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Langley Research Center

**Scientific and Technical
Information Program Office**

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- Domestic and foreign dissertations and theses.

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STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

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Subject Divisions

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G. Mathematical and Computer Sciences
H. Physics
I. Social Sciences
J. Space Sciences
K. General

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for searching on *NASA Thesaurus* subject terms and personal author names.

Subject Term Index

Personal Author Index

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Subject Categories of the Division A. Aeronautics

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01 Aeronautics (General) 1

02 Aerodynamics 2

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information, see also *34 Fluid Mechanics and Heat Transfer.*

03 Air Transportation and Safety 2

Includes passenger and cargo air transport operations; and aircraft accidents. For related information, see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 Aircraft Communications and Navigation N.A.

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information, see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *32 Communications Radar.*

05 Aircraft Design, Testing and Performance 9

Includes aircraft simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Urban Technology and Transportation*.

06 Aircraft Instrumentation N.A.

Includes cockpit and cabin display devices; and flight instruments. For related information, see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 Aircraft Propulsion and Power 15

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

08 Aircraft Stability and Control 24

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

09 Research and Support Facilities (Air) 25

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information, see also *14 Ground Support Systems and Facilities (Space).*

Subject Categories of the Division B. Astronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

12 Astronautics (General) 26

For extraterrestrial exploration, see *91 Lunar and Planetary Exploration*.

13 Astrodynamics 29

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

14 Ground Support Systems and Facilities (Space) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators. *For related information, see also 09 Research and Support Facilities (Air)*.

15 Launch Vehicles and Space Vehicles N.A.

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information, see also *20 Spacecraft Propulsion and Power.*

16 Space Transportation N.A.

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

17 Space Communications, Spacecraft Communications, Command and Tracking N.A.

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

18 Spacecraft Design, Testing and Performance 30

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. 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*.

19 Spacecraft Instrumentation 31

For related information, see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 Spacecraft Propulsion and Power 31

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

Subject Categories of the Division C. Chemistry and Materials

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

23 Chemistry and Materials (General) 32

24 Composite Materials 38

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see *27 Nonmetallic Materials*.

25 Inorganic and Physical Chemistry 39

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also *77 Thermodynamics and Statistical Physics*.

26 Metallic Materials 44

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 Nonmetallic Materials 47

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

28 Propellants and Fuels 54

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

29 Materials Processing 55

Includes space-based development of products and processes for commercial application. For biological materials see *55 Space Biology.*

Subject Categories of the Division D. Engineering

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

31 Engineering (General) 55

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 Communications and Radar 64

Includes radar; land and global communications; communications theory; and optical communications. 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*.

33 Electronics and Electrical Engineering 73

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 Fluid Mechanics and Heat Transfer 78

Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 Instrumentation and Photography 83

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

36 Lasers and Masers 94

Includes parametric amplifiers. For related information see also *76 Solid-State Physics*.

37 Mechanical Engineering 96

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

38 Quality Assurance and Reliability 98

Includes product sampling procedures and techniques; and quality control.

39 Structural Mechanics 99

Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

Subject Categories of the Division E. Geosciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

42 Geosciences (General) 101

43 Earth Resources and Remote Sensing 104

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography.*

44 Energy Production and Conversion 110

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

45 Environment Pollution 112

Includes atmospheric, noise, thermal, and water pollution.

46 Geophysics 122

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see *93 Space Radiation*.

47 Meteorology and Climatology 129

Includes weather forecasting and modification.

48 Oceanography 134

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

Subject Categories of the Division F. Life Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

51 Life Sciences (General) 136

52 Aerospace Medicine 138

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

53 Behavioral Sciences 141

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 Man/System Technology and Life Support 142

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also *16 Space Transportation.*

55 Space Biology 143

Includes exobiology; planetary biology; and extraterrestrial life.

Subject Categories of the Division G. Mathematical and Computer Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

59 Mathematical and Computer Sciences (General) 144

60 Computer Operations and Hardware 145

Includes hardware for computer graphics, firmware, and data processing. For components see *33 Electronics and Electrical Engineering*.

61 Computer Programming and Software 145

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

62 Computer Systems 149

Includes computer networks and special application computer systems.

63 Cybernetics 150

Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also *54 Man/System Technology and Life Support.*

64 Numerical Analysis 151

Includes iteration, difference equations, and numerical approximation.

65 Statistics and Probability 152

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

66 Systems Analysis N.A.

Includes mathematical modeling; network analysis; and operations research.

67 Theoretical Mathematics 154

Includes topology and number theory.

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Select a category to view the collection of records cited. N.A. means no abstracts in that category.

70 Physics (General) 155

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71 Acoustics 156

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72 Atomic and Molecular Physics 157

Includes atomic structure, electron properties, and molecular spectra.

73 Nuclear and High-Energy Physics 161

Includes elementary and nuclear particles; and reactor theory. For space radiation see *93 Space Radiation.*

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75 Plasma Physics 167

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76 Solid-State Physics 183

Includes superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 Thermodynamics and Statistical Physics 186

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

Subject Categories of the Division I. Social Sciences

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80 Social Sciences (General) N.A.

Includes educational matters.

81 Administration and Management 187

Includes management planning and research.

82 Documentation and Information Science 187

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

83 Economics and Cost Analysis N.A.

Includes cost effectiveness studies.

84 Law, Political Science and Space Policy N.A.

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 Urban Technology and Transportation 189

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion.*

Subject Categories of the Division J. Space Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

88 Space Sciences (General) 190

89 Astronomy 190

Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 Astrophysics 193

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also *75 Plasma Physics*.

91 Lunar and Planetary Exploration N.A.

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

92 Solar Physics 196

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

93 Space Radiation 201

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics.*

Subject Categories of the Division K. General

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99 General 204

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

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VOLUME 37, OCTOBER 11, 1999

01
AERONAUTICS (GENERAL)

19990070423 Defence Science and Technology Organisation, Airframes and Engines Div., Melbourne, Australia
Workshop on Helicopter Health and Usage Monitoring Systems, Pt. 2
Forsyth, Graham F., Editor, Defence Science and Technology Organisation, Australia; March 1999; In English, Feb. 1999, Melbourne, Australia; See also 19990070424 through 19990070432
Report No.(s): DSTO-GD-0197-Pt-2; DODA-AR-010-839-Pt-2; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

Over the last 10 years, helicopter Health and Usage Monitoring Systems (HUMS) have moved from the research environment to being viable systems for fitment to civil and military helicopters. In the civil environment, the situation has reached the point where it has become a mandatory requirement for some classes of helicopters to have HUMS fitted. Military operators have lagged their civil counterparts in implementing HUMS, but that situation appears set to change with a rapid increase expected in their use in military helicopters. A DSTO-sponsored Workshop was held in Melbourne, Australia, in February 1999 to discuss the current status of helicopter HUMS and any issues of direct relevance to military helicopter operations. This second part contains a list of those attending and a number of papers not received in time for publication before the event.
Author
Conferences; Health; Monitors

19990071044 Royal Aeronautical Society, London, UK
Verification of Design Methods by Test and Analysis: Proceedings
Verification of Design Methods by Test and Analysis: Proceedings; 1998; In English; Verification of Design Methods by Test and Analysis, 23-24 Nov. 1998, London, UK; See also 19990071045 through 19990071059; Original contains color illustrations; ISBN 1-85768-089-8; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

Contents include the following: Modelling of 3D aircraft inlets at ”zero” speed (and low speeds with cross-wind) and flow separation prediction; Numerical and experimental studies of 3D hypersonic inlet; Design verification of turbomachinery components by 3D flow analysis; Forced response prediction in a high pressure ratio fan using a linearized method and comparison with test results; The effect of pressure probe characteristics on the validation of modelling aero-engine compressor blades; Low speed compressor tests for code validation and for simulating high speed designs; Validation of novel low-temperature fire event modelling technique; The numerical simulation and experimental validation of ventilation flow and fire events in a Trent Nacelle fire zone; Experimental simulation and numerical modelling of foreign object damage aircraft gas turbines; Elastic-plastic buckling of shafts; Towards reliable computations of a subsonic turbine; Experimental investigations into turbo engine designs; Validation of advanced computational fluid dynamics in the design of military turbines; and An evaluation of the performance of a modern shroudless HP turbine using unsteady CFD.
CASI
Conferences; Aircraft Engines; Compressor Blades; Turbomachinery; Computational Fluid Dynamics; Engine Design; Gas Turbine Engines; Mathematical Models; Computerized Simulation; Design Analysis

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.

19990071243 Kyushu Univ., Faculty of Engineering, Fukuoka, Japan
Principal Component Analysis of the Aerodynamic Forces Acting on an RPRV
Higashino, Shin–ichiro, Kyushu Univ., Japan; Ikematsu, Takashi, Kyushu Univ., Japan; Seto, Masayuki, Kyushu Univ., Japan; Sakurai, Akira, Kyushu Univ., Japan; Technology Reports of Kyushu University; Jun. 1994; ISSN 0023-2718; Volume 67, No. 3, pp. 209-217; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We have been performing flight experiments using an RPRV (Remotely-Piloted Research Vehicle) in order to acquire the aerodynamic characteristics of the vehicle. The experiments and analyses are carried out under the concept of 'in-flight wind tunnel test' proposed by Kobavashi. It is shown that the principal component analysis is effective in finding out whether the multicolinearity between the motion variables exists or not. This analysis can also be used for the determination of the model for the aerodynamic characteristics.
Author
Aerodynamic Characteristics; Experiment Design; Flight Tests

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.

19990070409 Nebraska Univ., Aviation Inst., Omaha, NE USA
The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society, Volume 3
Oum, Tae Hoon, Editor, British Columbia Univ., Canada; Bowen, Brent D., Editor, Nebraska Univ., USA; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; 228p; In English; 8th; 1998 Air Transport Research Group (ATRG) Conference of the WCTR Society, 12-17 Jul. 1998, Antwerp, Belgium; Sponsored by World Conference on Transportation Research Society, Unknown; See also 19990070410 through 19990070422
Contract(s)/Grant(s): NAGw-4414
Report No.(s): UNOAI-98-8; Copyright Waived; Avail: CASI; A11, Hardcopy; A03, Microfiche

Thirteen papers (presentations) from the 8th World Conference on Transportation Research are presented. Topics include European Airline competition, cost analyses, performance evaluations, deregulation; aviation policy in Southeast Asia; corporate involvement in European business transportation; and cycles in the airline industry.
CASI
Conferences; Air Transportation; Airline Operations

19990070410 Universidad de Las Palmas de Gran Canaria, Dept. of Applied Economical Analysis, Las Palmas, Spain
Implications of Competition in the European Airline Market
Martin, Juan Carlos, Universidad de Las Palmas de Gran Canaria, Spain; Nombela, Gustavo, Universidad de Las Palmas de Gran Canaria, Spain; Romero, Manuel, Universidad de Las Palmas de Gran Canaria, Spain; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 20p; In English; See also 19990070409
Contract(s)/Grant(s): CEC Project ST-95-SC-402; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

As a consequence of limiting the possibility of new entrants in the market because of the privileges that flag incumbent airlines enjoy in their airports of their iniluence, there is only a 6% of the continental routes that can be considered as competitive according to our own definition of competition in the estimation of the models, and this one it is not too stringent. In this case we have shown that the demand is below the levels that could be achieved by the likely monopoly power that is exerted by the pairs of national flag carriers. In particular, it is necessary to develop a transparent policy trying to establish the common-user access rights to the principal airport of the E.U. The analysis shows that we have more goals to get by introducing initiatives to obtain more competition in the routes and at the same time it is clear that competition is possible and desirable to some extent. The airport at Brussels has the same landing capacity as London's Heathrow, but only half of the traffic. Its refusal to create new landing slots, on grounds that there is not enough room, is a serious barrier to entry that can be exploited by Sabena, Belgium's national airline. In addition, some new entrants airlines complain that in many cases the handling labour of the airports favour the national carrier. An E.U.

directive 96/67/CE form 1996 intended to prevent monopolies in airport services, but this directive in some experts' opinions has been watered down by the member states to the point where it will achieve virtually nothing. Swifter justice and a stronger directive on airport services would do much to help new entrants. to give newcomers a chance to break into new routes, the Commission needs to create a proper market in slots. In spite of the previous paragraphs we cannot minimise the real advantages and benefits that European citizens enjoy in these years after deregulation, and that the real change is going to be observed in the future after this year 1997, when we can say that the complete market deregulation is fulfilled. The paper that can be played by the companies that till now have developed their strategic movements to the competitive segment of regional and charter services can be higher than the expectations that have been said by some analysts. Cross entry and the signature of contracts with some companies can change the nowadays' network, and some low-priced services can emerge from this new situation.
Author
Civil Aviation; Airline Operations; Competition; Market Research

19990070411 Paris Univ., France
Priorities and Strategy for Liberalisation in the European Airlines
Briand, Sophie, Paris Univ., France; Kelvin, Alex, Hertfordshire Univ., UK; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 10p; In English; See also 19990070409; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The purpose of this paper was to outline priorities for liberalising European air transport. Although the empirical evidence from the US air industry has not fully supported all contestability assumptions, prices have fallen, networks have expanded, and the customers have benefited. More slots have been created and competition increased. Both price and quality of service appear to be better in America than in more regulated markets. Similarly, the increased competition in the UK has improved services. Up to the 1990s, the Liberalisation of air transport in Europe did not seem very effective. Protection of the incumbent public airlines appears to be detrimental to the customers and the taxpayers. But while competition is on the rise, some governments still continue subsidising their national carriers, e.g,. Air France. The sheltered markets exist in quite a number of countries. They result in redistribution of consumer surplus to the providers of air services. However, successful companies use market segmentation and positioning to match supply and demand. Under pressures of Liberalisation, there is a definite move towards globalisation. With over 400 alliances worldwide, the industry is changing to meet the needs of global market. Priorities for liberalisation were outlined such as removal of restrictions on route access and capacity related to the carriers' nationality, ending national public monopolies over air transport. Private companies or partnerships appear to provide services at lower financial costs, transaction costs and social costs. The customers express preferences for widening the choice of competing companies. In liberalised markets, the regulatory authorities need to prevent predatory pricing and price collusion, maintain high safety standards, make obligatory insurance arrangements to compensate the customers in case of airlines going bankrupt. Regulation would safeguard the fair allocation of slots. Mechanisms are needed to ensure that the customers' and environmentalists' views are adequately represented in decision-making. It is most encouraging that the customers are reaping rewards.
Derived from text
Air Transportation; Civil Aviation; Market Research; Competition

19990070412 Universidad de Las Palmas de Gran Canaria, Dept. of Economic Analysis, Las Palmas, Spain
European Air Transport Deregulation (1986-1994): A Panel Data Approach
Betancor, Ofelia, Universidad de Las Palmas de Gran Canaria, Spain; Campos, Javier, Universidad de Las Palmas de Gran Canaria, Spain; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 20p; In English; See also 19990070409
Contract(s)/Grant(s): CEC Project ST-96-SC-172; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this note we have carried out an empirical assessment of the effects of deregulation on the pricing policies of the European air industry from 1986 to 1994 for the scheduled passengers traffic. Our basic unit of analysis is the city-pair route, since we also consider this as the basic unit of competition for this sort of traffic. Two types of deregulation effects have been modelled. First, strict route-deregulation effect, according to the existence or not of liberal bilateral agreements between the countries involved in any single route. Second, a pure time-deregulation effect, according to the progressive influence of the European Commission deregulation packages that came into place at years 1987, 1990 and 1992. to capture these effects we compare different price definitions over forty-four different international intra-European routes consecutively observed for nine years. In order to make the comparison valuable, we control not only by deregulation variables, but also by several supply and demand variables, such as passengers-kms, number of flights, distance, load factor and per head income. We also control by unobservable individual effects that may possibly affect the validity of the estimated coefficients. In terms of fares in levels we can only confirm that the basic standard fare (Y-fare) is around a 7 percent lower in those routes where liberal bilaterals are in force, whilst the SPEX-fare would

be similar. With respect to other fares our econometric results are not conclusive. Once special features of routes are bore in mind including fixed effects, it happens that the effect of liberal bilaterals in Europe seems to be very weak. When percentages of discount with respect to the Economy fare are calculated, we have surprisingly found that these are always lower in routes subject to liberal bilaterals, but for the E-fare. There is also an important difference between the PEX and SPEX-fare in terms of the European liberalisation process. The discount applied to the former has been increasing, at at some points in time, though the trend for the last is to experienced lower percentages mainly at the beginning of the period. Thus the impact of the European deregulation process, if any, has not been the same as the one exerted by liberal bilateral agreements. However, the most striking impact of such bilateral agreements has been the proliferation of tariffs, allowing to choose among a greater range of fares that could be now on passengers average 87 percent higher. Airlines are nowadays working with a greater number of discounted fares, this might also indicate they could be now getting lower yields if these tariffs were actually widely available in terms of seats being offered on a discount basis. This information is not published in Europe, however significance of the load factor parameter and relevant literature for the USA case (Keeler, 1991) would support it. In relation to the European deregulation packages, it is also the case that effects on levels of fares have been negligible so far. Again, its impact is found in the greater number of fares that are now available to passengers. In conclusion, our work shows that the effects of the air transport deregulation process in Europe have been much more gradual than other non-European experiences. This is so because the European process has been phased in over a lengthy period and the nature and the intensity of government intervention varied enormously between different countries. This makes that the first two years of the Single Market (1993-1994) had not seen a uniform flourishing of competition across the European Union, either between the major carriers or from new entrants or existing smaller airlines. However there is one caveat to our conclusions and an important starting point for future work. Since European airlines' yields by route are not publicly available we have restricted our econometric analysis only to four types of fares. For none of these variables, competition in European skies has taken the form of generalised price decreases as a result from the application of liberal bilateral agreements or the European deregulation process itself. However, we have found an important impact in terms of a newer and wider catalogue of fares among which passengers could better accommodate their preferences. Only if these are also widely available for most flights would airline deregulation have improved matters.
Derived from text
Air Transportation; Europe; Airline Operations; Policies; Agreements

19990070413 Universidad de Las Palmas de Gran Canaria, Las Palmas, Spain
European Airline Industry: A Cost Analysis and Economic Performance Evaluation
Martin, Juan Carlos, Universidad de Las Palmas de Gran Canaria, Spain; Nombela, Gustavo, Universidad de Las Palmas de Gran Canaria, Spain; Romero, Manuel, Universidad de Las Palmas de Gran Canaria, Spain; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 23p; In English; See also 19990070409
Contract(s)/Grant(s): CEC Project ST-95-SC-402; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The European liberalisation process in the air industry has changed the conditions for carriers to operate in this market. Before this, it was a market were limitations to competition existed as in the domestic markets where in many cases there was a legal monopoly, or in the intraeuropean market where airlines operated with bilateral agreements between states to share the market. The three liberalisation packages have eliminated the legal barriers to competition to established a situation of complete freedom of entry and exit for European carriers in any domestic or intrastate market, into the philosophy of the Treaty of Rome. In this paper we study cost structure of air carriers with the main objective of analysing how the liberalisation process has affected efficiency in the production of European companies. by studying the existence of economies of scale in the industry, we can try to predict how the companies of this sector will response to the measures of the Commission. The main question to answer is if the size of the air carriers can affect to efficiency gains in costs and production. Market structure can be affected by existence of economics of scale in the market which could bring possible tendencies of concentration in the market, and that could be answer to the bilateral agreements, joint ventures and acquisitions that can be observed actually between air carriers along European market. Section 2 describes the sample of 22 airlines, 13 from Europe and 9 from North America for a period of six years since 1991 to 1995, that has been used to carry out this study. Data has been obtained from ICAO and IATA publications. Section 3 presents a parametric analysis as an approach to analyse the efficiency of airlines. So for the period 1990-95 there still exists a gap between the performance of European airlines and their American counterparts, both in terms of productivity and unit costs. Although it can be observed that European are covering in terms of costs to American levels. Although for the characteristics of output in air transport it might be estimated a desegregated cost function, the absence of information to make this have lead us to estimate an aggregated translogarithmical cost function. As a consequence, its necessary to define correctly what is understood by economies of scale and how to determine it from an aggregated cost function. Section 4 presents an Econometric analysis carry out to estimate a cost function for the industry. The use of translogarithmical cost function specification and the cost share equations is used as a standard methodology to estimate transport cost. This is because is the easiest to estimate and interpret (the arguments of the

function are in logarithms). The disadvantage comes from the number of coefficients to estimate. The analysis of economies of scale with the traditional form and corrected following Jara and Cortes (1996) and Oum and Zhang (1997) are compared in section 5. So the presence of economies of scale is notably reinforced if the correction of the effect of changes in output and network over other exogenous factors proposed is performed. Also in this section cost complementarity and the effect of public and private ownership is analysed. Finally residuals obtained from the estimated cost function are used to estimate the potential cost reductions that inefficient airlines may achieve. Section 6 presents the main conclusions of this paper.
Derived from text
Europe; Air Transportation; Cost Analysis; Economic Analysis; Market Research

