction processes in the magnetospheres of these rotating neutron stars, while the pulsar wind nebulae yield information high-energy particles interacting with their surroundings. During the next decade, a number of new and expanded gamma-ray facilities will become available for pulsar studies. In particular, the GLAST Large Area Telescope, a successor to EGRET on the Compton Observatory, will provide an excellent complement to H.E.S.S. for the study of the highest-energy emissions powered by neutron stars.
Author
Gamma Ray Observatory; Gamma Ray Telescopes; Particle Acceleration; Nebulae; Gamma Rays

20060013225 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Swift and GRB’s: Unveiling the Relativistic Universe
Marshall, Francis E.; [2006]; 1 pp.; In English; Swift and GRBs Unveiling the Relativistic Universe Conference, 5-9 Jun. 2006, Venice, Italy; No Copyright; Avail.: Other Sources; Abstract Only

We report Swift observations of GRB 051109A, a bright, long burst detected with BAT. A bright afterglow was quickly detected with the X-Ray Telescope and Ultraviolet and Optical Telescope, and observations continued for more than 10 days. The X-ray light is complex with a rapid initial decay followed by a more gradual decay. There is evidence for a jet break with

an indicated opening angle of a few degrees. UVOT observations with the V filter are consistent with a power-law day for the first 10 ks. We discuss the observations in light of current models.
Author
Universe; Swift Observatory; Gamma Ray Bursts

20060013226 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Ejecta of Eta Carinae: What We Learn about N-Rich Chemistry
Gull, Theodore; [2006]; 1 pp.; In English; Astonomical Institute Ultrecht Conference, 28 May - 1 Jun. 2006, Lunteren, Netherlands; No Copyright; Avail.: Other Sources; Abstract Only

At least one member of the binary system, Eta Carinae, is in the late stages of CNO-cycle. At least ten solar masses of ejecta make up the Homunculus, a neutral bi-polar shell ejected in the 1840s and the Little Homunculus, an internal, ionized bi-polar shell ejected in the 1890s. HST/STIS and VLTAJVES high dispersion spectroscopy revealed absorptions of multiple elements and diatomic molecules in these shells, some, such as V II and Sr II have not been seen previously in the ISM. The skirt region between the bi-lobes includes the very bright Weigelt blobs, within 0.1 to 0.3' of the central source, and the more distant, unusual Strontium Filament, a neutral emission nebula photoexcited by Balmer continuum, but shielded by Fe II from Lyman radiation. The 600+ emission lines are due to metals usually tied up in dust, but underabundances of C and O prevent precipitation as oxides onto the dust grains. Indications are that Ti/Ni is 100X solar, likely due not to nuclear processing, but the very different photo-excitation environments coupled with N-rich, C-, O-poor chemistry. In the Homunculus, level populations of the molecules indicate 60K gas; the metal absorption lines, 760K; that of the Little Homunculus 6400K during the broad spectroscopic maximum, relaxing to 5000K for the few month long minimum. Lyman radiation, including both continuum and Lyman lines, is trapped across periastron. leading to temporary relaxation of the ejecta. These ejecta are a treasure trove of information on material thrown out of massive stars in the CNO-cycle, well before the helium burning phase. Curiously, spectra of three very recent SWIFT GRBs indicate the presence of warm, photoexcited ejecta in the vicinity of the protoGRBs, but obviously of very different abundances. However, the ejecta of Eta Carinae promise to be a nearby example of massive ejecta, the study of which should lead to increased insight of earlier, very distant massive stars.
Author
Ejecta; Binary Stars; Nitrogen

20060013256 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Swift-BAT: The First Year of Gamma-Ray Burst Detections
Krimm, Hans A.; [2006]; 1 pp.; In English; Amerian Astronomical Society Meeting, 9-12 Jan. 2006, Washington, DC, USA; Copyright; Avail.: Other Sources; Abstract Only

The Burst Alert Telescope (BAT) on the Swift has been detecting gamma-ray bursts (GRBs) since Dec. 17,2004 and automated burst alerts have been distributed since Feb. 14,2005. Since commissioning the BAT has triggered on more than 100 GRBs, nearly all of which have been followed up by the narrow-field instruments on Swift through automatic repointing, and by ground and other satellite telescopes after rapid notification. Within seconds of a trigger the BAT produces and relays to the ground a position good to three arc minutes and a four channel light curve. A full ten minutes of event data follows on subsequent ground station passes. The burst archive has allowed us to determine ensemble burst parameters such as fluence, peak flux and duration. An overview of the properties of BAT bursts and BAT'S performance as a burst monitor will be presented in this talk. BAT is a coded aperture imaging system with a wide (approx.2 sr) field of view consisting of a large coded mask located 1 m above a 5200 cm2 array of 32.768 CdZnTe detectors. All electronics and other hardware systems on the BAT have been operating well since commissioning and there is no sign of any degradation on orbit. The flight and ground software have proven similarly robust and allow the real time localization of all bursts and the rapid derivation of burst light curves, spectra and spectral fits on the ground.
Author
Gamma Ray Bursts; Telescopes; Apertures; Field of View; Imaging Techniques; Real Time Operation; Degradation