19990070414 British Columbia Univ., Faculty of Commerce and Business Administration, Vancouver, British Columbia Canada
Overview of Regulatory Changes in International Air Transport and Asian Strategies Towards the U.S. Open Skies Initiatives
Oum, Tae Hoon, Editor, British Columbia Univ., Canada; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 17p; In English; See also 19990070409; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper identifies major issues facing Asian airlines and governments when they deal with the U.S. open skies initiatives directed towards Asian countries, and suggests how they might deal with those issues strategically and practically. The paper is organized as follows: Section I is a brief history of international air services regulation including the recent US initiatives for open skies and creation of European single aviation market. Section II identifies some key problems associated with traditional air services treaty negotiations. Key lessons from the US-Canada Open Skies agreement are described in Section III. Section IV identifies major challenges that the US open skies initiatives bring to Asian carriers with governments. Section V describes the suggested strategies for Asian carriers and governments to deal with the US open skies initiatives. The paper ends with a summary and conclusions.
Author
Air Transportation; Civil Aviation; Agreements; International Cooperation

19990070415 Sydney Univ., Inst. of Transport Studies, Australia
Aviation Policy in South East Asia: Alliances, "Open Skies" Bilaterals and Regional Airline Markets
Hooper, Paul, Sydney Univ., Australia; Duangphastra, Chakrit, Sydney Univ., Australia; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 15p; In English; See also 19990070409; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Regionalism is not a force that acts alone. It has been pointed out that the Latin American airlines see the Mercosur regional airline market as an opportunity to develop markets as they cope with the pressure of competition from the major US carriers under liberal bilateral agreements. In Asia, the USA has concluded several open skies agreements and its carriers now enjoy opportunities to carry intra-regional traffic on more advantageous terms than the airlines based in the region (Findlay et al., 1997). One way to counter this is to enter into liberal bilateral agreements with each other. New Zealand and Singapore already have done this. The formation of regional aviation markets takes this a step further. However, the USA becomes a de facto member of the groups where it has signed its open skies bilaterals with the significant partners. This is a factor that could lead to a more open approach to membership of the regional groups. Bowen (1997) argues that the US open skies agreements are a progressive step in an opening salvo to liberalise the transpacific market in the same way the Atlantic was Liberalised in the mid-1990's. Much will depend, though, on the way the governments in South East Asia respond to the open skies agreements and in the way they cope with their current economic problems and the pressure that these are placing on their airlines.
Derived from text
Market Research; Civil Aviation; Air Transportation; Policies; Agreements; International Cooperation

19990070416 Korea Transport Inst., Seoul, Korea, Republic of
An Economic Effect of Duopoly Competition in International Airline Industry: The Case of Korea
Kim, Jongseok, Korea Transport Inst., Korea, Republic of; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 12p; In English; See also 19990070409; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

There are two types of international routes in and out of Korea. One is single-tracked route where only one Korean carrier operates, and the other is double-tracked route where both of Korean carriers operate simultaneously. In this paper, we analyze whether there is a price competition between the two Korean carriers and thus whether single and double tracked routes show

difference in price performance. On the basis of the analysis, we calculate how much passengers are benefited due to price competition.
Author
Air Transportation; Competition; Economics; South Korea

19990070417 Plymouth Univ., Center for International Shipping and Transport, Plymouth, UK
Corporate Involvement in the Short Haul Business Travel Market in the European Union
Mason, Keith J., Plymouth Univ., UK; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 18p; In English; See also 19990070409; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper has provided additional information regarding the business traveller and his/her employing organization in the purchase of air travel. The scale for traveller attitudes towards corporate travel policies (CTPs) can be evaluated by its application in other markets. Other attitude statements could be developed that might gain greater insight into business traveller attitude constructs. The scale for purchase attributes which was previously developed has been assessed and surprisingly similar results were found in terms of the key purchase attributes in the short haul business travel market which provides strong evidence of the key purchase benefits sought by the business travel market. A new market segmentation based on these product elements reaped further insight into the market and how it has changed in the last five years.
Derived from text
Market Research; Industries; Commerce; Europe; Air Transportation

19990070418 Korea Aviation Univ., Dept. of Aviation Management, Go-Yang, Korea, Republic of
Econometric Analysis of Airlift Passenger Demand
Yoon, Suk–Hong, Korea Aviation Univ., Korea, Republic of; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 16p; In English; See also 19990070409; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This research reviews current airlift demand forecast models and refines them in accordance with the analysis methods of econometrics.
Derived from text
Air Transportation; Forecasting; Demand (Economics); Models; Econometrics

19990070419 Santander Univ., Cantabria, Dept. of Economics, Santander, Spain
Passenger's Choice of Air Transport Under Road Competition: The Use of Cointegration Techniques
Pablo, Coto–Millan, Santander Univ., Cantabria, Spain; Banos–Pino, Jose, Universidad de Oviedo, Spain; Inglada, Vicente, Ministerio de Obras Publicas, Spain; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 12p; In English; See also 19990070409
Contract(s)/Grant(s): DGICYT-PS95-0095; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this study we present a theoretical model for passenger air transport demands in Spain. Quarterly data has been used for the 1980.I-1992.IV period. We have used cointegration techniques, which are subject to a wide range of tests, to obtain short- and long-run equations. Moreover, we have obtained the product price and cross elasticities of each mode of transport. These estimations may be used to analyze the effects of transport fares on income changes, as well as to predict short- and long-run traffic.
Author
Air Transportation; Mathematical Models; Urban Transportation; Rail Transportation; Demand (Economics)

19990070420 Westminster Univ., Transport Studies Group, London, UK
Competition Between Hub Airports in Europe and a Methodology for Forecasting Connecting Traffic
Dennis, Nigel P. S., Westminster Univ., UK; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 20p; In English; See also 19990070409
Report No.(s): Paper-74-Rev; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper considers the extent to which hub airports in Europe compete for transfer traffic and the performance of the major airlines. The relationship with scheduling issues, airport facilities and geographical constraints is addressed. A method for estimating changes in transfer traffic under changes in service or infrastructure provision is suggested. Some possible future develop-

ments of hubbing in Europe are considered, with particular reference to the shortage of runway capacity at many of Europe's major airports.
Derived from text
Air Transportation; Competition; Air Traffic; Europe

19990070421 Ecole Nationale de l'Aviation Civile, Toulouse, France
Cycles in the Air Transportation Industry
Lenoir, Nathalie, Ecole Nationale de l'Aviation Civile, France; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 15p; In English; See also 19990070409; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The aim of this paper to analyze aviation cycles by using statistical methods, and from there to build a model of airline behavior, using a game theory framework, to account for observed reactions in cycles. The outline of the paper is the following: First the theory of economic cycles is briefly reviewed (part 2). Then, using long time series data on world GDP and traffic, the link between economic cycles and traffic is discussed (part 3), as well as the relevance of other indicators. In the fourth part, relations and time lags between relevant aviation activity variables are studied and their relations with economic cycles discussed. Finally (part 5), a game theory framework is used to give an explanation of the airlines behavior, which results in an amplification of economic cycles in the airline industry. We conclude by suggesting ways of smoothing the cycles through a better management of capacity investments. Can the aviation cycle be broken?
Derived from text
Air Transportation; Cycles; Economics; Game Theory; Civil Aviation

19990070422 Thrace Univ., Section of Transportation, Xanthe, Greece
A Model for the Forecast of Demand in Major Touristic Airports: The Case of the Airport of Rhodes
Profillidis, V., Thrace Univ., Greece; The Conference Proceedings of the 1998 Air Transport Research Group (ATRG) of the WCTR Society; December 1998; Volume 3; 25p; In English; See also 19990070409; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Models of forecast of demand of airports have focused for years on busy central airports. However, touristic airports with high seasonalities present an increasing interest. The appropriate models for demand forecast for such touristic airports are analyzed in this paper: statistical, time-series, econometric, gravity and fuzzy models. Application of the models are presented for the case of a major airport of Eastern Mediterranean, the airport of Rhodes. The impact of the method of forecast in the airport master planning is also discussed.
Author
Airport Planning; Forecasting; Mathematical Models; Demand (Economics); Tourism

19990071172 Aerospace Corp., Technology Operations, El Segundo, CA USA
Natural and Triggered Lightning Launch Commit Criteria (LCC)
Krider, E. P.; Koons, H. C.; Walterscheid, R. L.; Rust, W. D.; Willett, J. C.; Jan. 15, 1999; 23p; In English
Contract(s)/Grant(s): F04701-93-C-0094
Report No.(s): AD-A365329; TR-99(1413)-1; SMC-TR-99-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document has been prepared to document the Lightning Launch Commit Criteria recommended by the Lightning Advisory Panel (LAP) in May 1998. The LAP is a joint AF/NASA panel that provides an independent scientific assessment of, advice on, and recommended changes to the Lightning Launch Commit Criteria, lightning-related issues in the Flight Rules, and Lightning Advisories/Warnings for ground operations.
DTIC
Lightning; Launching

19990071581 Federal Aviation Administration, Atlantic City, NJ USA
Proposed Selection Criteria for Aviation Safety Analytical Methods and Tools
Press, Jacques; Jun. 1999; 21p; In English
Report No.(s): AD-A365209; DOT/FAA/CT-TN99/16; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report provides a set of criteria useful in choosing and using analytical tools and methods (artifacts) directed at aviation safety analysis. The approach consists of adopting a rational framework in three selection stages: artifact classification, value, and quality. Furthermore, we have supplied a scoring and weighting method as an example. Over the years, experts have devised numerous analytical artifacts to articulate safety data into a comprehensive body of knowledge. Given the seriousness of aviation

safety, we believe all such artifacts need to be evaluated wisely and cautiously before any claims are made. The criteria prescribed in this report provide one way to classify and evaluate them consistently, as a prelude to their use.
DTIC
Numerical Analysis; Aircraft Safety; Safety Factors; Flight Safety

19990071646 NASA Langley Research Center, Hampton, VA USA
Synthetic Vision Workshop 2
Kramer, Lynda J., Compiler, NASA Langley Research Center, USA; March 1999; 391p; In English; 2nd; Synthetic Vision Workshop, 27-29 Jan. 1998, Hampton, VA, USA; Sponsored by NASA, USA
Contract(s)/Grant(s): RTOP 522-19-11-01
Report No.(s): NASA/CP-1999-209112; L-17838; NAS 1.55:209112; No Copyright; Avail: CASI; A17, Hardcopy; A04, Microfiche

The second NASA sponsored Workshop on Synthetic/Enhanced Vision (S/EV) Display Systems was conducted January 27-29, 1998 at the NASA Langley Research Center. The purpose of this workshop was to provide a forum for interested parties to discuss topics in the Synthetic Vision (SV) element of the NASA Aviation Safety Program and to encourage those interested parties to participate in the development, prototyping, and implementation of S/EV systems that enhance aviation safety. The SV element addresses the potential safety benefits of synthetic/enhanced vision display systems for low-end general aviation aircraft, high-end general aviation aircraft (business jets), and commercial transports. Attendance at this workshop consisted of about 112 persons including representatives from industry, the FAA, and other government organizations (NOAA, NIMA, etc.). The workshop provided opportunities for interested individuals to give presentations on the state of the art in potentially applicable systems, as well as to discuss areas of research that might be considered for inclusion within the Synthetic Vision Element program to contribute to the reduction of the fatal aircraft accident rate. Panel discussions on topical areas such as databases, displays, certification issues, and sensors were conducted, with time allowed for audience participation.
Author
Conferences; Enhanced Vision; Aircraft Safety; Display Devices; Flight Safety

19990071656 International Centre for Aviation and the Environment, Montreal, Quebec Canada
Survey of Nonglycol and Reduced Glycol Aircraft Deicing Methods ***Final Report***
Cornish, J.; Eyre, F.; Apr. 1999; 74p; In English
Report No.(s): PB99-153967; DOT/FAA/AR-99/18; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This survey of no glycol and low-glycol deicing practices, methods, and procedures used by the world's airlines, including cargo carriers, was conducted under contract to the Federal Aviation Administration (FAA) William J. Hughes Technical Center. A representative sample of 80 of the world's airlines and airports with operations under winter ground icing conditions were surveyed by mail for their experience with no glycol or reduced-glycol deicing methods. Twenty-five responded. The results are presented in descriptive format for each of the procedures identified along with sample illustrations where appropriate. A summary is given of the principle characteristics for each procedure. Although the focus of the survey was the procedures in use, a number of technologies under development and which have been field tested have been included, such as truck-mounted blown air systems, mobile infrared heaters, and preheating of fuel prior to refueling.
NTIS
Glycols; Deicers; Civil Aviation

19990072345 Federal Aviation Administration, Administration Technical Center, Atlantic City, NJ USA
Evaluation of Oxygen Cylinder Overpacks Exposed to Elevated Temperature
Marker, T. R.; Diaz, R.; Jun. 1999; 26p; In English
Report No.(s): PB99-156853; DOT/FAA/AR-TN98/30; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Tests were conducted inside a large industrial convection furnace to determine the temperature and time required to cause pressure relief activation of three different size oxygen cylinders commonly used in commercial transport aircraft. The cylinders were first emptied of gaseous oxygen for safety reasons and refilled with nitrogen to the original pressure. The furnace temperature was ramped to 400 F, which represented the temperature reached during a Halon 1301 suppressed deep-seated cargo compartment fire. Cylinder pressure relief activation typically occurred after the surface temperature had reached only 300 F. Additional tests were conducted using a 76.5-cubic-foot oxygen cylinder placed inside several types of cylinder cases, commonly referred to as overpacks. The tests were run to determine the level of thermal protection, if any, that the overpacks might provide when the cylinders are subjected to elevated temperatures. Two custom-made overpacks were also tested that contained insulated materials aimed specifically at providing thermal protection. Tests showed that some common overpacks have the ability to protect the cyl-

inder from pressure relief activation for nearly 60 minutes while other types designed specifically for thermal insulation can provide significant additional protection.
NTIS
Oxygen; Surface Temperature; Thermal Protection; Thermal Analysis

19990072346 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA
Video Landing Parameter Survey: Washington National Airport ***Final Report***
Barnes, T.; DeFiore, T.; Micklos, R.; Jun. 1999; 50p; In English
Contract(s)/Grant(s): DTFA03-94-Z-0029
Report No.(s): PB99-156846; DOT/FAA/AR-97/106; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Federal Aviation Administration William J. Hughes Technical Center is conducting a series of video landing parameter surveys at high-capacity commercial airports to acquire a better understanding of typical contact conditions for a wide variety of aircraft and airports as they relate to current aircraft design criteria and practices. This was the second in an ongoing series of parameter landing surveys and was conducted at Washington National Airport in June 1995. Four video cameras were temporarily installed along the east side of runway 36. Video images of 532 transport, (525 narrow-body jets and 7 commuter jets) were captured, analyzed, and the results presented herein. Landing parameters presented include sink rate; approach speed; touchdown pitch, roll, and yaw angles; off-center distance; and the touchdown distance from the runway threshold measured along the runway center line. Wind and weather conditions were also recorded and landing weights were available for most landings.
NTIS
Aircraft Landing; Design Analysis; Aircraft Design; Video Tapes

19990075050 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA
Longitudinal Acceleration Tests of Overhead Luggage Bins and Auxiliary Fuel Tank in a Transport Airplane Airframe Section ***Final Report, Nov. 1997 - Jan. 1998***
McGuire, R.; Macy, T.; Jun. 1999; 356p; In English
Contract(s)/Grant(s): FAA DTF A03-95-R-00028
Report No.(s): PB99-165409; DOT/FAA?AR-99/4; No Copyright; Avail: CASI; A03, Microfiche; A16, Hardcopy

This report contains the description and test results of overhead stowage bin calibrations and longitudinal impact testing of a 10-foot transport airframe section conducted at the Transportation Research Center Inc. (TRC). The purpose of the tests was to measure the structural responses and interaction between the fuselage, overhead stowage bins, and auxiliary fuel tank under simulated, potentially survivable, crash conditions. A 10-foot section from a Boeing 737, Model 200 was used as the test section. The overhead stowage bin connection supports were instrumental with strain gages and calibrated. Two types of overhead storage bins were installed in the transport airframe and pulled in a longitudinal direction at various known loads to monitor and record the strain gage outputs. The transportation was longitudinally impact tested using TRC's 24-inch shock tester. The transport airframe section was configured with a 120-inch overhead stowage bin (Bin A) attached to the left/pilot side, a 60-inch overhead stowage bin (Bin B) attached to the right/copilot side, and a 500-gallon auxiliary fuel tank attached underneath the airframe's passenger floor section. The test articles were equipped with accelerometers, strain gages, and potentiometers totaling approximately 90 channels of data per simulated crash test.
NTIS
Fuel Tanks; Transport Aircraft; Airframes

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Urban Technology and Transportation.

19990070424 Naval Aviation Systems Team, Patuxent River, MD USA
Integrated Mechanical Diagnostics HUMS: Overview and Status
Muldoon, Rick, Naval Aviation Systems Team, USA; Gill, John, Goodrich (B. F.) Aerospace, USA; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 19-34; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

IMD HUMS is a commercial Operations and Support Saving Initiative (COSSI) to improve helicopter operational readiness and flight safety while slashing maintenance-related costs.
Derived from text
Helicopters; Maintainability; Flight Safety

19990070425 Royal Air Force, Aerospace Maintenance Development and Support, Huntingdon, UK
Introduction of HUMS into the RAF
Horsley, Dave, Royal Air Force, UK; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 35-50; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche
Contents include the following: Logistic support services, expectations, projects, and industrial strategy.
CASI
Support Systems; Logistics

19990070426 Eurocopter France, Marignane, France
Eurocopter HUMS: The Helicopter Manufacturer Commitments
Lubrano, Phillippe, Eurocopter France, France; Feraud, Pierre, Eurocopter France, France; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 51-61; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche
Contents include the following: safety and confidence, Health and Usage Monitoring System (HUMS) design, HUMS module configuration, safety and cost benefits.
CASI
Safety; Design Analysis; Costs; Health

19990070427 Defence Science and Technology Organisation, Airframes and Engines Div., Melbourne, Australia
Machine Dynamics
Rebbechi, Brian, Defence Science and Technology Organisation, Australia; Wong, Albert, Defence Science and Technology Organisation, Australia; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 63-74; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche
Contents include the following: Advanced transmission diagnostics, propulsion system vibration analysis, vibration monitoring of Navy helicopters, active vibration control of propulsion systems,
CASI
Systems Analysis; Helicopters; Active Control

19990070430 Analysis, Management and Systems (Pty) Ltd., South Africa
Health and Usage Monitoring System for the Rooivalk Combat Support Helicopter
Botes, C. J., Analysis, Management and Systems (Pty) Ltd., South Africa; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 103-114; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche
The Health and Usage Monitoring System (HUMS) developed for the Denel Aviation Rooivalk CSH forms an integral part of the System Status Monitoring (SSM) capability of the aircraft. It provides an on-board capability to monitor and report basic aircraft health, usage on critical components, status, performance and limits exceedances to both the air and ground crews. The HUMS comprises of the following elements: a) Two Health Monitoring Units (HMUs) which include the Master Warming electronics; b) Vibration Monitoring Unit (VMU); c) Refuel/Defuel Unit (RDU); d) Crash Recorder Unit (CRU) (optional); e) Mission Planning and Ground Support Station; f) Set-up and Diagnostics Station. This is an excellent example of a fully integrated HUMS with all the associated benefits of minimising the number of Line Replaceable Units (LRUs) on-board the aircraft.
Author
Health; Monitors; Helicopters; Combat

19990070431 Defence Science and Technology Organisation, Airframes and Engines Div., Melbourne, Australia
Lubrication Oil Debris Monitoring Program at AMRL
Parmington, Ben, Defence Science and Technology Organisation, Australia; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 115-121; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aero-

nautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

Enhance AMRL's understanding of the operation and performance of existing and new generation oil debris monitors, in order to better position AMRL to provide advance to the Australian Defence Force on the performance of monitors used on existing aircraft and of new generation monitors that are becoming available.
Derived from text
Lubrication; Oils; Debris; Monitors

19990071045 Nangia Aero Research Associates, Bristol, UK
Modelling of 3-D Aircraft Inlets at "Zero" Speed (and Low Speeds With Crosswind) and Flow Separation Prediction
Nangia, R. K., Nangia Aero Research Associates, UK; Palmer, M. E., Nangia Aero Research Associates, UK; Hodges, J., Defence Evaluation Research Agency, UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 2.1 - 2.14; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The location and design of an engine intake depends upon the operational and installation needs. These are different for combat aircraft and civil / transport aircraft. The shapes of the inlets can therefore differ widely as may the contraction ratios. An aspect that needs to be understood and "certified" for each intake is its behaviour when onset speeds are near zero or small. Such a situation can occur in maneuvers or on the runway as an aircraft (military or civil) prepares for take-off and begins to roll. Full engine power with brakes on can lead to an engine-face Mach M(Sub E) increase as well as very high velocities at the inlet lip (or in the throat, depending on the inlet contraction ratio CR). Subject to intake lip geometry (sharper the worse), this can cause onset of internal flow separations and unsteady effects which are deleterious to the propulsion system and may lead to flame-out or long term fatigue damage. Further, a small cross-wind may lead to very large flow bias and hence initiate internal flow separations. Close proximity to the ground (or indeed, near another surface or store), leads to a "one-sided" flow distortion effect. This paper describes the methodology used, verification with some test data and then applies techniques to several different types of intake.
Author
Three Dimensional Models; Engine Inlets; Design Analysis; Separated Flow; Transport Aircraft

19990071046 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
Numerical and Experimental Studies of 3D Hypersonic Inlet
Goldfeld, M. A., Institute of Theoretical and Applied Mechanics, Russia; Nestoulia, R. V., Institute of Theoretical and Applied Mechanics, Russia; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 3.1 - 3.12; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The results of numerical and experimental studies of a new configuration of 3D hypersonic inlet with the minimum throat area, which was called a convergent inlet, are presented in this paper. It is shown that the use of this inlet configuration allows one to reduce the drag and thermal protection of surfaces of a hypersonic engine within the entire range of flight velocities. This is achieved by decreasing the inclination of external compression surfaces and reducing the area of the inlet duct and combustor walls. The inlet configuration was constructed on the basis of gas dynamic design methods using the flows of lower dimension. The calculations were performed within the framework of inviscid gas model by the method of finite volumes. The flow and inlet characteristics, taking account of viscosity, were also calculated using the boundary layer equations. The numerical algorithm was verified by calculated and experimental data for a finite-width wedge and external compression surface of a convergent inlet. The experimental studies were performed within the Mach number range from 2 to 10.7 and Reynolds number based on the model inlet height of Re=1-5*10(exp 6). The results included the flow parameters on the external compression surface and in the inlet duct, the Mach number in the throat, the air flow rate, the total pressure recovery coefficient, and the inlet drag. Besides, the boundary layer characteristics on compression surfaces were determined, including the skin friction coefficients. The numerical and experimental results are in good agreement. These results are also compared with the data for traditional 2D inlets.
Author
Numerical Analysis; Experimentation; Three Dimensional Models; Hypersonic Inlets; Data Acquisition; Air Flow; Flow Characteristics; Intake Systems; Computerized Simulation

19990071047 Northern Research and Engineering Corp., Woburn, MA USA
Design Verification of Turbomachinery Components by 3-D Flow Analysis
Oreper, Gregory, Northern Research and Engineering Corp., USA; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 5.1 - 5.13; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

A system to perform turbomachinery flow analysis for design verification has been developed. The system has a pre-processor, a grid generator, an automatic boundary conditions generator, a flow analysis module, and a post-processor that allows designers to quickly evaluate properties of the design. The pre-processor also includes an initial condition generator. All modules are accessible through a graphical user interface. The flow analysis can be viscous or inviscid, steady or unsteady. The system can be used to verify designs of single components, stages, multiple stages, axial centrifugal, or mixed flow paths, compressors, turbines, or ducts. The numerical method used in the flow analysis module is based on the fully implicit algorithm developed by Beam and Warming. The algorithm was approximately factored by Pulliam and Steger and diagonalized by Pulliam and Chaussee. to model turbulence, several algebraic turbulence models, based on the Baldwin and Lomax formulation, were implemented. For complicated flows, a two-equation model of D. Wilcox is available. The computational system has a set of standard test cases to validate flow analysis result. This set of standard test cases covers major types of turbomachinery components and stages. In this paper, the system capabilities in the turbomachinery design verification process are shown through examples of calculations made for centrifugal and axial turbomachinery components. turbomachinery component.
Author
Design Analysis; Proving; Turbomachinery; Flow Characteristics; Three Dimensional Flow; Mathematical Models; Baldwin-Lomax Turbulence Model; Engine Design; Computational Fluid Dynamics

19990071185 NASA Langley Research Center, Hampton, VA USA
Experimental Investigation of Convoluted Contouring for Aircraft Afterbody Drag Reduction
Deere, Karen A., NASA Langley Research Center, USA; [1999]; In English; 35th Joint Propulsion, 20-24 Jun. 1999, Los Angeles, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 99-2670; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

An experimental investigation was performed in the NASA Langley 16-Foot Transonic Tunnel to determine the aerodynamic effects of external convolutions, placed on the boattail of a nonaxisymmetric nozzle for drag reduction. Boattail angles of 15 and 22 deg were tested with convolutions placed at a forward location upstream of the boattail curvature, at a mid location along the curvature and at a full location that spanned the entire boattail flap. Each of the baseline nozzle afterbodies (no convolutions) had a parabolic, converging contour with a parabolically decreasing corner radius. Data were obtained at several Mach numbers from static conditions to 1.2 for a range of nozzle pressure ratios and angles of attack. An oil paint flow visualization technique was used to qualitatively assess the effect of the convolutions. Results indicate that afterbody drag reduction by convoluted contouring is convolution location, Mach number, boattail angle, and NPR dependent. The forward convolution location was the most effective contouring geometry for drag reduction on the 22 deg afterbody, but was only effective for M is less than 0.95. At M = 0.8, drag was reduced 20 and 36 percent at NPRs of 5.4 and 7, respectively, but drag was increased 10 percent for M = 0.95 at NPR = 7. Convoluted contouring along the 15 deg boattail angle afterbody was not effective at reducing drag because the flow was minimally separated from the baseline afterbody, unlike the massive separation along the 22 deg boattail angle baseline afterbody.
Author
Boattails; Afterbodies; Wind Tunnel Tests; Drag Reduction; Pressure Ratio; Nozzle Geometry; Nozzle Design; Exhaust Nozzles; Pressure Drag; Aerodynamic Drag; Transonic Speed; Mach Number

19990071186 NASA Ames Research Center, Moffett Field, CA USA
Overview of the Testing of a Small-Scale Proprotor
Young, Larry A., NASA Ames Research Center, USA; Yamauchi, Gloria K., NASA Ames Research Center, USA; Booth, Earl R., Jr., NASA Ames Research Center, USA; Botha, Gavin, NASA Ames Research Center, USA; Dawson, Seth, Boeing Co., USA; 1999; In English; 55th, 25-27 May 1999, Montreal, Quebec, Canada; Sponsored by American Helicopter Society, Inc., USA; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper presents an overview of results from the wind tunnel test of a 1/4-scale V-22 proprotor in the Duits-Nederlandse Windtunnel (DNW) in The Netherlands. The small-scale proprotor was tested on the isolated rotor configuration of the Tilt Rotor Aeroacoustic Model (TRAM). The test was conducted by a joint team from NASA Ames, NASA Langley, U.S. Army Aeroflightdynamics Directorate, and The Boeing Company. The objective of the test was to acquire a benchmark database for validating aeroacoustic analyses. Representative examples of airloads, acoustics, structural loads, and performance data are provided and discussed.
Author
V-22 Aircraft; Aeroacoustics; Wind Tunnel Tests; Rotary Wings; Aircraft Noise; Propeller Efficiency; Aerodynamic Loads

19990071396 NASA Dryden Flight Research Center, Edwards, CA USA

Selected Performance Measurements of the F-15 ACTIVE Axisymmetric Thrust-Vectoring Nozzle

Orme, John S., NASA Dryden Flight Research Center, USA; Sims, Robert L., NASA Dryden Flight Research Center, USA; September 1999; 12p; In English; 14th, 5-10 Sep. 1999, Florence, Italy; Sponsored by International Society for Airbreathing Engines

Contract(s)/Grant(s): RTOP 529-20-24

Report No.(s): H-2339; ISABE Paper 1S-166; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flight tests recently completed at the NASA Dryden Flight Research Center evaluated performance of a hydromechanically vectored axisymmetric nozzle onboard the F-15 ACTIVE. A flight-test technique whereby strain gages installed onto engine mounts provided for the direct measurement of thrust and vector forces has proven to be extremely valuable. Flow turning and thrust efficiency, as well as nozzle static pressure distributions were measured and analyzed. This report presents results from testing at an altitude of 30,000 ft and a speed of Mach 0.9. Flow turning and thrust efficiency were found to be significantly different than predicted, and moreover, varied substantially with power setting and pitch vector angle. Results of an in-flight comparison of the direct thrust measurement technique and an engine simulation fell within the expected uncertainty bands. Overall nozzle performance at this flight condition demonstrated the F100-PW-229 thrust-vectoring nozzles to be highly capable and efficient. Author

F-15 Aircraft; Thrust Vector Control; Flight Tests; Thrust Measurement; Nozzle Geometry; Subsonic Speed; Nozzle Flow; Performance Tests

19990071577 SRI International Corp., Menlo Park, CA USA

Characterization of Early Stages of Corrosion Fatigue in Aircraft Skin, Phase 2, Interpretation of Corrosion-Fatigue Fracture Surfaces in Alclad 2024-T3 Aluminum Alloy Sheet, ***Oct. 1995 - Sep. 1998***

Schmidt, C. G.; Kobayashi, T.; Shockey, D. A.; May 1999; 75p; In English

Contract(s)/Grant(s): 95-G-065

Report No.(s): AD-A365106; DOT/FAA/AR-99/34; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

New methods were developed and applied to extract and interpret information from the fracture surfaces of corrosion-fatigue specimens of clad and bare 2024-T3 aluminum sheet. We developed two fracture surface topography analysis methods that characterize the effects of environment and a fracture surface analysis and finite element modeling approach to detect and quantify overloads that occurred during fatigue crack propagation. We used these methods to perform a detailed analysis of the fracture surface topography produced in the early stages of corrosion fatigue, and developed an understanding of the effect of environment on the crack nucleation mechanism based on fracture surface features. In addition, cyclic load experiments were conducted on bare and clad 2024-T3 sheet under vacuum and in air, salt water, and arsenated salt water environments to assess the effects of environment, stress, and material condition on nucleation and early propagation kinetics of corrosion-fatigue cracks. For bare 2024-T3 sheet, substantial reductions in fatigue life were observed when the environment produced elongated pits associated with constituent particle corrosion. For clad 2024-T3 sheet, reductions in fatigue life were observed in environments that did not produce pitting (e.g., laboratory air and salt water). A likely mechanism for enhanced crack nucleation in 2024-T3 sheet with pure aluminum clad is the weakening effect of hydrogen on pure aluminum and the concomitant enhancement of cracking kinetics. The analytical methods developed and the analyses performed bear directly on the understanding of corrosion-fatigue in commercial aircraft through the relevancy of the materials, loading conditions, and test environments.

DTIC

Fatigue (Materials); Fracturing; Aluminum; Cladding; Aluminum Alloys; Metal Sheets; Skin (Structural Member); Stress Corrosion

19990072347 Northrop Grumman Corp., Aircraft Div., Dallas, TX USA

Probabilistic Design Methodology for Composite Aircraft Structures ***Final Report, Sep. 1995 - Oct. 1997***

Long, M. W.; Narciso, J. D.; Jun. 1999; 150p; In English

Contract(s)/Grant(s): FAA 95G-0036

Report No.(s): PB99-156838; DOR/FAA/AR-99/2; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

Probabilistic structural analysis methods provide a means to quantify the inherent risk of a design and assess the sensitivities of design variables. This report is intended to introduce the subject of probability analysis to engineers in the aerospace industry as well as act as a reference to guide those applying this technology. The current (deterministic) structural analysis approach is described, and its shortcomings are pointed out. The evolution of probabilistic analysis is presented, and the basic theory is discussed and explained via examples. Aerospace industry method development is described in detail, along with associated aero-

space applications. An in-depth explanation of one industry method (Northrup Grumman) is given, along with an example run of their computer program. The report concludes with a consensus of potential benefits as well as potential issues of concern that must be addressed by those using these analysis methods.
NTIS
Design Analysis; Composite Materials; Composite Structures; Aerospace Engineering; Structural Analysis; Aircraft Design; Aircraft Structures; Structural Design Criteria

19990073341 International Centre for Aviation and the Environment, Montreal, Quebec Canada
Survey of Nonglycol and Reduced Glycol Aircraft Deicing Methods ***Final Report***
Cornish, Jeremy; Eyre, Frank; Apr. 1999; 67p; In English
Report No.(s): AD-A365050; DOT/FAA/AR-99/18; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
This survey of no glycol and low-glycol aircraft deicing practices, methods, and procedures used by the world's airlines, including cargo carriers, was conducted under contract to the Federal Aviation Administration (FAA) William J. Hughes Technical Center. A representative sample of 80 of the world's airlines and airports with operations under winter ground icing conditions were surveyed by mail for their experience with no glycol or reduced-glycol deicing methods. Twenty-five responded The written survey was supported by face-to-face interviews and telephone interviews. The results are presented in descriptive format for each of the procedures identified along with sample illustrations where appropriate. A summary is given of the principle characteristics for each procedure. Although the focus of the survey was the procedures in use, a number of technologies under development and which have been field tested have been included, such as truck-mounted blown air systems, mobile infrared heaters, and preheating of fuel prior to refueling. Major reductions in glycol use can be achieved through the use of simple mechanical aids such as scrapers or brushes to remove snow accumulation prior to conventional deicing.
DTIC
Deicing; Glycols; Surveys; Deicers; Ice Prevention

19990075952 Department of the Navy, Washington, DC USA
Pencil Drain Fixture for Aircraft Defueling
Hannick, Sidney L., Inventor; Mar. 09, 1999; 5p; In English
Patent Info.: Filed 15 Sep. 97,; US-Patent-Appl-SN-929,977; US-Patent-5,878,799
Report No.(s): AD-D019394; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A pencil drain fuel fixture for defueling aircraft pencil drains is provided. The pencil drain fixture has an extendable strut with a non-slip rubber base. The strut is set up on the tarmac under an aircraft pencil drain and extended to engage the drain. The upper end of the strut contains a funnel and pencil drain release rod mechanism which opens the pencil drain and by funnel and drain tube directs the fuel to a catch basin.
DTIC
Fuels; Drainage; Funnels; Aerospace Vehicles

19990075982 Department of the Navy, Washington, DC USA
Oscillating Flap Lift Enhancement Device
Greenhalgh, Samuel, Inventor; Mar. 23, 1999; 9p; In English
Patent Info.: Filed 30 Aug. 95,; US-Patent-Appl-SN-528,622
Report No.(s): AD-D019368; PATENTED,5,884-872; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A lift enhancing device for a solid wing is disclosed wherein a where a motor driven, flap dynamically oscillating flap mechanism produces an increase in the lifting capabilities of the wing.
DTIC
Wings; Aircraft Parts

07
AIRCRAFT PROPULSION AND POWER

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

19990070390 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Qualification of Life Extension Schemes for Engine Components ***Homologation des Programmes de Prolongation du Cycle de vie des Organes Moteur***
March 1999; 172p; In English, 5-6 Oct. 1998, Corfu, Greece; See also 19990070391 through 19990070408
Report No.(s): RTO-MP-17; AC/323(AVT)TP/7; ISBN 92-837-1012-6; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

Contains the papers presented at the Workshop on Qualification of Life Extension Schemes for Engine Components. The replacement cost of service-damaged components contributes significantly to the life cycle costs of an aero-engine. Damaged engine components also impact on the reliability and safety of aircraft. The papers discuss component damage management in turbines, including life management aspects of high cycle fatigue, and techniques for extending lives of service-damaged parts to achieve engine life cycle cost reductions, without compromising safety. Operators' needs and benefits accruing from component life extension are discussed. Various technologies available to life cycle managers for component life extension are described. The technologies include surface modification treatments and coatings, repair and refurbishment procedures, as well as improved component life cycle management practices based on damage tolerance and inspection. Emphasis is placed on the qualification testing requirements that must be satisfied to ensure that repaired or modified parts, or parts for which new life cycle management practices are applied, remain safe and reliable when returned to service.
Author
Aircraft Engines; Cost Reduction; Engine Parts; Gas Turbine Engines; Aircraft Maintenance; Operating Costs; Service Life; Life Cycle Costs; Damage Assessment; Aircraft Safety; Conferences

19990070391 Atlantis Aerospace Corp., Brampton, Ontario Canada
Aero-Engine Component Repair/Replacement Decision Factors
Hastings, R. R., Atlantis Aerospace Corp., Canada; March 1999; 6p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

The high cost of ownership of military weapons systems coupled with shrinking defense budgets is encouraging the pursuance of alternative management strategies for cost control. Aero-engines which typically consume 30% of the life cycle costs of a fighter aircraft platform are a prime target for initiatives including: damage tolerant design practices, on-condition maintenance and the repair, refurbishment or rejuvenation of components as opposed to their replacement. While the foregoing issue address cost issues in a very direct manner, there are a number of other factors which may motivate owners of large fleets of aircrafts to pursue management by repair/refurbishment.
Author
Aircraft Engines; Fighter Aircraft; Life Cycle Costs; Cost Analysis; Failure Analysis; Aircraft Maintenance; Cost Reduction

19990070392 Bundesamt fuer Wehrtechnik und Beschaffung, Propulsion Systems Div., Manching, Germany
Cost Effectiveness of Modern Lifting Concepts: Consideration of Economical Aspects Concentrating on Group A Parts of Military Aircraft Engines
Tschirne, K. U., Bundesamt fuer Wehrtechnik und Beschaffung, Germany; Holzbecher, W., Bundesamt fuer Wehrtechnik und Beschaffung, Germany; Qualification of Life Extension Schemes for Engine Components; March 1999; 9p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

It is an usual approach of traditional lifing procedures to perform extensive and therefore costly spinning and laboratory tests with subsequent sampling programmes aiming at the maximum usage of fracture critical parts, so called group-Aparts. Experience on military programmes has shown that this approach does not take into account all the aspects related to the real in-service situation. In order to avoid engine removals and disassemblies due to life-expired parts, causing major expenses, it becomes necessary to retire parts when they become available on the basis of natural arisings, i. e. at the most economical and suitable point in time. The aim of the presentation is to encourage both the manufacturer and operator of military engines to instigate a detailed review

of their current lifing policy as far as the remaining life at the point of retirement is concerned. Furthermore, some aspects concerning the philosophy of the required (desired) specified life for an engine and its components are highlighted.
Author
Cost Effectiveness; Aircraft Engines; Life (Durability)

19990070393 Standard Aero Ltd., Winnipeg, Manitoba Canada
International Acceptance of Commercial Repair Approvals
Thomas, Wayne, Standard Aero Ltd., Canada; Junkin, Brent, Standard Aero Ltd., Canada; March 1999; 5p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A01, Hardcopy; A02, Microfiche

As the military increasingly adopts commercial standards for the maintenance of ”dual use” aircraft, commercial repair approval and it’s methodology is becoming increasingly relevant in the military world. Component repair development is not limited to the MANUFACTURER. The repair marketplace is global with independent facilities operating around the world.The authority to issue approvals for aeronautical product repair procedures lies with the National Aviation Authority (NAA). Some NAA’s have implemented a system of delegation to enhance the efficiency and effectiveness of the approval process. The privileges and responsibilities of delegated authority may be granted to operators, independent repair stations, qualified individuals, or the manufacturer. This paper describes how the commercial system works to obtain approval for a new repair scheme, and describes some delegation systems.
Author
Aircraft Maintenance; Logistics; Checkout

19990070394 Air Force Research Lab., Materials and Manufacturing Technology Directorate, Wright-Patterson AFB, OH USA
High Cycle Fatigue Life Management in Gas Turbine Engines
Nicholas, T., Air Force Research Lab., USA; March 1999; 9p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

High Cycle Fatigue (HCF) failures in materials used in rotating components of gas turbine engines have often been found to be attributable to fatigue loading on materials which have sustained damage from other sources. Damage can be present in the form of initial material or manufacturing defects, or can develop during service operation. Three major sources of in-service damage have been identified which can alter the HCF resistance individually or in conjunction with one another: Low cycle fatigue (LCF), foreign object damage (fod) and fretting. Methodologies for treating such damage in establishing material allowables are considered. Some recent results on the effects of damage on the Haigh diagram and a discussion of the life management aspects of HCF are presented.
Author
Damage; Defects; Fatigue (Materials); Fatigue Life; Foreign Bodies; Gas Turbine Engines; Life (Durability); Engine Failure; Operational Hazards

19990070395 Rolls-Royce Ltd., Turbine Systems-Engineering, Bristol, UK
Cost Benefit Analysis for the Use of Better Turbine Materials and Technology Including Predicted Life Improvements
Williams, T. J., Rolls-Royce Ltd., UK; March 1999; 6p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

The new materials and technologies being identified to give an improved engine product have a number of interacting effects. For example, a more advanced turbine blade cooling system may offer improved performance and or life but may also increase the cost of each blade. Life cycle cost methods are used in the aero engine industry to establish the overall operating cost for a particular engine / airframe combination. As the name implies the total cost of operation of the engine over its scheduled service life can be established. This paper will demonstrate how the use of life cycle costing techniques at the early stage of life extension proposals can influence the design and lead to a more economic design solution. In the study the effect of initial costs (material and manufacture) were traded against performance and life improvement to optimize the most cost effective design. The results of the study have been used to identify what manufacturing cost reduction must be achieved to benefit fully from performance and life improvements during the overall life of the engine.
Author
Cost Effectiveness; Cost Reduction; Turbine Blades; Technology Assessment; Life (Durability); Service Life; Life Cycle Costs

19990070396 Vlaamse Instelling voor Technologisch Onderzoek, Mol, Belgium
Low Friction Diamond-Like Carbon Coatings for Engine Applications
Smeets, J., Vlaamse Instelling voor Technologisch Onderzoek, Belgium; March 1999; 3p; In English; See also 19990070390;

Copyright Waived; Avail: CASI; A01, Hardcopy; A02, Microfiche

The presentation discusses the low friction diamond-like carbon coatings and deposition methods for engine applications. The three types of coating types discussed are: (1) pure diamond-like Carbon, (2) doped diamond like carbon and (3) Gradient and multilayer coatings. The properties of each of the three coating types is reviewed. Six characteristics of vapor based deposition technology are discussed deposition methods are reviewed: (1) vacuum technology; (2) Physical Vapor Deposition (PVD), starting from solids; (3) Chemical vapor deposition, starting from gases; (4) flux of radicals and ions to the substrate (5) ion flux/ion energy determines film properties, and (6) Plasma assisted CVD (PACVD), with particular attention being paid to the characteristics of PACVD. The possible applications in many areas for low friction diamond-like carbon coatings are reviewed. Specific attention is paid to the use of the coatings on engine powertrain components. In conclusion the talk reviews the diamond like carbon coatings properties, and the engine applications. This is presented in view graph format.