20060013257 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Studying Galaxy Formation with the Hubble, Spitzer and James Webb Space Telescopes
Gardner, Jonathan F.; Barbier, L. M.; Barthelmy, S. D.; Cummings, J. R.; Fenimore, E. E.; Gehrels, N.; Hullinger, D. D.; Markwardt, C. B.; Palmer, D. M.; Parsons, A. M.; Sakamoto, T., et al.; [2006]; 1 pp.; In English; JPL Colloquium for the Astrophysics Group: Studying Galaxy Formation with Hubble, Spitzer, and James Webb Space Telescope, 29 Jan. - 3 Feb. 2006, Pasadena, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The deepest optical to infrared observations of the universe include the Hubble Deep Fields, the Great Observatories Origins Deep Survey and the recent Hubble Ultra-Deep Field. Galaxies are seen in these surveys at redshifts 2-6, less than 1 Gyr after the Big Bang, at the end of a period when light from the galaxies has reionized Hydrogen in the inter-galactic medium. These observations, combined with theoretical understanding, indicate that the first stars and galaxies formed at z\g10, beyond the reach of the Hubble and Spitzer Space Telescopes. To observe the first galaxies, NASA is planning the James Webb Space Telescope (JWST), a large (6.5m), cold (50K), infrared-optimized observatory to be launched early in the next decade into orbit around the second Earth- Sun Lagrange point. JWST will have four instruments: The Near-Infrared Camera, the Near-Infrared multi-object Spectrograph, and the Tunable Filter Imager will cover the wavelength range 0.6 to 5 microns, while the Mid-Infrared Instrument will do both imaging and spectroscopy from 5 to 27 microns. In addition to JWST s ability to study the formation and evolution of galaxies, I will also briefly review its expected contributions to studies of the formation of stars and planetary systems.
Author
Galactic Evolution; Galaxies; James Webb Space Telescope; Hubble Space Telescope; Infrared Astronomy; Red Shift; Spaceborne Telescopes; Space Infrared Telescope Facility

20060013338 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Gamma-ray Large Area Space Telescope and Gamma-Ray Bursts
McEnery, Julie; Ritz, Steve; [2006]; 4 pp.; In English; Swift Conference Proceedings, 25 Nov. - 1 Dec. 2005, Washington, DC, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The Gamma-ray Large Area Telescope (GLAST) is a satellite-based observatory to study the high energy gamma-ray sky. The main instrument on GLAST, the Large Area Telescope (LAT) is a pair-conversion telescope that will survey the sky from 20 MeV to greater than 300 GeV. With the GLAST launch in 2007, the LAT will open a new and important window on a wide variety of high energy phenomena, including supermassive black holes and active galactic nuclei, gamma-ray bursts, supernova remnants and cosmic ray acceleration and dark matter. A second instrument, the GLAST Burst Monitor (GBM), greatly enhances GLAST s capability to study GRB by providing important spectral and timing information in the 10 keV to 30 MeV range. We describe how the instruments, spacecraft and ground system work together to provide observations of gamma-ray bursts from 8 keV - 300 GeV and to provide rapid notification of bursts to the wider gamma-ray burst community.
Author
Gamma Ray Telescopes; Gamma Rays; Active Galactic Nuclei; Supernova Remnants; Cosmic Rays; Black Holes (Astronomy); Gamma Ray Bursts; Dark Matter

20060013373 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Uses of the ICRF and implications for future VLBI
Ma, Chopo; [2006]; 1 pp.; In English; Fourth IVS General Meeting, 9-13 Jan. 2006, Concepcion, Chile; No Copyright; Avail.: Other Sources; Abstract Only

Since its inception on 1 Jan 1998, the fundamental ICRF has been set by the VLBI positions of 212 'defining' extragalactic radio sources. In all there are approx.3000 sources with usefully accurate (\h few mas) positions consistent with the ICRF. The uses of the ICRF include fundamental astrometry, monitoring of Earth orientation, and spacecraft navigation. For fundamental astrometry, stability and accuracy are most important, and realizations at different frequencies must be in proper registration. However, there is no preferred frequency, and the GAIA mission has the potential for an optical ICRF with 500,000 objects at the 50 microarcsec level some time after the planned 2011 launch. The radio ICRF should be properly prepared for a transition to assure long term stability and consistency. Earth orientation monitoring requires objects attached to the solid Earth, and VLBI will continue to be the fundamental technique. For this purpose it is essential that the new VLBI stations contemplated in the VLBI20l0 report be capable of observing a sufficiently large and well-distributed set of stable sources, and identifying these sources is an on-going effort. Spacecraft navigation by differential VLBI is planned using the Ka-band telemetry signal, and work has begun towards an ICRF realization suitable for this purpose. The balancing of different needs related to the VLBI ICRF will be discussed.
Author
Extragalactic Radio Sources; Very Long Base Interferometry; Astrometry; Earth Orientation; Space Navigation; Stability; Accuracy

20060013397 NASA Goddard Space Flight Center, Greenbelt, MD, USA

GRB 050117: Simultaneous Gamma-ray and X-ray Observations with the Swift Satellite

Hill, J. E.; Morris, D. C.; Sakamoto, T.; Sato, G.; Burrows, D. N.; Angelini, L.; Pagani, C.; Moretti, A.; Abbey, A. F.; Barthelmy, S., et al.; [2005]; 4 pp.; In English; SWIFT Maryland Conference, 29 Nov. - 2 Dec. 2005, Washington, DC, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NAS5-00136; NCC5-637; PPA/Z/S/2003/00507; I/R/039/; Copyright; Avail.: CASI: A01, Hardcopy

The Swift Gamma-Ray Burst Explorer performed its first autonomous, X-ray follow-up to a newly detected GRB on 2005 January 17, within 193 seconds of the burst trigger by the Swift Burst Alert Telescope. While the burst was still in progress, the X-ray Telescope obtained a position and an image for an un-catalogued X-ray source; simultaneous with the gamma-ray observation. The XRT observed flux during the prompt emission was 1.1 x 10(exp -8) ergs/sq cm/s in the 0.5-10 keV energy band. The emission in the X-ray band decreased by three orders of magnitude within 700 seconds, following the prompt emission. This is found to be consistent with the gamma-ray decay when extrapolated into the XRT energy band. During the following 6.3 hours, the XRT observed the afterglow in an automated sequence for an additional 947 seconds, until the burst became fully obscured by the Earth limb. A faint, extremely slowly decaying afterglow, alpha=-0.21, was detected. Finally, a break in the lightcurve occurred and the flux decayed with alpha\h-1.2. The X-ray position triggered many follow-up observations: no optical afterglow could be confirmed, although a candidate was identified 3 arcsecs from the XRT position. Author