CASI

Coating; Deposition; Diamonds; Engine Parts; Vapor Deposition; Diamond Films; Vacuum Deposition

19990070399 Liburdi Engineering Ltd., Dundas, Ontario Canada

Enabling Technologies for Turbine Component Life Extension

Liburdi, J., Liburdi Engineering Ltd., Canada; March 1999; 7p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

The evolution in materials and turbine design has resulted in the parallel development of advanced equipment and processes capable of manufacturing and repairing the critical engine components. Modern, vision based automated welding systems are now essential for precise , low heat welding of crack sensitive alloy, while unique powder metallurgy process such as LPM-TM allows repairs to be engineered for higher localized strength or better wear properties such as abrasive tips. Significant changes have also occurred in the stripping and coating processes with the introduction of sophisticated vapor based technologies that are beyond reach of smaller repair facilities. The availability and costs associated with these enabling technologies, along with the difficulty in obtaining approvals, will serve to further consolidate the industry and restrict the sources for advanced component repairs.

Author

Engine Parts; Maintenance; Turbines; Welding; Powder Metallurgy; Turbine Blades; Brazing; Coating

19990070400 Orenda Aerospace Corp., Advanced Materials and Energy Systems, Gloucester, Ontario Canada

Development of a Qualification Methodology for Advanced Gas Turbine Engine Repairs/Reworks

Patnaik, P. C., Orenda Aerospace Corp., Canada; Thamburaj, R., Orenda Aerospace Corp., Canada; March 1999; 11p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

In this paper the engine and component qualification test requirements with specific application to component repairs/reworks of Civilian and US military specifications and standards for turboshaft, turboprop, turbofan and turbojet engines have been reviewed and a methodology developed. Having identified that repairs were feasible and cost beneficial, a review of civil and military airworthiness guidance was conducted in order to identify a process that would ensure that a high state of airworthiness was maintained and which would easily translate to civil requirements. Failure mode, effects and criticality analysis, as a reliability analysis tool, for Gas Turbines has been developed for component repair/reworks. As part of the development of a FMECA engineering tool, a specific procedure has been developed for performing FMECA on various type of gas turbines, including turbojet, turbofan, turboshaft and turboprop engines. According to the specification established by Orenda and GasTOPS (the sub-contactor), the developed software contains the following: (1) System definition with iconic display, (2) Complete FMEA capable to use either hardware or functional approach or a combination of both, (3) Complete CA capability with either qualitative or quantitative method and, (4) FMECA report format to help the users to generate a complete FMECA report. The software is a generic FMECA tool for the applications to various types of aircraft engine systems, including turbojet, turbofan, turboshaft turboprop and etc. The test of the software has been carried out by both GasTOPS and Orenda using a set of F-404 data. In terms of a Qualification Methodology Development, coupon, component and full scale engine testing are required by all standards to show compliance with the structural integrity and durability requirements (e.g. low cycle fatigue, high cycle fatigue, creep, vibration, containment) for gas path structural components under different environmental operating conditions. An Engine Repair Structural Integrity Program (ERSIP) Standard was proposed which is an integral part of the Qualification Methodology for engine component repairs. The ERSIP Standard incorporates the damage tolerance concept as required in MIL-STD-1783 (USAF-Engine Structural Integrity Program (ENSIP)). The ENSIP Standard establishes the repair development and repair qualification tests to ensure structural integrity and performance throughout the repair life cycle.

Author

Engine Tests; Equipment Specifications; Failure Analysis; Turbojet Engines; Turboprop Engines; Turboshafts; Structural Failure; Maintenance; Life (Durability)

19990070401 Lufthansa Technik A.G., Hamburg, Germany

Advanced Recontouring Process for Compressor Blades

Panten, M., Lufthansa Technik A.G., Germany; Hoenen, H., Technische Hochschule, Germany; March 1999; 5p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A01, Hardcopy; A02, Microfiche

This paper deals with the re-contouring of the leading edges contours of compressor airfoils by application of a newly developed method for the profile definition. Lufthansa Technik AG and the Institute of Jet Propulsion and Turbomachinery, Aachen University of technology have developed the Advanced Recontouring Process (ARP) which is an automated inspection and grinding process to produce defined and airflow optimized leading edge profiles with high reproducibility.

Author

Air Flow; Airfoils; Compressor Blades; Contours; Jet Propulsion; Turbomachinery; Leading Edges; Erosion; Forming Techniques

19990070402 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, CFM56 Product Support, Melun, France

Repair Developments to Fit Customer Needs

Burlon, Daniel, Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, France; March 1999; 3p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A01, Hardcopy; A02, Microfiche

This presentation describes the repair development process from identification of repair needs to repaired parts installed on an engine. The key factors in this process will be identified and economical inputs will be highlighted. The presentation will show how and why Snecma-services involves customers in identification of repair need and in the evaluation process. This process is called : Top Repair Program.

Author

Aircraft Maintenance; Deterioration; Identifying; Fault Detection; Ground Support Equipment; Shops

19990070403 General Electric Co., Aircraft Engines, Cincinnati, OH USA

Fracture Mechanics Evaluation of Weld Repaired Seal Teeth for Life Extension of Aircraft Gas Turbine Engine Components

Domas, P. A., General Electric Co., USA; March 1999; 8p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

Typical aircraft gas turbine engine rotating air seals incorporate radial protruding, knife-like, circumferential seal teeth at the outer diameter that intrude into a surrounding abradable shroud, forming a seal to unwanted air passage. The thin teeth are susceptible to wear in operation and nicks and dents during assembly and disassembly for overhaul. It is economically desirable to be able to repair such worn or damaged seals for return to service. A potential repair process is to grind down the tip of a damaged tooth, rebuild it with overlaid layers of similar alloy weld metal and machine the built up material back to final shape. A complication is that the weld material may contain porosity or other microstructural features that can act as a surface or subsurface fatigue crack initiation sites and limit the cyclic life capability of a repaired tooth. This paper discusses an experimental fatigue test program and associated test specimen and component fracture mechanics analyses conducted to assess the viability of a seal tooth weld repair process. The role of simulated component fatigue testing, nondestructive evaluation, fatigue and residual life prediction, and design trade studies in determination of life extension plans is discussed. Complication and issues that arise and potential means of addressing these are emphasized.

Author

Crack Initiation; Engine Parts; Fatigue Tests; Fracture Mechanics; Gas Turbine Engines; Life (Durability); Nondestructive Tests; Seals (Stoppers); Surface Cracks; Wear

19990070405 Defence Evaluation Research Agency, Farnborough, UK

The Development of Life Extension Methods for Fracture Critical Aero-Engine Components

Boyd–Lee, A. D., Defence Evaluation Research Agency, UK; Harrison, G. F., Defence Evaluation Research Agency, UK; March 1999; 10p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

Service experience and the rapid advancement of understanding frequently prompt revisions of the declared service lives for aeroengine components. Downward revisions can occur because: 1) ex-service disc tests show that engine operation is harder on components than was estimated at design; 2) in-service cracks, catastrophic failures, and ex-service testing show that some failure mechanisms differ from those identified at design; 3) improvements to service usage models has resulted in more conservative exchange rates; 4) refined analyses for some components show the operating stresses are higher than those estimated at design; and 5) some component design modifications cause a change in a life limiting critical area, etc. From whatever cause, the imposition of service life reductions often results in unexpected component life expires. The resulting costs of grounding the aircraft and

of engine removal can be many times greater than the component replacement costs. Thus, demand for life extensions is usually aimed at life reduced parts. Three life extension methods developed to meet this need are presented. Firstly, methods of life extension for crack tolerant component designs are outlined. Secondly, a robust statistical method for exploitation of non-finite results is demonstrated to provide significant life extensions. (A non-finite result is associated with a test stopped before reaching the desired component dysfunction point). Finally, in view of the importance of risk assessment modelling in the more critical cases, the derivation of a risk of fatigue failure model is presented. In this paper, the life-to-first-crack concept and the '2/3 dysfunction' criterion are used as standard 'reference lives' or 'stakes in the ground' relative to which life extensions are measured.
Author
Technology Assessment; Service Life; Failure; Aircraft Engines

19990070406 Motoren- und Turbinen-Union G.m.b.H., Dept. TPMR and TPMM, Munich, Germany
Critical Parts' Life Extension Based on Fracture Mechanics
Blueml, Peter, Motoren- und Turbinen-Union G.m.b.H., Germany; Broede, Juergen, Motoren- und Turbinen-Union G.m.b.H., Germany; March 1999; 7p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

The classical method for fracture critical parts lifing is the safe life approach, where 'safe life' in fact means safe crack initiation life. In many cases, the released life of a critical part can be extended if the lifing concept is supplemented with the safe crack propagation life approach. In particular, if the life limiting area of a part possesses substantial damage tolerance capability, the possible parts' life extension will be significant. The underlying safety criteria and the statistical treatment of the test results for both the approaches are equivalent, but for prediction of the crack propagation life the application of fracture mechanics methods and the knowledge of material crack growth behaviour are necessary. Crack growth is directly related to the stress intensity factor. The stress intensity factor itself depends on the currently applied stress field (which in turn depends on mechanical and thermal loading), the geometry of the component, and the current shape of the crack front. Load and crack front shape vary with time. Two methods are discussed how the stress intensity factor can be obtained, namely experimentally from crack growth tests of the real component or analytically from 3D finite element calculations. Service life of an aero engine component is determined by its released life and its life consumption caused by operational usage. Therefore, it is important to monitor the operational usage either by on-board monitoring devices or by the application of adequate cyclic exchange rates (r-factors). Experience gained with the RB199 IP compressor and IP turbine (where this safe crack propagation life approach is utilized) shows that crack propagation -factors are by a factor of 2 - 3 higher than crack initiation ,B-factors. Nevertheless, the achieved life extension in terms of engine flying hours is about 40%.
Author
Rates (Per Time); Tolerances (Mechanics); Aircraft Engines; Life (Durability); Fracture Mechanics; Service Life

19990070407 NASA Lewis Research Center, Cleveland, OH USA
Damage Tolerance and Reliability of Turbine Engine Components
Chamis, Christos C., NASA Lewis Research Center, USA; March 1999; 13p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

A formal method is described to quantify structural damage tolerance and reliability in the presence of multitude of uncertainties in turbine engine components. The method is based at the materials behaviour level where primitive variables with their respective scatters are used to describe the behavior. Computational simulation is then used to propagate those uncertainties to the structural scale where damage tolerance and reliability are usually specified. Several sample cases are described to illustrate the effectiveness, versatility, and maturity of the method. Typical results from these methods demonstrate that the methods are mature and that they can be used for future strategic projections and planning to assure better, cheaper, faster, products for competitive advantages in world markets. These results also indicate that the methods are suitable for predicting remaining life in aging or deteriorating structures.
Author
Damage; Deterioration; Engine Parts; Management Planning; Predictions; Reliability; Turbine Engines; Aircraft Maintenance; Simulation; Failure Modes; Structural Analysis; Probability Theory; Damage Assessment

19990070408 Technical Univ. of Lisbon, Portugal
Life Extension Methodology Based on Creep-Fatigue Models
Branco, C. Moura, Technical Univ. of Lisbon, Portugal; SousaeBrito, A., Technical Univ. of Lisbon, Portugal; Byrne, J., Portsmouth Univ., UK; March 1999; 19p; In English; See also 19990070390
Contract(s)/Grant(s): AGARD Proj. P111; Proj. CCI Defesa 07/91; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The first part of this paper presents the results of a detailed study carried out in the nickel base superalloy IN718 used in turbine discs where fatigue and creep crack growth rate data (FCGR and CCGR) was obtained at 600C in CT and CC specimens tested at different values of stress ration and dwell time at maximum load (frequency). In the second part of the paper a presentation is made of creep-fatigue models and also the results obtained with a computer program developed by the authors, which is able to make a comparison between the experimental data obtained for the FCGR in creep-fatigue situation and the equivalent results predicted by the models. This methodology can be directly used, with great advantages, in predictions of life extension in flawed components.
Author
Computer Programs; Crack Propagation; Creep Properties; Heat Resistant Alloys; Nickel Alloys; Turbines; Disks; Cracking (Fracturing); Fatigue (Materials); Mathematical Models; Aircraft Maintenance

19990070432 Defence Science and Technology Organisation, Airframes and Engines Div., Melbourne, Australia
Engine Gas Path Condition Assessment
Frith, Peter, Defence Science and Technology Organisation, Australia; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 125-135; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

Contents include the following: engine diagnostic and acceptance system, interactive fault diagnosis isolation system, and automated diagnostic and acceptance test system.
CASI
Helicopter Control; Gas Path Analysis; Engine Monitoring Instruments

19990071048 Defence Evaluation Research Agency, Propulsion Dept., Farnborough, UK
A Synthesis of NASA Compressor Rotor 37 Using a 3D CFD Code
Calvert, W. John, Defence Evaluation Research Agency, UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 6.1 - 6.11; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

CFD codes are now an essential part of the design system for the turbomachinery of modern gas turbine engines. In order to gain the maximum benefit from the codes it is necessary to study their application to representative test cases. In this way the code performance can be evaluated, best practice can be formulated and requirements for future improvements can be identified. NASA rotor 37 is one of the best high-speed compressor cases currently available. Detailed measurements of its performance were taken by NASA in order to provide a blind test case for an ASME exercise on CFD code evaluation, and further studies have since been carried out by NASA and by an AGARD Working Group. Despite this, there are still uncertainties about some aspects of the flow and it is necessary to interpret the data carefully. At DERA the case has been used in developing the TRANSCode 3D viscous flow code to provide more accurate predictions of transonic flows in axial compressors. Initial calculations using the Baldwin - Lomax algebraic turbulence model were consistent with the results from other codes using this model and overestimated the rotor pressure ratio. Calculations using the Spalart - Allmaras one-equation model are more successful and suggest that laminar flow and transition are important features in rotor 37, as well as shock wave/boundary layer interactions. Inclusion of the hub leakage flow effects identified by NASA is also necessary, and heat transfer to the CASIng may be a factor. It is hoped that the discussions of these effects will help other workers using this test case.
Author
Computational Fluid Dynamics; Compressor Rotors; Three Dimensional Flow; Turbocompressors; Gas Turbine Engines; Engine Design

19990071050 Rolls-Royce Ltd., Derby, UK
The Effect of Pressure Probe Characteristics on the Validation of Modelled Aero-Engine Compressor Blades
Smout, P. D., Rolls-Royce Ltd., UK; Ivey, P. C., Cranfield Univ., UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 8.1 - 8.14; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

Three dimensional, viscous flow solvers are finding increasing use in the design of aero-engine compressor blading. Low-speed, large scale compressor rig testing offers a cost effective means of validating these design methods, but requires instrumentation capable of returning reliable and repeatable measurements of the highly complex flow fields. This paper reviews some of the uncertainties associated with diagnostic techniques commonly used in low speed compressor testing. In particular, cobra and wedge type pressure probes fail to measure the correct static pressure and yaw angle when close to the compressor outer annulus wall. Parametric studies supported by flow visualisation and a CFD solution of the local flow field were undertaken to understand

this so called ’wall-proximity’ effect, and are presented here. A method for correcting this effect by adjusting the probe calibration maps is developed. The paper concludes by considering the implications of this in validating compressor design methods.
Author
Compressor Blades; Three Dimensional Flow; Mathematical Models; Flow Distribution; Pressure Sensors

19990071051 Defence Evaluation Research Agency, Propulsion Dept., Farnborough, UK
Low-Speed Compressor Tests for Code Validation and for Simulating High-Speed Designs
Lyes, P. A., Defence Evaluation Research Agency, UK; Ginder, R. B., Defence Evaluation Research Agency, UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 9.1 - 9.11; In English; See also 19990071044; Original contains color illustrations; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

This paper describes the use of low-speed multi-stage compressor testing to simulate the aerodynamics of high-speed designs and also to validate 3D (three dimensional) viscous modelling methods employed for both analysis and design. It covers two design/test programmes that have been carried out by DERA on a 4-stage low-speed research compressor at Cranfield University. The first set of tests involved conventional blading whose design was based on an embedded stage from the DERA C 147 highly-loaded high-speed compressor. The intention was to investigate the relevance of low-speed testing by acquiring detailed aerodynamic measurements and undertaking comparisons with corresponding high-speed data. The opportunity was also taken to use the low-speed test data to validate flowfield predictions carried out using the DERA TRANSCode 3D viscous solver. This work gave encouragement that the low-speed environment was representative and that the modelling, although suffering from some shortcomings, was adequate. It also gave sufficient confidence to redesign the low speed blading using the 3D CFD, with the principal aim of reducing the aerodynamic losses in the critical end-wall regions. This revised blading was manufactured and tested for comparison with the datum build results and with design predictions, providing the opportunity to verify use of the code for design purposes. The paper overviews the design of both the datum and advanced low-speed blading standards. It then describes the comparisons undertaken for the datum build with both CFD predictions and high-speed data, and gives predictions and preliminary test results for the advanced blading. Important conclusions are drawn concerning the degree to which low-speed testing is relevant and the applicability of the CFD modelling method employed.
Author
Performance Tests; Applications Programs (Computers); Program Verification (Computers); Computerized Simulation; Turbocompressors; Design Analysis

19990071054 Oxford Univ., Dept. of Engineering Science, Oxford, UK
Experimental Simulation and Numerical Modelling of Foreign Object Damage in Aircraft Gas Turbines
Williams, D. P., Oxford Univ., UK; Nowell, D., Oxford Univ., UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 12.1 - 12.8; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The programme of work outlined in this paper is designed to help gain a deeper understanding of the mechanisms involved in Foreign Object Damage (or FOD) sustained by jet engines during their service lives. A ballistic facility has been developed at the University Technology Centre for Solid Mechanics in Oxford that is capable of reproducing, on test blades, damage equivalent to that seen in service. The gas gun is used to fire steel balls of various sizes at the leading edges of stationary compressor blades. Several sets of experiments have been performed to investigate the type of damage resulting from different velocities of the projectile. Three categories of damage have been observed; a dent, a dent with a tear and a complete perforation. A set of 15 damaged blades (5 of each damage category) have been fatigue tested at Rolls-Royce in Bristol. Fatigue cracks have been seen to initiate from the damaged area and then propagate towards the trailing edge of the blade in a straight line. It was found that the ”dent and tear” was the type of damage most detrimental to fatigue life. The ”dent” and ”perforation” categories showed similar fatigue lives. In parallel with the experimental work, the numerical modelling package ’Dyna3D’ has been used to simulate the impact experiments on computer. This finite element package has proved capable of recreating the plastic deformation seen in the damage zone, although further work is in progress to model the tearing and failure of the material that occurs during the higher velocity impacts.
Author
Mathematical Models; Damage; Gas Turbine Engines; Aircraft Engines; Foreign Bodies; Computerized Simulation

19990071055 Nottingham Univ., Dept. of Mechanical Engineering, UK
Elastic-Plastic Buckling of Shafts
Robotham, W. S., Nottingham Univ., UK; Hyde, T. H., Nottingham Univ., UK; Williams, E. J., Nottingham Univ., UK; Taylor,

J. W., Rolls-Royce Ltd., UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 14.1 - 14.14; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

There is an ever increasing demand for more powerful and efficient aero-engines. One result of these demands is the need to consider ways of increasing the torque transmitted by shafts, whilst also reducing their dimensions and weight. This need for ever lighter, higher performance shafts and the use of features such as the triple spool engine configuration, can result in the shafts being relatively thin walled. A research project has been carried out to investigate the factors influencing the instability, in particular, the torsional buckling of shaft sections in order to provide the basis for an improved analysis method applicable to typical gas turbine aero-engine components. The analysis part of the research was conducted by the Finite Element Method (FEM) using ABAQUS version 5.6 (a nonlinear FE software package). Validation was achieved by using the results of a limited number of experimental tests. An analysis method has been developed which involves the use of a perturbation approach to model the geometric imperfections in plain shafts. The perturbations are based upon the buckling mode shapes calculated by eigenvalue analyses. Parametric analyses of plain shafts and shafts with holes have been performed. This paper contains the results of these parametric analyses and the validatory experimental test results.