Gamma Ray Bursts; Gamma Rays; Swift Observatory; Afterglows; Energy Bands; X Ray Telescopes; X Ray Sources

20060013399 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Science with the James Webb Space Telescope

Gardner, Jonathan P.; [2006]; 1 pp.; In English; Visions of Infrared Astronomy, 20-22 Mar. 2006, Paris, France; No Copyright; Avail.: Other Sources; Abstract Only

The scientific capabilities of the James Webb Space Telescope (JWST) fall into four themes. The End of the Dark Ages: First Light and Reionization theme seeks to identify the first luminous sources to form and to determine the ionization history of the universe. The Assembly of Galaxies theme seeks to determine how galaxies and the dark matter, gas, stars, metals, morphological structures, and active nuclei within them evolved from the epoch of reionization to the present. The Birth of Stars and Protoplanetary Systems theme seeks to unravel the birth and early evolution of stars, from infall onto dust-enshrouded protostars, to the genesis of planetary systems. The Planetary Systems and the Origins of Life theme seeks to determine the physical and chemical properties of planetary systems around nearby stars and of our own, and investigate the potential for life in those systems. To enable these for science themes, JWST will be a large (6.5m) cold (50K) telescope launched to the second Earth-Sun Lagrange point early in the next decade. It is the successor to the Hubble Space Telescope, and is a partnership of NASA, ESA and CSA. JWST will have three instruments: The Near-Infrared Camera, and the Near-Infrared multi-object Spectrograph will cover the wavelength range 0.6 to 5 microns, while the Mid-Infrared Instrument will do both imaging and spectroscopy from 5 to 27 microns. I review the status and capabilities of the observatory and instruments in the context of the major scientific goals.

Author

James Webb Space Telescope; Dark Matter; Galaxies; Ionization; Protostars; Morphology; Stellar Evolution; Planetary Systems

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20060013183 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Heliosheath Space Environment Interactions with Icy Bodies in the Outermost Solar System

Cooper, John F.; Hill, Matthew E.; Richardson, John D.; Sturner, Steven J.; [2006]; 2 pp.; In English; Institute of Geophysics and Planetary Physics, Univ. of California, San Diego, 5th Annual Internation Astrophysics Conference, 3-9 Mar. 2006, Oahu, HI, USA; Copyright; Avail.: CASI: A01, Hardcopy

The Voyager 1 and 2 spacecraft are exploring the space environment of the outermost solar system at the same time that earth-based astronomy continues to discover new icy bodies, one larger than Pluto, in the transitional region outward from the Classical Kuiper Belt to the Inner Oort Cloud. Some of the Scattered Disk Objects in this region periodically pass through the heliosheath, entered by Voyager 1 in Dec. 2004 and later expected to be reached by Voyager 2, and out even beyond the

heliopause into the Very Local Interstellar Medium. The less energetic heliosheath ions, important for implantation and sputtering processes, are abundant near and beyond the termination shock inner boundary, but the source region of the more penetrating anomalous cosmic ray component has not yet been found. Advantageous for modeling of icy body interactions, the measured heliosheath flux spectra are relatively more stable within this new regime of isotropic compressional magnetic turbulence than in the upstream heliospheric environment. The deepest interactions and resultant radiation-induced chemistry arise from the inwardly diffusing component of the galactic cosmic ray ions with significant intensity modulation also arising in the heliosheath beyond Voyager 1. Surface gardening by high-velocity impacts of smaller bodies (e.g., fragments of previous KBO collisions) and dust is a further space weathering process setting the time scales for long term exposure of different regolith layers to the ion irradiation. Sputtering and ionization of impact ejecta grains may provide a substantial feedback of pickup ions for multiple cycles of heliosheath acceleration and icy body interaction. Thus the space weathering interactions are potentially of interest not only for effects on sensible surface composition of the icy bodies but also for evolution of the heliosheath plasma energetic ion, and neutral emission environment.
Derived from text
Heliosphere; Voyager 1 Spacecraft; Voyager 2 Spacecraft; Aerospace Environments; Oort Cloud; Isotropic Turbulence; Radiation Chemistry; Kuiper Belt; Galactic Cosmic Rays; Ice; Cosmic Rays; Collisions

20060013206 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Getting a Kick Out of Numerical Relativity
Baker, John G.; Centrella, Joan; Dale, Choi; Koppitz, Michael; vanMeter, James R.; Miller, M. Coleman; [2005]; 14 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): ATP02-0043-0056; Copyright; Avail.: CASI: A03, Hardcopy

Recent developments in numerical relativity have made it possible to follow reliably the coalescence of two black holes from near the innermost stable circular orbit to final ringdown. This opens up a wide variety of exciting astrophysical applications of these simulations. Chief among these is the net kick received when two unequal mass or spinning black holes merge. The magnitude of this kick has bearing on the production and growth of supermassive black holes during the epoch of structure formation; and on the retention of black holes in stellar clusters. Here we report the first accurate numerical calculation of this kick, for two nonspinning black holes in a 1.5:1 mass ratio, which is expected based on analytic considerations to give a significant fraction of the maximum possible recoil. Our estimated kick is 10(exp 5) km/s with an error of less than 10%. This is intermediate between the estimates from two recent post-Newtonian analyses and suggests that at redshifts z greater than or approx. equal to 10, halos with masses less than or approx. equal to 10(exp 9) Solar Mass will have difficulty retaining coalesced black holes after major mergers.
Author
Black Holes (Astronomy); Coalescing; Circular Orbits; Astrophysics; Star Clusters

20060013207 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Excising das All: Evolving Maxwell waves beyond Scri
vanMeter, James R.; Fiske, David R.; Misner, Charles W.; [2006]; 11 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG06LA42C; ATP02-0043-0056; Copyright; Avail.: CASI: A03, Hardcopy

We study the numerical propagation of waves through future null infinity in a conformally compactified spacetime. We introduce an artificial cosmological constant, which allows us some control over the causal structure near null infinity. We exploit this freedom to ensure that all light cones are tilted outward in a region near null infinity, which allows us to impose excision-style boundary conditions in our finite difference code. In this preliminary study we consider electromagnetic waves propagating in a static, conformally compactified spacetime.
Author
Space-Time Functions; Finite Difference Theory; Electromagnetic Radiation; Cosmology; Boundary Conditions

20060013213 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sensitivity Analysis Applied to Atomic Data Used for X-ray Spectrum Synthesis
Kallman, Tim; [2006]; 2 pp.; In English; NASA Laboratory Astrophysics Workshop, 13-17 Feb. 2006, Las Vegas, NV, USA; No Copyright; Avail.: Other Sources; Abstract Only

A great deal of work has been devoted to the accumulation of accurate quantities describing atomic processes for use in analysis of astrophysical spectra. But in many situations of interest the interpretation of a quantity which is observed, such

as a line flux, depends on the results of a modeling- or spectrum synthesis code. The results of such a code depends in turn on many atomic rates or cross sections, and the sensitivity of the observable quantity on the various rates and cross sections may be non-linear and if so cannot easily be derived analytically. In such cases the most practical approach to understanding the sensitivity of observables to atomic cross sections is to perform numerical experiments, by calculating models with various rates perturbed by random (but known) factors. In addition, it is useful to compare the results of such experiments with some sample observations, in order to focus attention on the rates which are of the greatest relevance to real observations. In this paper I will present some attempts to carry out this program, focussing on two sample datasets taken with the Chandra HETG. I will discuss the sensitivity of synthetic spectra to atomic data affecting ionization balance, temperature, and line opacity or emissivity, and discuss the implications for the ultimate goal of inferring astrophysical parameters.
Author
Spectrum Analysis; X Rays; Astrophysics; Atomic Physics; Ionization

20060013220 NASA Goddard Space Flight Center, Greenbelt, MD, USA
SPECS: The Submillimeter Probe of the Evolution of Cosmic Structures
Rinehart, Stephen; January 2006; 1 pp.; In English; Society of Photo-Optical Instrumentation Engineers, 24-31 May 2006, Orlando, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

The idea for the Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) was investigated through NASA Vision Missions Program. In the course of this study, a compelling need for high spatial-resolution far-infrared/submillimeter observations with high angular resolution (50 milliarcseconds) was identified. In order to achieve these scientific goals, a kilometer-baseline FIR/SMM Michelson stellar interferometer is required, operating in the 40-640 micron range with fully cryogenically cooled optics and photon-limited detectors. There are significant technological challenges to developing this mission, including controllable tethered flight, detector equipment, and large cryogenic mechanisms. We present here a concept for SPECS and discuss some of the relevant technical aspects of the mission.
Author
Submillimeter Waves; Michelson Interferometers; NASA Programs; Angular Resolution; Far Infrared Radiation; Infrared Astronomy; Tethering

20060013222 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fourier resolved spectroscopy of 4U 1543-47 during the 2002 outburst
Reig, P.; Papadakis, I. E.; Shrader, C. R.; Kazanas, D.; [2006]; 19 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We have obtained Fourier-resolved spectra of the black-hole binary 4U 1543-47 in the canonical states (high/soft, very high, intermediate and low/hard) observed in this source during the decay of an outburst that took place in 2002. Our objective is to investigate the variability of the spectral components generally used to describe the energy spectra of black-hole systems, namely a disk component, a power-law component attributed to Comptonization by a hot corona and the contribution of the iron line due to reprocessing of the high energy (E greater than or approx, equal to 7 keV) radiation. We find that i) the disk component is not variable on time scales shorter than approx. 100 seconds, ii) the reprocessing emission as manifest by the variability of the Fe K(alpha) line responds to the primary radiation variations down to time scales of approx. 70 ms in the high and very-high states, but longer than 2 s in the low state, iii) the low-frequency QPOs are associated with variations of the X-ray power law spectral component and not to the disk component and iv) the spectra corresponding to the highest Fourier frequency are the hardest (show the flatter spectra) at a given spectral state. These results questions the models that explain the observed power spectra as due to modulations of the accretion rate only.
Author
Black Holes (Astronomy); Variability; Energy Spectra; Compton Effect; Power Spectra; Fourier Analysis; Coronas

20060013223 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Future Gamma-Ray Observations of Pulsars and their Environments
Thompson, David J.; [2006]; 1 pp.; In English; 363rd Heraeus Seminar, 'Neutron Stars and Pulsars about 40 Years after their Discovery, 15-19 May 2006, Bad Honnef, Germany; No Copyright; Avail.: Other Sources; Abstract Only

Pulsars and pulsar wind nebulae seen at gamma-ray energies offer insight into particle acceleration to very high energies. Pulsed emission provides information about the geometry and interaction processes in the magnetospheres of these rotating neutron stars, while the pulsar wind nebulae yield information high-energy particles interacting with their surroundings. During the next decade, a number of new and expanded gamma-ray facilities will become available for pulsar studies,

including AGILE and GLAST in space and a number of higher-energy ground-based systems. This review describes the capabilities of such observatories to answer some of the open questions about the highest-energy processes involving neutron stars.
Author
Gamma Rays; Pulsars; Nebulae; Energetic Particles; Particle Acceleration