Author

Engine Parts; Shafts (Machine Elements); Torque; Elastic Properties; Plastic Properties; Finite Element Method; Elastic Buckling; Applications Programs (Computers)

19990071056 Eidgenoessische Technische Hochschule, Turbomachinery Lab., Zurich, Switzerland

Towards Reliable Computations for a Subsonic Turbine

Casciaro, C., Eidgenoessische Technische Hochschule, Switzerland; Sell, M., Eidgenoessische Technische Hochschule, Switzerland; Gyarmathy, G., Eidgenoessische Technische Hochschule, Switzerland; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 15.1 - 15.10; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The research aim is to identify and clarify those issues affecting code assessment in turbine steady and subsonic flow regime. In order to validate tools and methodology a detailed and precise data set obtained in the Annular Cascade Test Stand of the ETH Turbomachinery Laboratory, Zurich, Switzerland with a single prismatic blade row in steady flow has been critically contrasted to the results. Many points of interest have been considered covering a wide area of computational issues. Three operating points in the subsonic regime have been investigated and, for one of these, tip clearance effects have been investigated by varying the gap height. The flow has been computed in a two- and three dimensional domain; as viscous and inviscid; laminar and fully turbulent. In the latter computations the Kato-Launder and k-epsilon models have been compared and the inlet free-stream turbulence values varied. As commercial codes generally apply wall laws, the logarithmic velocity profile is set against a two layer model. Under a numerical point of view first the effects of grid refinement have been addressed. Furthermore the importance of high-order numerical smoothing schemes is shown. In fact the ultimate aim of the work is not to produce computations which, through very fine meshes or high order schemes are computationally unfeasible within an industrial design context, but to produce clear, unambiguous advice as how to achieve the best results with currently available industrial tools.

Author

Computation; Subsonic Flow; Velocity Distribution; Computational Grids; K-Epsilon Turbulence Model; Gas Turbines

19990071057 Motoren- und Turbinen-Union G.m.b.H., Munich, Germany

Experimental Investigations into Turbo Engine Designs

Heitmeir, F. J., Motoren- und Turbinen-Union G.m.b.H., Germany; Radons, U., Motoren- und Turbinen-Union G.m.b.H., Germany; Heisler, A., Motoren- und Turbinen-Union G.m.b.H., Germany; Artmeier, M., Motoren- und Turbinen-Union G.m.b.H., Germany; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 16.1 - 16.9; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The ever increasing demands in terms of performance and cost-effectiveness have taken the advanced aero engine to the limits of what is technologically feasible. On the other hand, decreasing profits require, among other things, a highly efficient development phase. With the emergence of computer systems with enhanced capabilities analytical predictions have become a valuable development tool. Highly sophisticated programs are available, which allow a great variety of physical effects to be precisely predicted. This was not conceivable a decade ago. Despite the wide-spread use of analytical predictions, experiments and tests are still indispensable. The verification and adjustment of the highly sophisticated analytical tools as well as system verifications still require complex test items to be tested in even more complex test facilities. This calls for an integrated approach and a highly skilled workforce. This paper gives at first a rough overview of the different fields in which testing is mandatory to ensure an

efficient engine development process. One important goal is the optimization of the engine cooling air system. High-pressure turbine vanes are highly-loaded components with a sophisticated internal cooling system. Knowledge of the heat transfer coefficients is therefore essential to ensure the design life of the turbine vanes on the one hand and to avoid overcooling which would adversely affect engine efficiency on the other hand. A unique procedure is presented for the heat transfer analysis in very complex geometries such as internal cooling structures or film cooled structures. The second example covers the optimization of low-pressure turbines. Although turbine efficiencies appear to have reached a point where no further improvement is possible analytical predictions have shown that, in efficiency of low-pressure turbines by optimizing the stator vane positions. to verify this, an experimental investigation with a dedicated test set up was performed.
Author
Experimentation; Design Analysis; Turbines; Aircraft Engines; Turbojet Engines; Cost Effectiveness; Performance Tests; Prediction Analysis Techniques; Engine Design

19990071058 Rolls-Royce Ltd., Turbine Engine Systems, Bristol, UK
Validation of Advanced Computational Fluid Dynamics in the Design of Military Turbines
Gwilliam, N. J., Rolls-Royce Ltd., UK; Kingston, T. R., Rolls-Royce Ltd., UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 17.1 - 17.11; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

Today's design of turbine blade challenges the designer to meet the demanding requirements of overall increase in engine performance - more power for the same weight, greater engine efficiency and fuel economy. This has resulted in designs to cater for higher blade loading and faster rotational speeds. to achieve this, highlift shroudless designs are being adopted. One of the greatest challenges to the aerodynamic designer is the design of such blading so that the additional losses incurred, shock losses, greater secondary flows and susceptability to tip clearance are minimized. to do so, it is essential to be able to carry out an accurate three-dimensional analysis of the flow within the stage. This is achieved using computational fluid dynamics. This paper aims to describe and evaluate some of the tools available at Rolls Royce plc. for the numerical simulation of turbine flows. It was generated as part of a study to analyse a 'datum' and 'highlift' HP (high pressure) turbine, so as to establish both where losses occurred, and which CFD (Computational Fluid Dynamics) codes could best analyse the blading.
Author
Computational Fluid Dynamics; Design Analysis; Military Technology; Computerized Simulation; Gas Turbines; Engine Design

19990071059 Defence Evaluation Research Agency, Farnborough, UK
An Evaluation of the Performance of a Modern Shroudless HP Turbine Using Unsteady CFD
Smith, G. C., Defence Evaluation Research Agency, UK; Stapleton, A. W., Defence Evaluation Research Agency, UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 18.1 - 18.11; In English; See also 19990071044; Original contains color illustrations
Contract(s)/Grant(s): CEC-AER2-CT92-0044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

This paper presents a CFD analysis of the unsteady aerodynamics of an HP turbine, and compares the results with experimental data acquired on a transient turbine test facility. The 2D code UNSFLO and the 3D code Un-NEWT are shown to agree well with the measured mid span unsteady pressures. Use of these solutions to interpret the measured data indicates that the rotor pressure surface is strongly influenced by the NGV potential flow field, while the suction surface shows evidence of a wake shock/interaction. Loss generation within the stage is shown to be concentrated at the end walls, with the rotor tip leakage flow being a major contributor. The Un-NEWT solution was modified to include a hot streak at stage inlet, representative of the exit temperature profile of a modern military combustor. Hot/cold fluid segregation is shown to occur in the rotor passage. Hot fluid migrates to the pressure surface, and is drawn over the tip of the unshrouded rotor, giving the potential for locally high heat transfer.
Author
Gas Turbines; Shock Wave Interaction; Heat Transfer; Flow Distribution; Computational Fluid Dynamics; Unsteady Flow; Applications Programs (Computers); Program Verification (Computers)

19990071176 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
Large Engine Uncontained Debris Analysis *Final Report*
Franeknberger, C. E.; May 1999; 100p; In English
Contract(s)/Grant(s): DTFA-03-95-X-90019
Report No.(s): PB99-154569; DOT/FAA/AR-99/11; No Copyright; Avail: CASI; A02, Microfiche; A05, Hardcopy

The Naval Air Warfare Center has conducted an analysis to define the characteristics of large commercial transport turbine engine uncontained debris. The objective of the analysis was to define the debris size, weight, exit velocity, and trajectory that can be used to update Advisory Circular (AC) 20-128A. The effort was conducted by gathering historical data from uncontained engine failures. This data included, when available, phase of flight, engine operating condition, the failed engine component, aircraft damage location, and damage size. With this basic information, debris size was correlated to damage size. A methodology was developed to estimate debris exit velocity. Representative engine cases and cowls were defined and existing ballistic penetration equations used to calculate debris exit velocity. This analysis was conducted for disk and blade failures on fan, compressor, and turbine components. Looking at the debris trajectories, the analysis shows that the trajectories defined in AC20-128A are too narrow and should be expanded significantly. Also, the analysis highlights the fact that during an uncontained event the aircraft is subjected to multiple 'small' fragment impacts, not just a single impact. It is the combined effects from the small fragments that pose the highest hazard potential to the aircraft.
NTIS
Aircraft Engines; Turbine Engines; Debris; Engine Design; Trajectory Analysis

08
AIRCRAFT STABILITY AND CONTROL

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

19990071177 Aerotech Engineering and Research, Lawrence, KS USA
Prediction of Antisymmetric Buffet Loads on Horizontal Stabilizers in Massively Separated Flows, Phase 2 ***Final Report***
Farokhi, S.; Mirsafian, S.; Sherwood, T.; Ewing, M.; May 1999; 154p; In English
Contract(s)/Grant(s): DTRS-57-95-C-00091
Report No.(s): PB99-154478; DOT/FAA/AR-99/27; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy
The Federal Aviation Administration (FAA) has a continuing program to collect data and develop predictive methods for aircraft flight loads. Some of the most severe and potentially catastrophic flight loads are produced by separated flows. Structural response to the aerodynamic excitation produced by separated flow is defined as buffeting.
NTIS
Buffeting; Stabilizers (Fluid Dynamics); Wind Tunnel Tests; Prediction Analysis Techniques; Separated Flow; Aerodynamic Loads; Antisymmetry

19990071215 NASA Langley Research Center, Hampton, VA USA
Advanced Aerodynamic Control Effectors
Wood, Richard M., NASA Langley Research Center, USA; 1999; 14p; In English; 1999 World Aviation Congress, 19-21 Oct. 1999, San Francisco, CA, USA; Sponsored by Society for Automotive Engineers, Inc.
Report No.(s): SAE-1999-01-5619; Copyright; Avail: Issuing Activity, Hardcopy
A 1990 research program that focused on the development of advanced aerodynamic control effectors (MCE) for military aircraft has been reviewed and summarized. Data are presented for advanced planform, flow control, and surface contouring technologies. The data show significant increases in lift, reductions in drag, and increased control power, compared to typical aerodynamic designs. The results presented also highlighted the importance of planform selection in the design of a control effector suite. Planform data showed that dramatic increases in lift (greater than 25%) can be achieved with multiple wings and a sawtooth forebody. Passive porosity and micro drag generator control effector data showed control power levels exceeding that available from typical effectors (moving surfaces). Application of an advanced planform to a tailless concept showed benefits of similar magnitude as those observed in the generic studies.
Author
Research; Aerodynamics; Product Development; Control Boards

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information see also 14 Ground Support Systems and Facilities (Space).

19990071195 NASA Glenn Research Center, Cleveland, OH USA
NASA Glenn 1-by 1-Foot Supersonic Wind Tunnel User Manual
Seablom, Kirk D., NASA Glenn Research Center, USA; Soeder, Ronald H., NASA Glenn Research Center, USA; Stark, David E., NASA Glenn Research Center, USA; Leone, John F. X., NASA Glenn Research Center, USA; Henry, Michael W., NYMA, Inc., USA; April 1999; 32p; In English
Contract(s)/Grant(s): RTOP 523-91-13
Report No.(s): NASA/TM-1999-208478; NAS 1.15:208478; E-11251; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This manual describes the NASA Glenn Research Center's 1 - by 1 -Foot Supersonic Wind Tunnel and provides information for customers who wish to conduct experiments in this facility. Tunnel performance envelopes of total pressure, total temperature, and dynamic pressure as a function of test section Mach number are presented. For each Mach number, maps are presented of Reynolds number per foot as a function of the total air temperature at the test section inlet for constant total air pressure at the inlet. General support systems-such as the service air, combustion air, altitude exhaust system, auxiliary bleed system, model hydraulic system, schlieren system, model pressure-sensitive paint, and laser sheet system are discussed. In addition, instrumentation and data processing, acquisition systems are described, pretest meeting formats and schedules are outlined, and customer responsibilities and personnel safety are addressed.
Author
Mach Number; Reynolds Number; Supersonic Wind Tunnels; Supersonic Flow; Test Chambers; Data Acquisition; Manuals

19990073060 Communications Research Lab., Tokyo, Japan
Anechoic Chamber for VHF and UHF Bands
Morikawa, Takao, Communications Research Lab., Japan; Sugiura, Akira, Communications Research Lab., Japan; Harima, Katsushige, Communications Research Lab., Japan; Masuzawa, Hiroshi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 109-116; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Built in 1969, the anechoic chamber of CRL has been used to the fullest by researchers in many fields such as EMI, EMC, antenna design, standard of electric field intensity, and type approval testing. In particular, in the early days of space development in Japan, many satellite-born antennas were developed in this anechoic chamber. However, a quarter of a century has passed since its construction and deteriorated performance due to superannuation sometimes caused difficulties in experiments conducted in the chamber. In 1993, CRL constructed a Measuring Facility for Radio Research (MFRR) and the anechoic chamber for VHF-UHF bands was remodeled as one of the sub-facilities of MFRR. The remodeling work included full replacement of the electromagnetic shielding, absorbers and measurement system. Since the remodeled anechoic chamber is being used not only for EMI tests but also for other purposes, a full-anechoic chamber has been adopted. In addition the antenna positioner can be housed under the floor absorbers to create an ideal free space. The chamber has been designed for the frequency range between 30 MHz and 10 GHz. After the remodeling work, the performance of the chamber is greatly improved. The average shielding factor is better than 85 dB for all frequency ranges and the unwanted reflection characteristic is -30 dB for frequencies above 1 GHZ. This paper summarizes the remodeling work, and the specifications and performance of the remodeled anechoic chamber.
Author
Anechoic Chambers; Replacing; Construction; Military Air Facilities; Ultrahigh Frequencies

19990073061 Communications Research Lab., Tokyo, Japan
An Anechoic Chamber for SHF and EHF Bands
Fujino, Yoshiyuki, Communications Research Lab., Japan; Fujita, Masaharu, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 117-123; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A small scale radio anechoic chamber was constructed for antenna measurement and/or EMC measurement in the SHF and EHF bands. This paper summarizes special features of the anechoic chamber, and gives detailed explanations of the chamber, measurement system, and measurement software.
Author
Anechoic Chambers; Extremely High Frequencies; Superhigh Frequencies; Construction; Scale (Ratio)

19990073063 Communications Research Lab., Tokyo, Japan
Open-Field Test Site
Gyoda, Koichi, Communications Research Lab., Japan; Shinozuka, Takashi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 139-150; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

An open-field test site with measurement equipment, a turn table, antenna positions and measurement auxiliary equipment was remodeled at the CRL north-site. This paper introduces the configuration, specifications and characteristics of this new open-field test site. Measured 3-m and 10-m site attenuations are in good agreement with theoretical values, and this means that this site is suitable for using 3-m and 10-m method EMI/EMC measurements. This site is expected to be effective for antenna measurement, antenna calibration, and studies on EMI/EMC measurement methods.
Author
Specifications; Measuring Instruments; Manufacturing; Military Air Facilities

12
ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

19990071192 NASA Goddard Space Flight Center, Greenbelt, MD USA
Autonomous Formation Flying from Ground to Flight
Chapman, Keith B., AI Solutions, Inc., USA; Dell, Gregory T., AI Solutions, Inc., USA; Rosenberg, Duane L., AI Solutions, Inc., USA; Bristow, John, NASA Goddard Space Flight Center, USA; 1999; In English; FMET, May 1999, Greenbelt, MD, USA; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The cost of on-orbit operations remains a significant and increasingly visible concern in the support of satellite missions. Headway has been made in automating some ground operations; however, increased mission complexity and more precise orbital constraints have compelled continuing human involvement in mission design and maneuver planning operations. AI Solutions, Inc. in cooperation with the National Aeronautics and Space Administration's (NASA) Goddard Space Flight Center (GSFC) has tackled these more complex problems through the development of AutoCon as a tool for an automated solution. NASA is using AutoCon to automate the maneuver planning for the Earth Orbiter-1 (EO-1) mission. AutoCon was developed originally as a ground system tool. The EO-1 mission will be using a scaled version of AutoCon on-board the EO-1 satellite to command orbit adjustment maneuvers. The flight version of AutoCon plans maneuvers based on formation flying algorithms developed by GSFC, JPL, and other industry partners. In its fully autonomous mode, an AutoCon planned maneuver will be executed on-board the satellite without intervention from the ground. This paper describes how AutoCon automates maneuver planning for the formation flying constraints of the EO-1 mission. AutoCon was modified in a number of ways to automate the maneuver planning on-board the satellite. This paper describes how the interface and functionality of AutoCon were modified to support the on-board system. A significant component of this modification was the implementation of a data smoother, based on a Kalman filter, that ensures that the spacecraft states estimated by an on-board GPS receiver are as accurate as possible for maneuver planning. This paper also presents the methodology use to scale the AutoCon functionality to fit and execute on the flight hardware. This paper also presents the modes built that allow the incremental phasing in of autonomy. New technologies for autonomous operations are usually received with significant, and probably appropriate trepidation. A number of safeguards have been designed in both AutoCon and the interfacing systems to alleviate the potential of mission-impacting anomalies from the on-board autonomous system. This paper describes the error checking, input data integrity validation and limits set on maneuvers in AutoCon and the on-board system.
Author
Autonomy; Mission Planning; Ground Support Equipment; Orbital Maneuvers; Space Navigation; Satellite Guidance; Automatic Control; Data Processing; Software Engineering; Computer Systems Programs

19990071258 Technische Hochschule, Aachen, Germany

Concerning Space Travel from the Viewpoint of Politics, Industry, Research, and Colleges ***Zur Situation der Raumfahrt aus der Sicht von Politik, Industrie, Forschung und Hochschule***

Hallmann, W., Fachhochschule, Germany; Ley, W, Fachhochschule, Germany; Wittmann, K., Fachhochschule, Germany; Concerning Space Travel from the Viewpoint of Politics, Industry, Research, and Colleges; 1996; 71p; In German; 9th, 22 Nov. 1996, Aachen, Germany; See also 19990071259 through 19990071264

Report No.(s): DGLR-Rept-96-03; KS00220680X; DE01-0237195; ISBN 3-922010-96-2; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This current year's spaceflight colloquium concerned the state of the space program in Germany. The talks given concerned the politics, the industry, the research and the teaching of space flight technology.

CASI

Conferences; Politics; Space Flight; German Space Program; Manned Space Flight

19990071259 Chemie in Bayern, Munich, Germany

A Look Back at German Space Travel 'Where We Are Today and What About the Future?' ***Rueckblick auf die Deutsche Raumfahrt - Wo Stehen Wir Heute, Was ist mit der Zukunft?-***

Hoegenauer, Ernst, Chemie in Bayern, Germany; Concerning Space Travel from the Viewpoint of Politics, Industry, Research, and Colleges; 1996, pp. 2-13; In German; See also 19990071258; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This lecture focuses on a historical review of German space travel from 1960 to the present day. This is why for the most part there is no technical coverage of these years. The lecture briefly presents the most important phases of the development of German space travel, the highlights and the participants involved. Also discussed are the negative results and their effects that occurred during this time. This lecture concludes with an outlook beyond the year 2000.