20060013228 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fast X-ray Oscillations During Magnetar Flares
Strohmayer, T.; [2006]; 1 pp.; In English; APS DAP business meetings, 22-25 Apr. 2006, Dallas, TX, USA; No Copyright; Avail.: Other Sources; Abstract Only

'We report on recent studies of high frequency variability during magnetar giant flares. These oscillations may represent the first observations of global shear oscillations in neutron star crusts, and can provide a new tools to study neutron star structure.
Author
X Rays; Oscillations; Magnetars; High Frequencies; Variability

20060013324 Naval Research Lab., Washington, DC, USA
Highlights of NRL's (Naval Research Laboratory's) First 75 Years
Calderwood, T. D.; Oct. 1998; 32 pp.; In English
Report No.(s): PB2006-109335; NRL/PU/5250-98-368; No Copyright; Avail.: National Technical Information Service (NTIS)

This document presents brief descriptions of projects and a listing of awards received by NRL employees for their work on these projects.
NTIS
Navy; Histories; Awards; Personnel

20060013336 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Comprehensive Analysis of RXTE Data from Cyg X-1. Spectral Index-Quasi-Periodic Oscillation Frequency-Luminosity Correlations
Shaposhnikov, Nickolai; Titarchuk, Lev; [2006]; 43 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-637; No Copyright; Avail.: CASI: A03, Hardcopy

We present timing and spectral analysis of approx. 2.2 Ms of Rossi X-ray Time Explorer (RXTE) archival data from Cyg X-1. Using the generic Comptonization model we reveal that the spectrum of Cyg X-1 consists of three components: a thermal seed photon spectrum, a Comptonized part of the seed photon spectrum and the iron line. We find a strong correlation between 0.1-20 Hz frequencies of quasiperiodic oscillations (QPOs) and the spectral power-law index. Presence of two spectral phases (states) are clearly seen in the data when the spectral indices saturate at low and high values of QPO frequencies. This saturation effect was discovered earlier in a number of black hole candidate (BHC) sources and now we strongly confirm this phenomenon in Cyg X-1. In the soft state this index- QPO frequency correlation shows a saturation of the photon index Gamma approx. 2.1 at high values of the low frequency upsilon(sub L). The saturation level of Gamma approx. 2.1 is the lowest value found yet in BHCs. The bolometric luminosity does not show clear correlation with the index. We also show that Fe K(sub alpha) emission line strength (equivalent width, EW) correlates with the QPO frequency. EW increases from 200 eV in the low/hard state to 1.5 keV in the high/soft state. The revealed observational correlations allow us to propose a scenario for the spectral transition and iron line formation which occur in BHC sources. We also present the spectral state (the power-law index) evolution for eight years of Cyg X-1 observations by RXTE.
Author
X Ray Timing Explorer; Spectrum Analysis; Time Measurement; Cygnus Constellation; Black Holes (Astronomy); High Frequencies; Compton Effect

20060013401 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Supercritical Pile Model for GRBs

Kazanas, D.; Dec. 19, 2005; 39 pp.; In English; Original contains black and white illustrations

Report No.(s): astro-ph/0512447-v1; Copyright; Avail.: CASI: A03, Hardcopy

We present the spectral and temporal radiative signatures expected within the 'Supercritical Pile' model of Gamma Ray Bursts (GRB). This model is motivated by the need for a process that provides the dissipation necessary in GRB and presents a well defined scheme for converting the energy stored in the relativistic protons of the Relativistic Blast Waves (RBW) associated with GRB into radiation; at the same time it leads to spectra which exhibit a peak in the burst nuF(sub nu) distribution at an energy E(sub p) approx. equal to 1 MeV in the observer s frame, in agreement with observation and largely independent of the Lorentz factor r of the associated relativistic outflow. Futhermore, this scheme does not require (but does not preclude) acceleration of particles at the shock other than that provided by the isotropization of the flow bulk kinetic energy on the RBW frame. In the present paper we model in detail the evolution of protons, electrons and photons from a RBW to produce detailed spectra of the prompt GRB phase as a function of time from across a very broad range spanning roughly 4 log10Gamma decades in frequency. The model spectra are in general agreement with observations and provide a means for the delineating of the model parameters through direct comparison with trends observed in GRB properties.

Author

Gamma Ray Bursts; Time Dependence; Frequencies; Signatures; Photons; Protons; Electrons

91
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*.

20060013247 NASA Johnson Space Center, Houston, TX, USA

Human Factors Engineering as a System in the Vision for Exploration

Whitmore, Mihriban; Smith, Danielle; Holden, Kritina; [2006]; 1 pp.; In English; Habitation 2006, 6-8 Feb. 2006, Orlando, FL, USA

Contract(s)/Grant(s): NAS9-02078; Copyright; Avail.: CASI: A01, Hardcopy

In order to accomplish NASA's Vision for Exploration, while assuring crew safety and productivity, human performance issues must be well integrated into system design from mission conception. To that end, a two-year Technology Development Project (TDP) was funded by NASA Headquarters to develop a systematic method for including the human as a system in NASA's Vision for Exploration. The specific goals of this project are to review current Human Systems Integration (HSI) standards (i.e., industry, military, NASA) and tailor them to selected NASA Exploration activities. Once the methods are proven in the selected domains, a plan will be developed to expand the effort to a wider scope of Exploration activities. The methods will be documented for inclusion in NASA-specific documents (such as the Human Systems Integration Standards, NASA-STD-3000) to be used in future space systems. The current project builds on a previous TDP dealing with Human Factors Engineering processes. That project identified the key phases of the current NASA design lifecycle, and outlined the recommended HFE activities that should be incorporated at each phase. The project also resulted in a prototype of a webbased HFE process tool that could be used to support an ideal HFE development process at NASA. This will help to augment the limited human factors resources available by providing a web-based tool that explains the importance of human factors, teaches a recommended process, and then provides the instructions, templates and examples to carry out the process steps. The HFE activities identified by the previous TDP are being tested in situ for the current effort through support to a specific NASA Exploration activity. Currently, HFE personnel are working with systems engineering personnel to identify HSI impacts for lunar exploration by facilitating the generation of systemlevel Concepts of Operations (ConOps). For example, medical operations scenarios have been generated for lunar habitation in order to identify HSI requirements for the lunar communications architecture. Throughout these ConOps exercises, HFE personnel are testing various tools and methodologies that have been identified in the literature. A key part of the effort is the identification of optimal processes, methods, and tools for these early development phase activities, such as ConOps, requirements development, and early conceptual design. An overview of the activities completed thus far, as well as the tools and methods investigated will be presented.

Author

Human Factors Engineering; Systems Integration; Lunar Exploration; Aerospace Systems; NASA Space Programs

20060013412 NASA Glenn Research Center, Cleveland, OH, USA

EXPLORING MARS WITH SOLAR-POWERED ROVERS

Landis, Geoffrey A.; [2006[; 4 pp.; In English; 31st Photovoltaic Specialists Conference, 3-7 Jan. 2005, Orlando, FL, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-390-30-20; No Copyright; Avail.: CASI: A01, Hardcopy

The Mars Exploration Rover (MER) project landed two solar-powered rovers, 'Spirit' and 'Opportunity,' on the surface of Mars in January of 2003. This talk reviews the history of solar-powered missions to Mars and looks at the science mission of the MER rovers, focusing on the solar energy and array performance.

Author

Roving Vehicles; Mars Exploration; Solar Energy; Mars Surface; Mars Missions

20060013432 NASA Kennedy Space Center, Cocoa Beach, FL, USA

NASA Space Exploration Logistics Workshop Proceedings

deWeek, Oliver; Evans, William A.; Parrish, Joe; James, Sarah; April 2006; 33 pp.; In English; 1st NASA Space Exploration Logistics Workshop, 17-18 Jan. 2006, Washington, DC, USA; Original contains color illustrations

Contract(s)/Grant(s): NK05OA50C

Report No.(s): NASA/CP-2006-214202; No Copyright; Avail.: CASI: A03, Hardcopy

As NASA has embarked on a new Vision for Space Exploration, there is new energy and focus around the area of manned space exploration. These activities encompass the design of new vehicles such as the Crew Exploration Vehicle (CEV) and Crew Launch Vehicle (CLV) and the identification of commercial opportunities for space transportation services, as well as continued operations of the Space Shuttle and the International Space Station. Reaching the Moon and eventually Mars with a mix of both robotic and human explorers for short term missions is a formidable challenge in itself. How to achieve this in a safe, efficient and long-term sustainable way is yet another question. The challenge is not only one of vehicle design, launch, and operations but also one of space logistics. Oftentimes, logistical issues are not given enough consideration upfront, in relation to the large share of operating budgets they consume. In this context, a group of 54 experts in space logistics met for a two-day workshop to discuss the following key questions: 1. What is the current state-of the art in space logistics, in terms of architectures, concepts, technologies as well as enabling processes? 2. What are the main challenges for space logistics for future human exploration of the Moon and Mars, at the intersection of engineering and space operations? 3. What lessons can be drawn from past successes and failures in human space flight logistics? 4. What lessons and connections do we see from terrestrial analogies as well as activities in other areas, such as U.S. military logistics? 5. What key advances are required to enable long-term success in the context of a future interplanetary supply chain? These proceedings summarize the outcomes of the workshop, reference particular presentations, panels and breakout sessions, and record specific observations that should help guide future efforts.

Derived from text

Space Commercialization; Robotics; Spacecrews; Spacecraft Launching; Space Logistics; Space Exploration

20060013464 NASA Johnson Space Center, Houston, TX, USA

To Mars by the Way of the Moon

Carpenter, Joyce; 2004; 21 pp.; In English; Mars Society Meeting, 4 Nov. 2004, Atlanta, GA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): 7611012-E0608; No Copyright; Avail.: CASI: A03, Hardcopy

The Vision for Space Exploration defines a new U.S. space exploration policy. In support of this policy, through a renewed spirit of discovery, NASA will: a) Implement a sustained and affordable human and robotic program to explore the Solar System and beyond; b) Extend human presence across the Solar System, staring with a human return to the moon by the year 2020, in preparation for human exploration of Mars and other destinations; c) Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about destination for future human exploration; and d) Promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests.

Derived from text

Space Exploration; Solar System; Policies; Moon; Mars (Planet); Robotics

20060013465 Lockheed Martin Space Operations, Houston, TX, USA
The Advanced Integration Matrix Project and Analog Sites: Difference or Duplication?
Wells, Kevin M.; [2004]; 5 pp.; In English; 34th International Conference on Environmental Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA
Contract(s)/Grant(s): NAS9-19100
Report No.(s): 04ICES-336; Copyright; Avail.: Other Sources

Several project teams have conducted Mars and Lunar mission simulations at analog sites and facilities over the past decade. These projects have a range of scope, participants, and objectives. NASA has provided many of these projects with funding, equipment, and personnel. Despite their variety, a consistent aim of these sites is advancing our capability to return to the Moon or to go to Mars. The Advanced Integration Matrix (AIM) Project was begun in 2002 with a corollary aim: that of advancing the technology needed for long duration human exploration of space. As a new project, it is prudent to ask and answer the question: 'What does AIM offer to NASA that is distinct from what current and past analog sites offer?' The price tag for human spaceflight is high enough without needless duplication of efforts. The AIM Project concept is distinct from currently operating terrestrial analogs in three important ways. First, AIM is not strictly an analog site or facility; second, AIM is primarily focused on systems and integration issues; and finally, AIM is organizationally related to NASA s advanced development groups and subject to the rigors of the JSC Engineering Directorate s development process. The successful development of destination-independent, cost-effective, safe, and reliable long duration human exploration systems requires that NASA use both the analog sites and ground-based systems integration efforts. The Advanced Integration Matrix Project will not simply duplicate the former, but will give the agency the capability for the latter.
Author
Mars Missions; Analog Data; Numerical Integration; Simulation; Systems Integration; Systems Engineering