Author

Histories; German Space Program; Space Flight

19990071260 Deutscher Bundestag, Bonn, Germany

Space Policy from the Viewpoint of the German Parliament ***Die Raumfahrtpolitik aus der Sicht des Deutschen Bundestages***

Rachel, Thomas, Deutscher Bundestag, Germany; Concerning Space Travel from the Viewpoint of Politics, Industry, Research, and Colleges; 1996, pp. 3-20; In German; See also 19990071258; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

To this very day, space travel has not lost any of its fascination as the most demanding and spectacular field of high tech endeavor. The profound significance of space travel, however, to all of us did not really sink in, as far as I was concerned, until I covered the subject in depth as a reporter for aviation and space travel for the Christian Democratic Union/ Christian Social Union Parliamentary Group. Who, after all, is not familiar with the image of the globe, probably the most valuable bequest from Apollo? These pictures of Earth profoundly altered our concepts of the world. due to space travel, we have recognized the uniqueness, and vulnerability of our Earth. If the data from the observation of Earth has been consistently evaluated, it would have been possible to discover the hole in the Ozone layer 10 years earlier.

Author

Politics; Space Flight; German Space Program

19990071261 Fachhochschule, Aachen, Germany

Prospects for Students in (Aviation and) Space Travel? Young Graduate Engineers ***Perspektiven fuer Studierende in der (Luft-und) Raumfahrt? Jungdiplomingenieure-***

Hallmann, W., Fachhochschule, Germany; Ley,W., Fachhochschule, Germany; Concerning Space Travel from the Viewpoint of Politics, Industry, Research, and Colleges; 1996, pp. 42-56; In German; See also 19990071258; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Because of developments in recent years regarding the numbers of prospective students entering the engineering sciences -- especially aviation and space technology -- we must address some critical questions to leaders in colleges, industry, politics and research. The aviation and space industry is marked by a tremendous dynamic change worldwide. Astronautics can no longer be

ignored in view of its outstanding achievements and performances. The influence of space travel has marked our daily life, although the average citizen no longer perceives that fact. But what chance does a young space engineer currently have in getting a job in industry, research or government. Colleges, being responsible for their students, must critically pursue this complex problem. This also calls for more intensive participation and involvement of small- and medium-sized enterprises in astronautics.
Author
Engineers; Students; Aerospace Engineering; Education

19990071262 NASA, Washington, DC USA
Mars: Our Big Objective in Outer Space ***Der Mars: Unser Grosses Ziel im Weltraum***
vonPuttkamer, Jesco, NASA, USA; Concerning Space Travel from the Viewpoint of Politics, Industry, Research, and Colleges; 1996, pp. 57-64; In German; See also 19990071258; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Mars is the fourth planet from the sun. Its war-like, fiery-red appearance has been a part of man's concepts for thousands of years. For centuries, its relative proximity and similarity to Earth has made it a fascinating object of research and the target of science's unrestrained curiosity. The very recent development of presumed forms of life in its past has roused public interest, particularly today. The possibility of life on the neighboring planet is a question that has been posed for hundreds of years. In 1976, this question was once again posed in conjunction with our two successful Viking landing probes. these experiments of course did non answer any questions at all. They did not find life such as we know it, and on the basis of contradictory data, it has not been possible to prove or refute the existence of microscopic life on Mars, today or in the past. But now, we have indications for the first time of some probability that the presence of primitive biota may have been present on Mars more than 3.6 billion years ago. This evidence was discovered deep in a chunk of stone that fell from Mars to Earth in the form of a meteorite 13,000 years ago: organic molecules, plus traces of several minerals tied in with biological activity, as well as possible microscopic fossils of primitive, microbe-like organisms--some egg-shaped, others looking like little tubes or worms and well organized, but tiny when compared to earthly microbes.
Author
Extraterrestrial Life; Mars (Planet); Microorganisms; Mars Environment; Mars Exploration; German Space Program

19990071263 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Microgravity User Support Center, Cologne, Germany
The Mission of MUSC in the Field of Extraterrestrial Research ***Die Aufgabe des MUSC im Bereich der Extraterrestrischen Forschung***
Wittmann, K., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Schmidt, H. P., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Ulamec, S., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Concerning Space Travel from the Viewpoint of Politics, Industry, Research, and Colleges; 1996, pp. 65-71; In German; See also 19990071258; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the German user center for space experiments (Microgravity User Support Center/MUSC), the German Aerospace Research Institutes for space simulation and space medicine make their experience and their technical knowledge on space experimentation technique available to all interested parties in the fields of science and the economy. The objectives of the user support center are: (1) to facilitate access to space experiments and to make them available to new groups of users; (2) to contribute to scientific success by means of technical and scientific support during preparation, implementation and analysis of experiments; (3) to reduce costs by using unified experiences.
Author
Microgravity; Spaceborne Experiments; German Space Program

19990071264 NASA, Washington, DC USA
ISS Space Station: From "Shuttle/MIR-Phase 1" to "International Space Station" ***Raumstation ISS: Von 'Shuttle/MIR-Phase 1' zur 'International Space Station'***
VonPuttkamer, Jesco, NASA, USA; Concerning Space Travel from the Viewpoint of Politics, Industry, Research, and Colleges; 1996, pp. 72-79; In German; See also 19990071258; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

On September 18th of the current year, the NASA space shuttle Atlantis docked on the Russian space station Mir to pick up the American astronaut Shannon Lucid. She had been on board the station since March, thus setting a new record in outer space

both for U.S. astronauts and women worldwide. The time spent on board amounted to 188 days and 5 hours. At the same time, the Atlantis shuttle transproted her successor, John Blaha, who is to stay on board for four months. This means that a new era has begun for the USA during which we will have a constant American presence in outer space, first of all, with Mir, and then with the International Space Station (ISS) now being developed.
Author
Astronauts; International Space Station; Mir Space Station; USA; International Cooperation; Russian Space Program; German Space Program

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ASTRODYNAMICS

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

19990070948 NASA Marshall Space Flight Center, Huntsville, AL USA
The Video Guidance Sensor- A Flight Proven Technology
Howard, Richard T., NASA Marshall Space Flight Center, USA; Bryan, Thomas C., NASA Marshall Space Flight Center, USA; Book, Michael L., NASA Marshall Space Flight Center, USA; Dabney, Richard W., NASA Marshall Space Flight Center, USA; 1999; 1p; In English; Guidance and Control, 3-7 Feb. 1999, Breckenridge, CO, USA; Sponsored by American Astronomical Society, USA; Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

The Video Guidance Sensor (VGS) flew on Shuttle mission STS-95 in October of 1998 to test the VGS functional characteristics on orbit. This was the second flight of the VGS, and during these two flights, both long range and short range data were gathered under a variety of lighting conditions, orbital exposure times, and temperatures. The flight experiment sensor was designed to operate from 1.5 meter range out to 110 meter range, with a field-of-view of 16 X 21 degrees. The VGS tracked its target at a 5 Hz rate and returned 6-degree-of-freedom information on the target's position and attitude relative to the sensor. The VGS was mounted in the Shuttle cargo bay, and its target was mounted on the Spartan spacecraft being carried on this mission. The VGS is a sensor designed to allow an automated vehicle to dock with a spacecraft equipped with a passive target. The VGS is a part of an Automated Rendezvous and Capture (AR&C) system being developed and tested by NASA. The orbital testing included operations with the target on the Shuttle's Remote Manipulator System (RMS) near the start of each flight of the VGS, long-range data (on the STS-95 flight) during the Shuttle rendezvous with the Spartan two days later, and some more RMS operations later in the mission. The data returned from the orbital testing included VGS diagnostics, acquisition, and tracking data, RMS positions, hand-held laser range data, tapes of the data from the VGS video camera, and orbital positioning data from the Spartan and the Shuttle to allow correlation of the VGS data with orbital best-estimate-of-truth data. The Video Guidance Sensor performed well in all phases of the testing, and the VGS is being incorporated into the ground testing of a complete automated rendezvous and docking system. Work on the development of the next generation VGS is continuing.
Author
Guidance Sensors; Space Missions; Video Equipment; Spacecraft Instruments

19990072352 NASA Marshall Space Flight Center, Huntsville, AL USA
Design of the Automated Rendezvous and Capture Docking System
Cruzen, Craig A., NASA Marshall Space Flight Center, USA; Lomas, James J., NASA Marshall Space Flight Center, USA; 1999; 1p; In English; Sevice Vehicle, 25-28 Apr. 1999, Houston, TX, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 242-70-05; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

This paper describes the Automated Rendezvous and Capture (AR&C) system that was designed and is being tested at NASA's Marshall Space Flight Center (MSFC). The AR&C system incorporates some of the latest innovations in Global Positioning System (GPS), laser sensor technologies and automated mission sequencing algorithms as well as the capability for ground and crew monitoring and commanding. This paper summarizes the variety of mission scenarios supported by the AR&C system. It also describes the major components of the AR&C system including the Guidance, Navigation and Control system, GPS receivers, relative navigation filter and the Video Guidance Sensor. A discussion of the safety and reliability issues confronted during the design follows. by designing a safe and robust automated system, space mission operations cost can be reduced by decreasing the number of ground personnel required for the extensive mission design, preflight planning and training typically required for rendezvous and docking missions.
Author
Orbital Rendezvous; Spacecraft Docking; Design Analysis

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SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. 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.

19990070923 NASA Goddard Space Flight Center, Greenbelt, MD USA
On-Orbit Thermal Performance and Model Correlation of the Fast Auroral Snapshot Explorer
Parrish, Keith, NASA Goddard Space Flight Center, USA; 1999; 8p; In English; 29th; Environmental Systems, 12-15 Jul. 1999, Denver, CO, USA
Report No.(s): Rept-99-ES-23; Copyright; Avail: Issuing Activity, Hardcopy

The Fast Auroral SnapshoT explorer (FAST) spacecraft, the second of NASA's Small Explorer (SMEX) series of scientific satellites, was launched on August 21, 1996 by a Pegasus XL launch vehicle. Due to slightly higher than expected temperatures during early orbit operations, an extensive thermal model correlation effort was undertaken to understand and characterize FAST's thermal performance in order to properly orient the spacecraft's attitude during its mission. FAST's thermal design and the on-orbit thermal model correlation and resolution are described. Finally, the correlated model's predictions are compared with nine months of flight data.
Author
Temperature Effects; Auroras; Attitude (Inclination)

19990071159 Innsbruck Univ., LunARSat Project Team, Austria
LunarSat: Europe's Lunar Initiative
Eckardt, Peter, Innsbruck Univ., Austria; Groemer, Gernot E., Innsbruck Univ., Austria; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 19-24; In English; See also 19990071155; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

LunarSat is a micro-spacecraft that will be sent into an orbit around the Moon to perform scientific investigations concerning the lunar environment and its characteristics. LunarSat is designed by young engineers, scientists, and students from around Europe, with support ftom numerous institutions and space industry. It shall be launched as an auxiliary payload on an Ariane 5 ASAP platform and will have a mass of 100 kg in GTO. LunarSat will orbit the Moon on a highly elliptical polar orbit with its perigee above the lunar south pole area. This orbital strategy yields the possibility to obtain images of the lunar south pole region with a resolution never achieved before.
Author
Lunar Environment; Aerospace Environments; Planetary Environments; Spacecraft Configurations; Mission Planning

19990071160 Innsbruck Univ., LunARSat Project Team, Austria
Lunarsat Searching for the South Polar Cold Traps
Groemer, Gernot E., Innsbruck Univ., Austria; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 25-32; In English; See also 19990071155; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

LunARSat (Lunar Academic Research Satellite) is a micro-spacecraft that will be sent into an orbit around the Moon to perform scientific investigations on the lunar environment and its characteristics. LunARSat is designed by young engineers, scientists, and students from around Europe, with support from numerous institutions and space industry. It shall be launched as an auxiliary payload on an Ariane 5 ASAP platform and will have a mass of 100 kg in GTO. LunARSat will orbit the Moon on a highly elliptical polar orbit with its perigee above the lunar south pole area. This orbital strategy yields the possibility to obtain images of the lunar south pole region with a resolution never achieved before.
Author
Lunar Environment; Lunar Satellites; Spacecraft Configurations; Satellite Design; Spacecraft Structures; Cold Traps

19
SPACECRAFT INSTRUMENTATION

For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

19990071165 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Concurrent Design used in the Design of Space Instruments
Oxnevad, Knut I., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 59-67; In English; See also 19990071155; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

At the Project Design Center at the Jet Propulsion Laboratory, a concurrent design environment is under development for supporting development and analyses of space instruments in the early, conceptual design phases. This environment is being utilized by a Team I, a multidisciplinary group of experts. Team I is providing study and proposal support. to provide the required support, the Team I concurrent design environment features effectively interconnected high-end optics, CAD, and thermal design and analysis tools. Innovative approaches for linking tools, and for transferring files between applications have been implemented. These approaches together with effective sharing of geometry between the optics, CAD, and thermal tools are already showing significant timesavings.
Author
Concurrent Engineering; Computer Graphics; Computer Aided Design; Systems Engineering; Multidisciplinary Design Optimization

19990071658 Control Dynamics Co., Huntsville, AL USA
Performance Evaluation Gravity Probe B Design ***Final Report, 25 Sep. - 5 Apr. 1996***
Francis, Ronnie, Control Dynamics Co., USA; Wells, Eugene M., Control Dynamics Co., USA; Apr. 05, 1996; 94p; In English
Contract(s)/Grant(s): NAS8-40618
Report No.(s): NASA/CR-1999-209565; NAS 1.26:209565; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This final report documents the work done to develop a 6 degree-of-freedom simulation of the Lockheed Martin Gravity Probe B (GPB) Spacecraft. This simulation includes the effects of vehicle flexibility and propellant slosh. The simulation was used to investigate the control performance of the spacecraft when subjected to realistic on orbit disturbances.
Author
Gravity Probe B; Flight Simulation; Spacecraft Stability; Spacecraft Performance; Spacecraft Motion; Spacecraft Models

20
SPACECRAFT PROPULSION AND POWER

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

19990071183 Air Force Research Lab., Edwards AFB, CA USA
The Effects of LOX Post Biasing on SSME Injector Wall Compatibility
Strakey, P. A., Air Force Research Lab., USA; Talley, D. G., Air Force Research Lab., USA; Tseng, L. K., Rockwell International Corp., USA; Miner, K. I., Rockwell International Corp., USA; 1999; In English; Joint Propulsion, Jun. 1999, Los Angeles, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS8-45000; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

An experimental investigation has been carried out to examine the effects of LOX post biasing of a shear coaxial injector on the behavior of the spray near a chamber wall. The experimental work was performed with inert propellant simulants in a high-pressure chamber. Injector flow rates and chamber pressure were designed to match the Space Shuttle Main Engine (SSME) injector gas-to-liquid density and velocity ratio at the point of propellant injection. Measurements of liquid mass flux, gas phase velocity and droplet size were made using mechanical patternation and phase Doppler interferometry techniques. The measurements revealed that the liquid mass flux distribution shifts away from the wall with increasing LOX post bias away from the wall. The shift in the liquid flux distribution was much greater than that caused by the angling of the LOX post alone. Gas velocity near

the wall simultaneously increased with increasing LOX post bias away from the wall. The increase in wall side gas velocity was due to the higher fraction of gas injected on the wall side of the injector as a result of the eccentricity at the injector exit. The net result is a decrease in mixture ratio near the wall. Estimates of heat transfer and engine performance relative to the unbiased case are presented.
Author
Experimentation; Liquid Oxygen; Injectors; Vapor Phases; Propellants; High Pressure; Heat Transfer; Gas Injection; Gas Density

19990073345 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
On-Line Monitoring for the RKX-300-LPN Rocket Actuator System ***On-Line Monitoring Untuk Sistem Aktuator Roket RKX-300-LPN***
Sofyan, Edi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; LAPAN Supplementary Issue; July 1998; ISSN 0126-9754; Volume 22, No. 56, pp. 28-33; In Malay-Indonesian; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Deputy of Space Technology development at LAPAN has developed an experimental flying vehicle RKX-300-LPN. This vehicle is produced as to assist in the design and development of a satellite launcher vehicle. The RKX-300-LPN is equipped with 3 different conventional aerodynamic control surfaces; elevator, aileron and rudder. to enable on-line monitoring of all these control surface movements, the writer has set up an acquisition unit consisting of a personal computer, software logger, software Trend Link, Hydra instrument and Universal Input Module. All these acquisition components are described briefly in this paper. Basically, the entire unit can be set up quickly and easily,, and operated to monitor almost any kind of systems. Any recorded data can be processed further with other software with ease, such as Matlab and Excell.
Author
On-Line Systems; Actuators; Aerospace Engineering; Rocket Vehicles

23
CHEMISTRY AND MATERIALS (GENERAL)

19990071218 Maryland Univ., Biotechnology Inst., College Park, MD USA
Thermal Decomposition of Phosphorus and Sulphur Compounds ***Final Report***
Kafafi, Sherif A.; Tsang, Wing; Feb. 08, 1999; 24p; In English
Contract(s)/Grant(s): DAAG55-98-1-0028
Report No.(s): AD-A364773; ARO-38522.5-CH; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Most industrial chemical processes consist of highly complex sequence of interrelated reactions in which neutral and charged molecular fragments are known to play major roles. These molecular fragments are normally very reactive and are present in small quantities, which are difficult to detect experimentally. Accordingly, in order to postulate a mechanism for a given chemical process, conventional end product analysis aids in the selection of a suitable mechanism(s). Consequently, the improvement of industrial chemical processes is often achieved by semiempirical experimentation. The determination of detailed mechanism would permit the development of rational strategies for removing undesired products and enhancing the yield of desired ones. Chemical warfare agents (CWAs), e.g., G-series and VX nerve agents, are highly electrophilic organophosphonate derivatives, some-of-which are known inhibitors of acetylcholinesterase (1). Because of the relative ease of preparation of CWAs, effective decontamination procedures need also to be developed. The most direct way of destroying a CWA is through incineration (2-8), which can totally decompose their toxic and hazardous products. This process requires a detailed understanding of the high temperature decomposition kinetics of the CWA of interest. However, for such highly toxic chemicals, this information is not available! The lack of understanding is not surprising since even at the present time there are serious uncertainties regarding the detailed high temperature chemistry of CWAs. In addition, CWAs and/or some of their decomposition products may act as inhibitors or promoters of the combustion (3). Since combustion is a manifestation of exothermic chemical change, obviously, some consideration of what occurs at the molecular level must be the first step towards developing any degree of understanding.
DTIC
Thermal Decomposition; Phosphorus Compounds; Sulfur Compounds; Temperature Control

19990071321 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
Complexation and Fluorescence Behavior of Diaza-15-crown-5 Carrying Two Naphthyl Pendants
Kubo, Kanji, Kyushu Univ., Japan; Yamamoto, Emi, Kyushu Univ., Japan; Sakurai, Tadamitsu, Kanagawa Univ., Japan; The Reports of the Institute of Advanced Material Study, Kyushu University; 1998; ISSN 0914-3793; Volume 12, No. 2, pp. 137-140;

In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

N,N'-Bis(1-naphthylmethyl)-4,10-diaza-15-crown-5 (1b) was found to display unique photophysical properties in the presence of the guest metal salts. The diaza-15-crown-5 (1b) exhibited high Zn(2+) enhancement selectivity and in the presence of this cation the host fluorescence intensity was increased by a factor of 8.3.

Author

Photochemical Reactions; Fluorescence; Emission Spectra; Molecular Spectra; Augmentation

19990072349 National Inst. of Standards and Technology, Building Environment Div., Gaithersburg, MD USA

Study of a Water-to-Water Heat Pump Using Hydrocarbon and Hydrofluorocarbon Zeotropic Mixtures

Vance Payne, W.; Domanski, P. A.; Muller, J.; May 1999; 46p; In English

Report No.(s): PB99-152373; NISTIR-6330; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This investigation compared the performance of R22 to the performance of propane (R290) and zeotropic mixtures of HFC's and hydrocarbons in a water-to-water heat pump. Baseline testing began with R22 and proceeded to R290, R32/290, R32/152a, and R290/600a. The use of brazed plate heat exchangers arranged in counterflow for both heating and cooling allowed glide matching using the zeotropic refrigerant mixtures. The performance of the system was characterized by air-side capacity, air-side Coefficient of Performance (COP), compressor RPM, and refrigerant conditions.

NTIS

Heat Pumps; Hydrocarbons; Fluorocarbons; Gas Mixtures

19990075847 NASA Marshall Space Flight Center, Huntsville, AL USA

Third Aerospace Environmental Technology Conference

Whitaker, A. F., Editor, NASA Marshall Space Flight Center, USA; Cross, D. R., Editor, NASA Marshall Space Flight Center, USA; Caruso, S. V., Editor, NASA Marshall Space Flight Center, USA; Clark–Ingram, M., Editor, NASA Marshall Space Flight Center, USA; Third Aerospace Environmental Technology Conference; April 1999; 724p; In English; 3rd; Aerospace Environmental Technology Conference, 1-3 Jun. 1998, Huntsville, AL, USA; Sponsored by NASA Marshall Space Flight Center, USA; See also 19990075848 through 19990075912

Report No.(s): NASA/CP-1999-209258; M-921; NAS 1.55:209258; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

The elimination of CFC's, Halons, TCA, other ozone depleting chemicals, and specific hazardous materials is well underway. The phaseout of these chemicals has mandated changes and new developments in aerospace materials and processes. We are beyond discovery and initiation of these new developments and are now in the implementation phase. This conference provided a forum for materials and processes engineers, scientists, and managers to describe, review, and critically assess the evolving replacement and clean propulsion technologies from the standpoint of their significance, application, impact on aerospace systems, and utilization by the research and development community. The use of these new technologies, their selection and qualification, their implementation, and the needs and plans for further developments are presented.