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20060013172 NASA Goddard Space Flight Center, Greenbelt, MD, USA
IHY Modeling Support at the Community Coordinated Modeling Center
Chulaki, A.; Hesse, Michael; Kuznetsova, Masha; MacNeice, P.; Rastaetter, L.; [2005]; 2 pp.; In English; Stereo/Solar-B Science Planning Workshop: Living With a Star, 15-18 Nov. 2005, Oahu, HI, USA; Copyright; Avail.: Other Sources; Abstract Only

The Community Coordinated Modeling Center (CCMC) is a US inter-agency activity aiming at research in support of the generation of advanced space weather models. As one of its main functions, the CCMC provides to researchers the use of space science models, even if they are not model owners themselves. In particular, the CCMC provides to the research community the execution of 'runs-onrequest' for specific events of interest to space science researchers. Through this activity and the concurrent development of advanced visualization tools, CCMC provides, to the general science community, unprecedented access to a large number of state-of-the-art research models. CCMC houses models that cover the entire domain from the Sun to the Earth. In this presentation, we will provide an overview of CCMC modeling services that are available to support activities during the International Heliospheric Year. In order to tailor CCMC activities to IHY needs, we will also invite community input into our IHY planning activities.
Author
Models; Space Weather; Heliosphere; Aerospace Sciences

20060013179 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MHD Simulation Heliospheric Magnetic Fields and Turbulence
Roberts, D. Aaron; [2005]; 1 pp.; In English; Calspace-TGPP Numerical Modeling of Space Plasma Flows, 27-31 Mar. 2005, Palm Springs, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

This talk will present a summary of our results on simulations of heliospheric structure and dynamics. We use a three-dimensional MHD code in spherical coordinates to produce a solar wind containing a rotating, tilted heliospheric current sheet, fast-slow stream and microstream shear layers, waves, 2-D turbulence, and pressure balanced structures that are input to the inner (superAlfvenic) boundary. The evolution of various combinations of these has led to a deeper understanding of sector structure, magnetic holes, fluctuation anisotropies, and general turbulent evolution. We show how the sectors are likely

to be connected, how spiral fields can arise, and how field line diffusion can be caused by waves with transverse structure and microstream shears.
Author
Magnetohydrodynamics; Simulation; Heliosphere; Magnetic Fields; Turbulence; Spherical Coordinates; Solar Wind; Current Sheets; Shear Layers; Boundaries

20060013194 NASA Goddard Space Flight Center, Greenbelt, MD, USA
UV Observations of Prominence Activation and Cool Loop Dynamics
Kucera, Therese A.; Landi, Enrico; January 2006; 2 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

In this paper we investigate the thermal and dynamic properties of dynamic structures in and around a prominence channel observed on the limb on 17 April 2003. Observations were taken with the Solar and Heliospheric Observatory's Solar Ultraviolet Measurements of Emitted Radiation (SOHO/SUMER) in lines formed at temperatures from 80,000 to 1.6 MK. The instrument was pointed to a single location and took a series of 90 s exposures. Two-dimensional context was provided by the Transition Region and Coronal Explorer (TRACE) in the UV and EUV and the Kanzelhohe Solar Observatory in H-alpha. Two dynamic features were studied in depth: an activated prominence and repeated motions in a loop near the prominence. We calculated three-dimensional geometries and trajectories, differential emission measure, and limits on the mass, pressure, average density, and kinetic and thermal energies. These observations provide important tests for models of dynamics in prominences and cool (approx. 10(exp 5) K)loops, which will ultimately lead to a better understanding the mechanism(s) leading to energy and mass flow in these solar features.
Author
Dynamic Characteristics; Extreme Ultraviolet Radiation; Solar Observatories; Heliosphere; Mass Flow; Thermal Energy

20060013195 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Electron-He(+) P-wave Elastic Scattering and Photoabsorption in Two-electron Systems
Bhatia, A. K.; January 2006; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

In a previous paper [Bhatia, Phys. Rev. A 69,032714 (2004)], electron-hydrogen P-wave scattering phase shifts were calculated using the optical potential approach based on the Feshbach projection operator formalism. This method is now extended to the singlet and triplet electron-He(+) P-wave scattering in the elastic region. Phase shifts are calculated using Hylleraas-type correlation functions with up to 220 terms. Results are rigorous lower bounds to the exact phase shifts and they are compared to phase shifts obtained from the method of polarized orbitals and close-coupling calculations. The continuum functions calculated here are used to calculate photoabsorption cross sections. Photoionization cross sections of He and photodetachment cross sections of H(-) are calculated in the elastic region, i.e. leaving He(+) and H in their respective ground states, and compared with previous calculations. Radiative attachment rates are also calculated.
Author
Wave Scattering; Elastic Scattering; Photoionization; Correlation; Hydrogen; P Waves; Photoabsorption

20060013196 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Prominence and Cool Loop Energetics Measured in the UV, EUV, and H-alpha
Kucera, Therese A.; Landi, E.; January 2006; 1 pp.; In English; SOHO-17 Workshop, 7-12 May 2006, Sicily, Italy
Contract(s)/Grant(s): NNH04AA12I; W10,232; NNG04ED07P; RTOP 370-16-25; Copyright; Avail.: Other Sources; Abstract Only

We investigate the thermal and dynamic properties of moving features in a prominence jet, a approx. 10(exp 5)K loop near a prominence channel, and an erupting prominence. In order to make measurements of the quickly moving features seen in prominences in the UV we use the SOHO/SUMER spectrograph to take a time series of exposures from a single pointing position, providing a measurement of spectral line properties as a function of time and position along the slit. The lines observed cover a broad range of temperatures from 80,000 - 1.6 million K. These measurements are combined with TRACE movies in transition region and coronal temperature bands and with ground based H-alpha data to obtain more complete information concerning prominence structure and motions. The resulting observations allow us perform DEM analysis and to calculate limits on densities, pressures, and the thermal and kinetic energies of the moving sources.
Author
Extreme Ultraviolet Radiation; Solar Prominences; Transition Temperature; H Alpha Line; Thermal Energy; Coronas; Dynamic Characteristics; Time Series Analysis; Time Dependence

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20060013413 NASA Glenn Research Center, Cleveland, OH, USA
Active Solid State Dosimetry for Lunar EVA
Wrbanek, John D.; Fralick, Gustave C.; Wrbanek, Susan Y.; Chen, Liang-Yu.; January 2006; 14 pp.; In English; Space Resources Roundtable VII: LEAG Conference on Lunar Exploration, 25-28 Oct. 2005, League City, TX, USA; Original contains color illustrations
Contract(s)/Grant(s): 22-617-97-99; Copyright; Avail.: CASI: A03, Hardcopy

The primary threat to astronauts from space radiation is high-energy charged particles, such as electrons, protons, alpha and heavier particles, originating from galactic cosmic radiation (GCR), solar particle events (SPEs) and trapped radiation belts in Earth orbit. There is also the added threat of secondary neutrons generated as the space radiation interacts with atmosphere, soil and structural materials.[1] For Lunar exploration missions, the habitats and transfer vehicles are expected to provide shielding from standard background radiation. Unfortunately, the Lunar Extravehicular Activity (EVA) suit is not expected to afford such shielding. Astronauts need to be aware of potentially hazardous conditions in their immediate area on EVA before a health and hardware risk arises. These conditions would include fluctuations of the local radiation field due to changes in the space radiation field and unknown variations in the local surface composition. Should undue exposure occur, knowledge of the dynamic intensity conditions during the exposure will allow more precise diagnostic assessment of the potential health risk to the exposed individual.[2]
Derived from text
Astronauts; Charged Particles; Dosimeters; Exposure; Extraterrestrial Radiation; Extravehicular Activity; Galactic Radiation; Radiation Trapping; Radiation Shielding; Radiation Distribution

20060013443 NASA Johnson Space Center, Houston, TX, USA
Radiation measured with TEPC and CR-39 PNTDs in low Earth orbit
Zhou, D.; Semones, E.; Weyland, M.; Johnson, S.; [2006]; 1 pp.; In English; 36th Scientific Assembly of Committee on Space Research (COSPAR), 16-23 Jul. 2006, Beijing, China; No Copyright; Avail.: Other Sources; Abstract Only

The radiation impact to astronauts depends strongly on the particles linear energy transfer (LET) and is dominated by high LET radiation. It is important to investigate the LET spectrum for the radiation field in low Earth orbit (LEO) and the influence of radiation on astronauts. The best active dosimeter used for all LET is the tissue equivalent proportional counter (TEPC); the best passive dosimeter used for high LET is CR-39 plastic nuclear track dosimeter (PNTD). TEPC and CR-39 PNTDs were used to investigate the radiation in LEO. LET spectra and radiation quantities were obtained for STS-112 and STS-114 missions with TEPC and CR-39 PNTDs. This paper introduces the operation principles for the two types of dosimeters, presents radiation results measured and compares the results obtained with different dosimeters.
Author
Low Earth Orbits; Linear Energy Transfer (LET); Astronauts; Dosimeters; Radiation Distribution

20060013444 NASA Johnson Space Center, Houston, TX, USA
Simultaneous observation of the radiation environment inside and outside the ISS
Lee, K. T.; Flanders, J.; Semones, E.; Shelfer, T.; Riman, F.; [2006]; 1 pp.; In English; 36th Scientific Assemby of the Committee on Space Research (COSPAR), 16-23 Jul. 2006, Beijing, China; Copyright; Avail.: Other Sources; Abstract Only

The low-Earth orbit (LEO) radiation environment has been directly observed by the IV and EV charged particle directional spectrometers (CPDS) aboard the International Space Station (ISS). The EV instrument is mounted on the S0 truss of the ISS and consists of three separate silicon detector telescopes which are oriented in different directions. The IV instrument is a single silicon detector telescope located inside the US Laboratory module of the ISS. We report on the current state of the data analysis for these instruments, which includes the proton and He stopping particle spectra, relative CNO abundances, LET spectra, and measured dose rate as a function of time.
Author
Low Earth Orbits; Charged Particles; Time Dependence; International Space Station; Extraterrestrial Radiation

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20060013342 Research and Technology Organization, Neuilly-sur-Seine, France
Infrared Measurements and Modeling for Ship Self Defence
March 2006; 20 pp.; In English
Report No.(s): RTO-TR-SET-032; AC/323(SET-032)TP/29; Copyright; Avail.: CASI: C01, CD-ROM: A03, Hardcopy

This paper is the final report for NATO AC/323 Sensors and Electronics Technology Panel Task Group Number 16 (TG16) on Infrared (IR) Measurements and Modeling for Ship Self Defence. TG16 was organized in 2000 and continued until the end of 2003. The primary purpose of TG16 was to address the vulnerability of military ships to IR homing missiles. The main research topics related to ship self-defence included: 1) The detection of anti-ship missiles using passive IR search and track sensors; 2) Ship IR signature control via modeling and field testing of candidate techniques; and 3) Passive IR countermeasure techniques.
Author
Ships; Infrared Detectors; Infrared Signatures; Missiles; Homing; Vulnerability

Subject Term Index

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