Author

Conferences; Aerospace Systems; Aircraft Construction Materials; Spacecraft Construction Materials; Environment Effects

19990075850 Delta Air Lines, Inc., Environmental Compliance, Atlanta, GA USA

Aerospace NESHAP Compliance: Planning and Lessons Learned at Delta Air Lines, Inc

Pearl, Ira G., Delta Air Lines, Inc., USA; Burke, Jack M., Radian International, LLC, USA; Hait, Mitchell J., Trinity Consultants Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 20-37; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Delta Air Lines' began it's efforts to comply with the Aerospace NESHAP over two years before the effective date of the rule, with intensive efforts commencing upon issuance of the revised rule, approximately one year in advance of the scheduled compliance date. This paper discusses the processes used to develop, review, refine, and implement a Master Compliance Plan. In addition to outlining the planning and implementation processes used, this discussion will also focus on system requirements, such as material monitoring and record keeping, personnel training, and lessons learned during the implementation of the Master Plan.

Author

Civil Aviation; Commercial Aircraft; Management Information Systems; Records Management

19990075861 Lockheed Martin Michoud Space Systems, New Orleans, LA USA

Implementation of Precision Verification Solvents on the External Tank

Campbell, Mike, Lockheed Martin Michoud Space Systems, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 144-152; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

This presentation will discuss the implementation of precision on the external tank. This presentation discusses the background of the project, solvent usage, future works, solvent replacement studies, implementation, and the problems occurring during implementation.

CASI

Solvents; Chlorofluorocarbons; External Tanks; Air Pollution

19990075865 Boeing Co., Houston, TX USA

CFC-113 Replacement Plan for the BNA Palmdale Facility

Eichinger, Eric, Boeing Co., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 178-199; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The objectives of this presentation is to provide a new and safe facility to utilize CFC-113 (chlorofluorocarbon-113) replacements for precision cleaning and verification, perform facility modifications and certification with minimal schedule impact to manufacturing, and to update documentation to include all appropriate replacement.

CASI

Cleaning; Cleanliness; Cleaners; Chlorofluorocarbons; Contaminants; Ultrasonic Cleaning; Ultrasonic Processing; Solvents

19990075866 Naval Surface Warfare Center, Indian Head, MD USA

Energetic Ingredients Processing in Liquid Carbon Dioxide

Farncomb, Robert E., Naval Surface Warfare Center, USA; Nauflett, George W., Naval Surface Warfare Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 200-207; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

NSWC's Green Chemistry program requires preparation of energetic materials containing C-nitro, N-Nitro, and O-Nitro moieties using liquid carbon dioxide (L-CO2) as the processing solvent. L-CO2 replaced methylene chloride as the solvent in nitrations of 3-methyl-3-oxetane-methanol, glycidol, gamma-cyclodextrin, and cotton linters with dinitrogen pentoxide (N2O5) and anhydrous nitric acid. Nitration of acid-sensitive substrates with N2O5 or HNO3 are generally carried out at low temperatures in organic media, particularly chlorinated hydrocarbons or Freons. With substrates possessing both strained rings and labile groups, the reaction can be "fine-tuned" using L-CO2. Because nitrate esters are acid-sensitive, sodium fluoride was used to form a complex with the nitric acid resulting from the nitration with N2O5. The 3-nitratomethyl-3-methyl oxetane (NIMMO) was subjected to polymerization conditions in liquid carbon dioxide (L-CO2), using gaseous boron trifluoride (BF3) catalyst. Polymerizations in L-CO2 simplifies solvent removal and product purification. The L-CO2 on the small-scale batches is not recycled, but vented to the atmosphere. Supercritical carbon dioxide (SC-CO2) was used for oligomer extraction and fractionation of the polymers. The main focus of this effort was the design, construction, and evaluation of the processing equipment. No effort was made to optimize the conditions for polymer synthesis in carbon dioxide.

Author

Supercritical Fluids; Polymerization; Carbon Dioxide; Nitric Acid; Nitrogen Oxides; Sodium Fluorides; Nitrate Esters

19990075872 Boeing Co., Rocketdyne Propulsion and Power, Canoga Park, CA USA

Hazardous Materials Elimination: A Management Perspective

Brown, Alan, Boeing Co., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 290-294; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

Rocketdyne conducted a very successful hazardous materials elimination program from 1989 through 1996. Goals for the program were established in accordance with regulatory constraints and a team was assembled to address the actions. Technological advances are seldom completed with respect to calendars or legislative decrees; however, this program accomplished the goals in a time frame that satisfied the regulatory activity. In reviewing the program, several critical factors were identified which were key to success. These elements are identified along with examples that demonstrate the contribution of each. They are valuable lessons learned and can be applied to any hazardous materials elimination activity to achieve success. This is a management perspective on conducting a successful Hazardous Materials Elimination program.

Author

Hazardous Materials; Project Management; Materials Handling; Elimination

19990075873 Thiokol Propulsion, Brigham City, UT USA

Electrostatic Hazard Considerations for ODC Solvent Replacement Selection Testing

Fairbourn, Brad, Thiokol Propulsion, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 295-307; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

ODC solvents are used to clean many critical substrates during solid rocket motor production operations. Electrostatic charge generation incidental to these cleaning operations can pose a major safety issue. Therefore, while determining the acceptability of various ODC replacement cleaners, one aspect of the selection criteria included determining the extent of electric charge generation during a typical solvent cleaning operation. A total of six candidate replacement cleaners, sixteen critical substrates, and two types of cleaning swatch materials were studied in simulated cleaning operations. Charge generation and accumulation effects were investigated by measuring the peak voltage and brush discharging effects associated with each cleaning process combination. In some cases, charge generation was found to be very severe. Using the conductivity information for each cleaner, the peak voltage data could in some cases, be qualitatively predicted. Test results indicated that severe charging effects could result in brush discharges that could potentially result in flash fire hazards when occurring in close proximity to flammable vapor/air mixtures. Process controls to effectively mitigate these hazards are discussed.

Author

Electric Charge; Electric Potential; Electrostatic Charge; Electrostatics; Electric Discharges

19990075881 Lockheed Martin Corp., Houston, TX USA

Evaluation of HCFC AK 225 Alternatives for Precision Cleaning and Verification

Melton, Donald M., Lockheed Martin Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 378-390; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Maintaining qualified cleaning and verification processes are essential in an production environment. Environmental regulations have and are continuing to impact cleaning and verification processing in component and large structures, both at the Michoud Assembly Facility (MAF) and component suppliers. The goal of this effort is to assure that the cleaning and verification proceed unimpeded and that qualified, environmentally compliant material and replacements are implemented and perform to specifications.

Derived from text

Precision; Cleaning; Cleaners; Solvents; Chloroethylene

19990075882 Boeing Co., M and P Engineering, Canoga Park, CA USA

Orbiter Program CFC-113 (Freon 113) Replacements

Nguyen, Carol, Boeing Co., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 391-404; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The objective of this presentation is to summarize test results of selected freon 113 replacement materials such as vertrel MCA, HCFC-225 and HFE-7100 (hydrofluoroether). The presentation will address both the compatibility and performance of these cleaners.

Derived from text

Cleaners; Cleaning; Washers (Cleaners); Solvents

19990075883 Boeing Co., Rocketdyne Propulsion and Power, Canoga Park, CA USA

Elimination of Carbon Tetrachloride for Quantitative Hydrocarbon Analysis

Douglas, Vonnie M., Boeing Co., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 405-413; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Carbon tetrachloride, which has been identified as an ozone depleting chemical, was banned from manufacture in 1995. An exemption for laboratory use was given by Federal agencies which allowed the use of carbon tetrachloride for analytical purposes. However, due to anticipated future regulation and the uncertainty of the availability of this chemical, more permanent options are being pursued. The majority of the procedures which utilized carbon tetrachloride at Rocketdyne were replaced by alternatives before the end of 1996. The last remaining application which required an alternative technique was the quantitative analysis of hydrocarbons by infrared spectrometry. The final goal for carbon tetrachloride elimination was to identify a solvent or alternative technique for this analytical procedure. Several methods were investigated which do not require the use of ozone depleting chemicals. The proposed techniques included high pressure liquid chromatography (HPLC), gravimetric procedures, total organic carbon analysis (TOC), gas Chromatography (GC) and alternative infrared procedures. A review of these alternatives and the current

status of the experimentation will be provided. The implementation of successful alternatives will result in complete elimination of carbon tetrachloride at Rocketdyne.
Author
Carbon Tetrachloride; Hydrocarbons; Quantitative Analysis; Gas Chromatography; Liquid Chromatography; Gravimetry

19990075890 Thiokol Propulsion, Brigham City, UT USA
Chemical Fingerprinting of ODC Replacement Solvents for Acceptance Criteria
McClennen, William H., Thiokol Propulsion, USA; Weber, Bart L., Thiokol Propulsion, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 508-516; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Qualification and implementation of ODC (ozone depleting chemical) replacement materials requires carefully defined acceptance criteria and stability information for proper quality control. Chemical fingerprinting by powerful instrumental analysis techniques can be an essential aspect of these criteria and is currently being mandated by NASA as part of performance enhancement programs. However, a major challenge to the utility of chemical fingerprinting is the development of a database which is both versatile and efficient enough to facilitate materials data retrieval, examination and approval for a broad range of scientific and engineering backgrounds and requirements. This paper discusses the planned uses, system requirements, current approach and capabilities of our chemical fingerprinting database using preliminary examples of GC, GC/MS and FTIR data from a terpene in hydrocarbon ODC replacement solvent.
Author
Identifying; Chemical Analysis; Analytical Chemistry; Mass Spectroscopy; Spectroscopic Analysis; Hydrocarbons

19990075891 ENSR Corp., Camarillo, CA USA
Using Hazard Evaluation Techniques to Detect Potential Operational Risks Associated with Chemical Substitutions
Mullen, John B., ENSR Corp., USA; Cardinal, Rhonda, Boeing Co., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 517-526; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The Boeing Company (Boeing) in Huntington Beach, CA fabricates the liquid oxygen (LO2) tanks of the Delta II launch vehicles on-site. After metal treatment, machining, welding and hydrotesting, the tanks go through a final cleaning process to remove any contamination. This paper briefly describes a methodology that has proven very useful in past studies that were performed for a wide variety of chemicals and processes. Although these techniques were originally devised for studying acutely hazardous materials, they also useful for defining potential operational risks that may be encountered any time a chemical substitution, a increase in chemical usage, a process change or a hardware modification is made.
Derived from text
Launch Vehicles; Liquid Oxygen; Tanks (Containers)

19990075896 Lawrence Livermore National Lab., Livermore, CA USA
Near Real-Time Analysis of Hydrocarbon Contamination in RSRM Production
Meltzer, Michael, Lawrence Livermore National Lab., USA; Gregg, Hugh, Lawrence Livermore National Lab., USA; Koester, Carolyn, Lawrence Livermore National Lab., USA; Ross, Stephanie, Lawrence Livermore National Lab., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 562-576; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Lawrence Liver-more National Laboratory (LLNL) is engaged in a study with Thiokol Aerospace and Industrial Technologies to examine the utility of a novel surface analysis system for determining contamination levels on Reusable Solid Rocket Motor (RSRM) parts. The analysis system, termed the ”contamination analysis unit,” or CAU, was developed and patented by LLNL to serve as a method of rapidly identifying the type and quantity of hydrocarbon contaminants on various substrates. The CAU uses vacuum and thermal desorption to remove sample contaminants from a surface, which are then analyzed in a Leybold Transpector mass spectrometer. The CAU is a portable instrument that can be used in the field. It has demonstrated detection limits of 1 microgram/sq cm or less for many hydrocarbon contaminants. The Thiokol study seeks to evaluate the effectiveness of the CAU in detecting both solvent and soil residues on various RSRM substrates. Test coupons were supplied to LLNL by Thiokol that reproduced various RSRM critical soil/substrate combinations, and that were cleaned using either 1,1,1 trichloroethane (TCA), the control solvent, or one of the solvents recently implemented to replace TCA. The analysis was performed under both ambient and elevated temperature environments.
Author
Hydrocarbons; Contaminants; Contamination; Solid Propellant Rocket Engines; Reusable Rocket Engines; Engine Parts

19990075899 Albemarle Corp., Baton Rouge, LA USA

Cleaning Solvents Based on n-Propyl Bromide Technology

Shubkin, Ronald L., Albemarle Corp., USA; Chang, Suae–Chen, Albemarle Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 600-609; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The cleaning of complex parts to exacting specifications has become a major consideration in the manufacture of a wide variety of machines, instruments, appliances and other equipment. The introduction of chlorinated solvents provided manufacturers and fabricators a convenient and economical way to clean a host of difficult soils from strategic parts. Efficient cleaning, rapid drying, low flammability, residue free parts and relatively low solvent costs all contributed to the popularity of chlorocarbon fluids. However, many chlorine containing solvents have now been banned or restricted because of environmental and/or health considerations. With the mandated elimination of the most popular cleaning solvents, many manufacturers switched to aqueous or semi-aqueous cleaning systems. While these proved to be viable solutions in many applications, they were not suitable for all situations. In the search to find more appropriate alternatives, a wide variety of new solvents were developed. Many of the new solvent cleaners do excellent jobs, but still suffer from one or more deficiencies relative to the overall cost/performance of the chlorinated materials they replaced. Even some of the newer solvents, such as some hydrochloroflouorocarbons (HCFCs), have been shown to have environmental problems and have been banned from usage in cleaning applications or are scheduled for phase-out. In other cases, the newly introduced solvents meet the environmental and toxicological requirements, but do not meet the performance standards. The need in specialized applications for a high-performance cleaning agent that could be used in a safe and efficient manner led to the development of cleaning solvents based on normal-propyl bromide (nPB).

Derived from text

Cleaners; Cleaning; Solvents; Electronic Equipment

19990075903 United Space Boosters, Inc., Cocoa Beach, FL USA

Elimination of Methyl Ethyl Ketone for Removal of Tenacious Contaminants

Clayton, Catherine, United Space Boosters, Inc., USA; Mason, Mike, United Space Boosters, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 638-642; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

In this project, the cleaners were chosen for their ability to remove inadvertant coatings, adhesives and other tenacious contaminants. Due to the cleaners ability to remove paints and other tough contaminants, some also attacked the paints being cleaned. All cleaners tested had relatively short dry times when used on bare metal. However, on coated systems, the dry times were much longer. Some cleaners soaked into the coating and would not readily dissipate. N-methyl pyrrolidone and cleaners containing N-methyl pyrrolidone are examples of these types of cleaners. A fine line had to be found between removing the contaminants and not significantly harming the coatings.

Derived from text

Cleaners; Cleaning; Solvents; Paint Removal; Surface Treatment

19990075906 NASA Marshall Space Flight Center, Huntsville, AL USA

Corrosion Evaluation of Aircraft Depainting Chemicals

McGill, Preston, NASA Marshall Space Flight Center, USA; Torres, Pablo, NASA Marshall Space Flight Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 657-664; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The National Aeronautics and Space Administration is participating in an interagency task agreement with the Environmental Protection Agency and the USA Air Force to evaluate alternative technologies for aerospace depainting operations that do not adversely affect the environment. An element of this study is directed towards the evaluation of environmentally advantaged chemical paint strippers, specifically, paint strippers that do not contain methylene chloride. Eight environmentally advantaged, or alternative, chemical paint strippers and two methylene chloride, or baseline, paint strippers were obtained from various manufacturers and incorporated into the depainting study. In addition to being evaluated on their ability to remove paint, the potential of these chemicals to promote corrosion and hydrogen embrittlement was evaluated. The corrosion and hydrogen embrittlement potential of the chemical paint strippers are presented in this report.

Derived from text

Aerospace Systems; Paint Removal; Anodic Stripping

19990075909 EFX Systems, Lansing, MI USA

Anaerobic Treatment of Glycol Based Deicing Fluid Runoff

Hickey, Robert, EFX Systems, USA; Weinert, C., Rensselaer Polytechnic Inst., USA; Komisar, S., Rensselaer Polytechnic Inst., USA; Veltman, S., Massachusetts Univ., USA; Switzenbaum, M. S., Massachusetts Univ., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 683-689; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Deicing or removal of snow, ice and frost from aircraft and anti-icing for the prevention of ice from reforming on the aircraft is generally accomplished using ethylene and propylene glycol based fluids. With chemical oxygen demand (COD) equivalents of 1.29 g COD/g and 1.68 g COD/g for ethylene glycol and propylene glycol respectively, deicing wastes have a high oxygen demand. Depending upon the method of collection and precipitation at the time of fluid application, glycol concentrations in the runoff from deicing operations may range from 2,000 - 300,000 ppm. The treatment of airport deicing fluid runoff is necessary to avoid the potential for severe oxygen depiction in receiving waters. Often the combination of flow rate and high oxygen demand represents too high a mass of oxygen demand for the local wastewater treatment plant. Pretreatment to reduce the oxygen demand down to typical sewer discharge limits is sufficient in many cases to render the water discharge acceptable. Aerobic processes, which are widely used for wastewater applications, convert organic constituents to carbon dioxide and cell mass. The high cell yield and high power requirements associated with oxygen transfer makes these processes expensive for treating high-strength wastewaters such as aircraft deicing fluid (ADF) runoff. In contrast, anaerobic systems require significantly less energy to operate and produce much less sludge.

Derived from text

Deicing; Aircraft Icing; Antiicing Additives; Ice Prevention; Deicers

19990075910 Thiokol Corp., Propulsion Group, Brigham City, UT USA

Report of the Biodegradability and Toxicity Studies of Ethoxylated Aqueous Surfactant and Utilization of the Aqueous Surfactant Wastewater as a Carbon and Energy Source in Biological Industrial Wastewater Treatment Facilities

Ball, Ken L., Thiokol Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 690-699; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

New environmentally acceptable aqueous surfactants are utilized as a replacement for 1,1,1-trichloroethane in the manufacture of Reusable Solid Rocket Motor (RSRM). A study to find an effective, low cost method of disposing of the wastewater generated from the alternative aqueous cleaners was completed. The study investigated the biodegradability, toxicity and potential utilization of the waste aqueous surfactant solutions as a carbon and energy source. Due to the proprietary nature of the surfactant, chemical compositions and structure of the surfactant will not be identified.

Author

Biodegradability; Toxicity; Surfactants; Product Development; Solid Propellant Rocket Engines

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.

19990071230 NASA Marshall Space Flight Center, Huntsville, AL USA

Assessment of Uncertainty in the Determination of Activation Energy for Polymeric Materials

Darby, Stephania P., NASA Marshall Space Flight Center, USA; Landrum, D. Brian, Alabama Univ., USA; Coleman, Hugh W., Alabama Univ., USA; Journal of Thermophysics and Heat Transfer; October 1998; Volume 12, No. 4, pp. 520-527; In English; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

An assessment of the experimental uncertainty in obtaining the kinetic activation energy from thermogravimetric analysis (TGA) data is presented. A neat phenolic resin, Borden SC1O08, was heated at three heating rates to obtain weight loss vs temperature data. Activation energy was calculated by two methods: the traditional Flynn and Wall method based on the slope of log(q) versus 1/T, and a modification of this method where the ordinate and abscissa are reversed in the linear regression. The modified method produced a more accurate curve fit of the data, was more sensitive to data nonlinearity, and gave a value of activation energy 75 percent greater than the original method. An uncertainty analysis using the modified method yielded a 60 percent uncertainty in the average activation energy. Based on this result, the activation energy for a carbon-phenolic material was doubled and used to calculate the ablation rate In a typical solid rocket environment. Doubling the activation energy increased surface recession

by 3 percent. Current TGA data reduction techniques that use the traditional Flynn and Wall approach to calculate activation energy should be changed to the modified method.
Author
Ablation; Activation Energy; Carbon-Phenolic Composites; Phenolic Resins; Thermogravimetry

19990071332 Lehigh Univ., Dept. of Mechanical Engineering and Mechanics, Bethlehem, PA USA
Some Basic Problems on the Mechanics of Functionally Graded Materials ***Final Report, 1 May 1995 - 30 Sep. 1998***
Erdogan, Fazil; Dec. 1998; 124p; In English
Contract(s)/Grant(s): DAAH04-95-1-0232
Report No.(s): AD-A365177; 533249; ARO-33534.9-EG; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

Grading thermomechanical properties of composites by continuously varying the volume fractions of their constituents is becoming a powerful tool in designing new materials for specific applications. The broad objective of this project has been to identify and study a series of basic mechanics problems relating to the failure of this new class of composites called functionally graded materials. The fields selected for investigation which also have important technological applications are fracture mechanics of thermal barrier coatings and thermoelectric cells, contact mechanics of graded materials, and wave propagation in inhomogeneous solids. In each case first the basic concepts are studied analytically. Then a series of benchmark problems are considered in order to demonstrate the distinguishing features of the mechanics of graded materials and to provide some results that could be used in practical applications. Because of its importance in life prediction and failure analysis of structural components, a greater part of the research effort in the project was devoted to the fracture mechanics of graded materials. In solving the benchmark problems the method used has been generally analytical, the exceptions being the layered thermal barrier coatings and the nonlinear post-buckling examination of spallation problems for which finite element methods were used.
DTIC
Composite Materials; Fracture Mechanics

19990076101 Oak Ridge National Lab., TN USA
Characterization and Process Development of Cyanate Ester Resin Composites
Frame, B. J.; May 23, 1999; 14p; In English; 44th; SAMPE Symposia and Exhibition, 23-27 May 1999, Long Beach, CA, USA; Sponsored by Department of Energy, USA
Report No.(s): DE00-003556; ORNL/CP-101112; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

Cyanate ester resins offer advantages as composite matrices because of their high thermal stability, low outgassing, low water absorption, and radiation resistance. This paper describes the results of a processing study to develop a high-strength hoop-wound composite by the wet-filament winding method using Toray TI 000G carbon fiber and YLA RS-14A cyanate ester resin as the constituent materials. The study shows that the cyanate ester resin has a broad process envelope but that an inert-atmosphere cure is essential for obtaining optimum resin and composite properties. Minimizing moisture exposure prior to and during cure is also crucial as it affects the glass transition temperature of the resin and composite. Composite cylinders wound and cured with these methods yielded excellent ring tensile strengths both at room and elevated temperature. A summary of the measured mechanical and thermal property data for these composites is presented. Potential applications for these materials include flywheel energy storage systems for space and satellite structures.
NTIS
Cyanates; Procedures; Esters; Resins; Thermal Stability; Radiation Tolerance; Matrix Materials

25
INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

19990070753 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan
Improvement of Pulse Characteristics of a Composite Cold Moderator of Liquid-Hydrogen Surrounded by Water for Pulsed Spallation Neutron Sources
Kiyanagi, Yoshiaki, Hokkaido Univ., Japan; Kosugi, Morimitsu, Hokkaido Univ., Japan; Memoirs of the Faculty of Engineering, Hokkaido University; 1994; ISSN 0368-9379; Volume 19, No. 1 (No. 82), pp. 9-14; In English; No Copyright; Avail: Issuing Activity, Hardcopy

An efficient cold neutron moderator is required for future projects employing spallation neutron sources. The most promising candidate is a composite moderator consisting of a liquid-hydrogen main moderator with a water premoderator. This type of moderator produces the highest cold neutron intensity but with broad pulse-width. We studied two methods for improving the pulse characteristics: the methods by decoupling the premoderator from the reflector and by heterogeneously poisoning the reflector. It was found that the former is superior for improving the pulse characteristics. Dependence of neutronic characteristics on premoderator thickness was also studied for the decoupling method.
Author
Moderators; Liquid Hydrogen; Cold Neutrons; Pulse Duration

19990070934 NASA Goddard Space Flight Center, Greenbelt, MD USA
Quantum Calorimetry
Stahle, Caroline Kilbourne, NASA Goddard Space Flight Center, USA; McCammon, Dan, Wisconsin Univ., USA; Irwin, Kent D., National Inst. of Standards and Technology, USA; Physics Today; August 1999, pp. 32-37; In English; Copyright; Avail: Issuing Activity, Hardcopy

Your opponent's serve was almost perfect, but you vigorously returned it beyond his outstretched racquet to win the point. Now the tennis ball sits wedged in the chain-link fence around the court. What happened to the ball's kinetic energy? It has gone to heat the fence, of course, and you realize that if the fence were quite colder, you might be able to measure that heat and determine just how energetic your swing really was. Calorimetry has been a standard measurement technique since James Joule and Julius von Mayer independently concluded, about 150 years ago, that heat is a form of energy. But only in the past 15 years or so has calorimetry been applied, at millikelvin temperatures, to the measurement of the energy of individual photons and particles with exquisite sensitivity. In this article, we have tried to show that continuing research in low-temperature physics leads to a greater understanding of high-temperature astrophysics. Adaptations of the resulting spectrometers will be useful tool for fields of research beyond astrophysics.
Derived from text
Heat Measurement; Calorimeters; High Temperature

19990071052 Oxford Univ., Dept. of Engineering Science, Oxford, UK
Validation of Novel Low-Temperature Fire Event Modelling Technique
Neely, Andrew J., Oxford Univ., UK; Ireland, Peter T., Oxford Univ., UK; Mullender, Andrew J., Rolls-Royce Ltd., UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 10.1 - 10.14; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

This paper documents the experimental, analytical and numerical approach used in the low-temperature fire certification technique. The Propane-air burner flame is simulated at low temperature using a mixture of Helium and air with mixture ratio, flow rates and scale chosen to achieve correct matching of the relevant non-dimensional groups: Reynolds number, Prandtl number, Froude number, density ratio and momentum flux ratio. The effects of mixing between the burner plume and the surrounding ambient air are also accounted for. Extensive measurements in both the standard burner plume and the analogue burner plume are used to assess the simulation. Calibration of the half-scale low temperature analogue burner via heat flux measurements indicates accurate reproduction of the hot flow from the standard fire-test burner. Full validation of the technique is demonstrated by its ability to reproduce the measured component metal temperatures from an actual fire test.
Author
Mathematical Models; Numerical Analysis; Fires; Computerized Simulation; Burners; Plumes

19990071203 NASA Marshall Space Flight Center, Huntsville, AL USA
Heat Treatments of ZnSe Starting Materials for Physical Vapor Transport
Su, Ching–Hua, NASA Marshall Space Flight Center, USA; Palosz, W., NASA Marshall Space Flight Center, USA; Feth, S., NASA Marshall Space Flight Center, USA; Lehoczky, S. L., NASA Marshall Space Flight Center, USA; Journal of Crystal Growth; 1998; Volume 192, pp. 386-394; In English; Original contains color illustrations; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The effect of different heat treatments on stoichiometry and residual gas pressure in ZnSe physical vapor transport system was investigated. The dependence of the amount and composition of the residual gas on various heat treatment procedures is reported. Heat treatment of ZnSe starting materials by baking under the condition of dynamic vacuum to adjust its stoichiometry was performed and the effectiveness of the treatment was confirmed by the measurements of the partial pressure of Se2, P(sub

Se2), in equilibrium with the heat treated samples. Optimum heat treatment procedures on the ZnSe starting material for the physical vapor transport process are discussed and verified experimentally.
Author
Gas Pressure; Heat Treatment; Stoichiometry; Zinc Selenides; Crystal Growth; Vapor Phases

19990071227 Cornell Univ., Ithaca, NY USA
Flamelet Surface Density and Burning Rate Integral in Premixed Combustion ***Final Report, 1 Mar. 1995 - 30 Nov. 1998***
Gouldin, F. C.; Mar. 12, 1999; 65p; In English
Contract(s)/Grant(s): DAAH04-95-1-0109
Report No.(s): AD-A365200; ARO-33144.10-EG; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We have developed, tested and applied in V-flames and a spark ignition engine a new experimental method, crossed-plane laser imaging, for measuring flamelet surface normals in premixed turbulent flames. The method consists of taking simultaneous planar images in two orthogonal, laser illumination planes, and finding the flamelet normal at points along the line of intersection between the two planes where the flamelet crosses the line. In each image, the curve of intersection between the flamelet and the laser illumination plane is determined. Tangents to these curves are tangents to the flamelet surface, and where flamelet curves in the two illumination planes intersect, the normal is obtained from the cross product of the intersecting tangent lines. Flamelet data obtained with the method are used to determine probability density functions of normals, flamelet crossing densities, flamelet surface densities, and estimates of the burning rate integral. In addition, two-component laser Doppler velocimetry has been combined with compensated fine-wire thermocouple thermometry to obtain mass flux data required for calculating the burning rate integral. Measurements have been made on several methane-air V-flames. The results demonstrate the utility of the method and the potential for turbulent burning velocity data to over estimate the acceleration of combustion by turbulence. Also, the performance of ionization probes in premixed turbulent flame studies was evaluated.
DTIC
Premixed Flames; Premixing; Turbulent Flames; Turbulent Combustion; Flame Propagation

19990071322 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
Synthesis and Conformational Analysis of Spirocyclopropane- and Spirooxirane-annelated Dinaphthobicyclo[4.4.1] Undecanes
Taniguchi, Masahiko, Kyushu Univ., Japan; Thiemann, Thies, Kyushu Univ., Japan; Sawada, Tsuyoshi, Kyushu Univ., Japan; Mataka, Shuntaro, Kyushu Univ., Japan; The Reports of the Institute of Advanced Material Study, Kyushu University; 1998; ISSN 0914-3793; Volume 12, No. 2, pp. 131-135; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The preparation and conformational analysis of spirocyclopropane- and spirooxirane-annelated dinaphtho[c,h]bicyclo[4.4.1]undecane derivatives 9, 10, and 11 are reported. Compounds 9, 10, and 11 exist in equilibrium of two nonequivalent chair-boat conformers, of which the predominant conformer in the solution was studied. H-NMR spectroscopic analysis at -60 C and the calculation of the dipole moment of the conformer revealed that the ratio of the conformers of 9, 10, and 11 is dependent on the polarity of the solvent.
Author
Synthesis (Chemistry); Cycloaddition

19990071573 Washington Univ., Dept. of Chemical Engineering, Seattle, WA USA
Phase Transitions in Vapor Deposited Water Under the Influence of High Surface ELectric Fields, ***Oct. 1998 - Sep. 1999***
Scovell, Dawn L.; Pinkerton, Tim D.; Medvedev, Valentin K.; Stuve, Eric M.; Jun. 24, 1999; 39p; In English
Contract(s)/Grant(s): N00014-97-1-0417
Report No.(s): AD-A365073; TR-11; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Field ionization of vapor deposited water on a platinum field emitter was studied over a temperature range of 103-150 K. Water adlayers that were 50 - 3600 A thick were grown under field-free conditions by exposure of a cryogenically cooled emitter tip to water vapor in ultrahigh vacuum. Field ionization was probed by ramped field desorption (RFD) in which desorption of ionic species (hydrated protons) is measured while increasing the applied electric field linearly in time. The dependence of the field required for ionization onset as a function of temperature and water thickness is presented and discussed. In the limit of thin layers the onset field decreased from 0.5 to 0.2 V/A as temperature increased from 105 to 150K. An activation barrier of 0.7 eV (16 kcal/mol) for ionization of amorphous and crystalline water was estimated from the temperature dependence of the onset field. This is in excellent agreement with the 0.74 eV (17 kcal/mol) required to produce a pair of ions from a pair of solvated water molecules.
DTIC
Phase Transformations; Vapor Deposition; Electric Fields; Surface Properties; Emitters; Platinum

19990071574 Washington Univ., Dept. of Chemical Engineering, Seattle, WA USA

Field Distributions in Thin Water Films - A Comparison of Theoretical and Empirical Trends, *Oct. 1998 - Sep. 1999*

Scovell, Dawn L.; Pinkerton, Tim D.; Medvedev, Valentin K.; Stuve, Eric M.; Jun. 24, 1999; 12p; In English; New Direction in Electroanalytical Chemistry II, 1999, USA

Contract(s)/Grant(s): N00014-97-1-0417

Report No.(s): AD-A365077; TR-13; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Field ionization of thin water layers adsorbed onto a platinum field emitter tip was investigated by numerical simulation and analysis of experimental data. The numerical simulation, which includes a field-dependent relative permittivity, was developed to predict the field distribution around a water-covered field emitter tip. The model predicts that the dominant field occurs at the water-vacuum interface in thin layers. In the experiments, water adlayers were grown under field-free conditions by exposure of a cryogenically cooled emitter tip to water vapor in ultrahigh vacuum. Field ionization was probed by ramped field desorption (RFD) in which desorption of ionic species (hydrated protons) is measured while increasing the applied electric field linearly in time. The onset field of ionization decreased from 0.3 to 0.2 V/A as temperature increased from 130 to 150 K. An activation barrier of 0.7 eV (16 kcal/mol) for ionization of water to produce hydrated protons and hydroxide ions was estimated from the temperature dependence of the onset field. The experimental trends agree with the predicted trends for thin water layers.

DTIC

Electric Fields; Thin Films; Ionization; Trends

19990071576 Washington Univ., Dept. of Chemical Engineering, Seattle, WA USA

Ionization of Thin and Thick Water Films on Platinum Field Emitter Tips - A Comparison of Theoretical and Empirical Trends, *Oct. 1998 - Sep. 1999*

Scovell, Dawn L.; Pinkerton, Tim D.; Medvedev, Valentin K.; Stuve, Eric M.; Jun. 24, 1999; 42p; In English; Prepared for publication in the Journal of Chemical Physics

Contract(s)/Grant(s): N00014-97-1-0417

Report No.(s): AD-A365080; TR-12; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Field ionization of thin water layers adsorbed onto a platinum field emitter tip was investigated by numerical simulation and analysis of experimental data. The numerical simulation, which includes a field-dependent relative permittivity, was developed to predict the field distribution around a water- covered field emitter tip. The simulation predicts that ionization begins at the water-vacuum interface in thin layers and at the tip-water interface in thick layers. Experiments were conducted to verify the predicted trends. Water was vapor deposited onto a cryogenically cooled tip under field-free conditions. Field ionization was probed by ramped field desorption (RFD) in which desorption of ionic species (hydrated protons) is measured while increasing the applied electric field linearly in time. The ionization onset field decreased from 0.5 to 0.2 V/A as temperature increased from 105 to 150 K. The estimated average relative permittivity for crystalline ice is 2.5 and that of amorphous ice is 2.0. The experimental results are consistent with the trends predicted by the numerical model. Data at all temperatures show a change in slope when the water thickness exceeds a critical thickness. This change in slope is evidence of a change in ionization location. The measured slope agrees with the predicted slope for thin crystalline layers, but not for amorphous layers. Thinning of the amorphous layers due to field-enhanced mobility of the ice may explain the discrepancy with the model.

DTIC

Thin Films; Ionization; Platinum; Electric Fields; Emitters; Trends

19990071652 Virginia Transportation Research Council, Charlottesville, VA USA

Evaluation of Anodes for Galvanic Cathodic Prevention of Steel Corrosion in Prestressed Concrete Piles in Marine Environments in Virginia *Final Report, Oct. 1996 - Jun. 1999*

Clemena, G. G.; Jackson, D. R.; Jul. 1999; 46p; In English

Contract(s)/Grant(s): FHWA/VTRC-00021557

Report No.(s): PB99-156895; VTRC-00-R3; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Many of the major highway crossings over coastal waters in the Hampton area of Virginia are supported by prestressed concrete piles, some of which are showing signs of reinforcement corrosion. Grout jacketing alone is an inadequate protection against corrosion and should be supplemented with cathodic protection (CP). Recent advances in the development of anodes make it practical to use galvanic CP to protect these types of concrete bridge components. Five anode systems were tested on several piles of the Willoughby Bay Bridge on I-64 in Norfolk, Virginia: (1) an aluminum-zinc-indium alloy applied by arc spraying on the concrete, (2) a zinc foil with conductive adhesive backing, (3) a system of zinc mesh and grout jacket, (4) a system of zinc mesh

and compression panels, and (5) a bulk zinc. During the first 14 months of operation, the protection current outputs of these anodes, the closed-circuit potentials of the steel at carious elevations on the piles, and the extent of polarization imparted were measured.
NTIS
Cathodic Coatings; Anodes; Concretes; Steels; Corrosion Prevention; Prestressing

19990073339 Georgia Inst. of Tech., School of Materials Engineering, Atlanta, GA USA
Thermal Analysis Instrumentation for Kinetics of Shocked Materials ***Final Report, 2 Mar. 1998 - 1 Mar. 1999***
Thadhani, Naresh; Namjoshi, Shantanu; Vandersall, Kevin; Xu, Xiao; May 12, 1999; 18p; In English
Contract(s)/Grant(s): DAAG55-98-1-0101
Report No.(s): AD-A365261; ARO-38214.1-MS-RIP; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report describes the development of thermal analysis instrumentation for studies of the kinetics of chemical reactions and phase transformations of shock compressed powder materials. The instrumentation consists of a Perkin-Elmer differential thermal analyzer and a ”power-compensated” differential scanning calorimeter, both equipped with controlled gas flow and vacuum. The objective of the instrumentation is to accurately determine the thermodynamics and kinetics of chemical and structural changes occurring in shock-compressed materials. The thermal analysis system is used to obtain fundamental data, including onset temperatures for chemical reactions, amorphous-to-crystalline phase transformations, and austenite/martensite transformation temperatures in shock densified powder mixtures. The measurements allow determination of the apparent activation energies, to model the enhanced reaction and transformation behavior of shock-compressed materials.
DTIC
Thermal Analysis; Amorphous Materials; Reaction Kinetics

19990073348 North Carolina State Univ., Raleigh, NC USA
Soot, Temperature, and OH Measurements in a Unsteady Counterflow Diffusion Flame ***Final Report, 1 May 1995 - 30 Oct. 1998***
Roberts, William L.; Dec. 18, 1998; 9p; In English
Contract(s)/Grant(s): DAAH04-95-1-0230
Report No.(s): AD-A366140; ARO-34438.5-EG-YIP; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The objective of this research project was to increase the current level of understanding of the interaction between an unsteady hydrodynamic field and the chemical kinetics in a laminar diffusion flamelet. A steady counterflow diffusion flame burner has been modified to allow periodic oscillations of the input velocity. Laser diagnostics were used to quantitatively measure soot volume fraction in an unsteady propane-air counterflow diffusion flame. The instantaneous strain rate at global flame extinction for a propane-air flame has been measured as a function of steady strain and both amplitude and frequency of the unsteady component Two component LDV was used to measure the velocities allowing determination of the true strain rate. The phase lag between velocity and strain rate was quantified. Low frequency oscillations in the reactant flow rates increased net soot production by as much as 6 times over the steady flame. At low initial strain rates, high frequency oscillations reduce the maximum soot volume fraction by as much as 90% of the steady flame soot concentration. At high initial strain rates, soot production was insensitive to high frequency oscillations.
DTIC
Soot; Counterflow; Diffusion Flames; Turbulent Flames

19990075897 Thiokol Corp., Propulsion Group, Huntsville, AL USA
Refinement of Portable FTIR Spectroscopy to Characterize Metal Surface Contamination
Blanks, J. W., Thiokol Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 577-589; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Recent improvements were accomplished in using a portable FTIR infrared spectrometer to detect, identify, and quantify hydrocarbon grease and silicone contaminants on RSRM metal surfaces. Calibration techniques are discussed. Soundness of the method is built by validating calibration standards by a secondary method. Variation of contaminant concentration at multi-locations on a given specimen is examined. Effects of metal surface oxidation on low level contamination detection limits are discussed. Applications of the developed method to real world problems are presented.
Author
Portable Equipment; Infrared Spectrometers; Infrared Spectroscopy; Metal Surfaces; Surface Finishing; Refining

19990075898 Thiokol Corp., Propulsion Group, Brigham City, UT USA

Enhancing Infrared Reflectance Methods for Detection of Thin Organic Contaminant Films on Bonding Surfaces

Pearson, L. H., Thiokol Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 590-599; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

With the elimination of solvents, such as methylchloroform, used in industry for cleaning of bonding surfaces, and their replacement with non-ozone depleting chemicals, the issue of surface cleanliness must be re-addressed. Contamination on bonding surfaces has been determined to be a primary cause for degraded bond strength with foreign hydrocarbon and silicone-based materials that are airborne or directly introduced to a surface being the most common sources of contamination. Specular and diffuse infrared (IR) reflectance methods have been extensively used for detection of foreign organic compounds on surfaces of various compositions and textures. This paper deals with methods for enhancing the sensitivity of IR reflectance methods for detection and characterization of thin absorbing films. Both diffuse and specular reflection methods are addressed for rough and smooth metal surfaces, respectively. Methods for detection of contaminant films on non-metal surfaces are also discussed. Experimental and data analysis methods having a basis in fundamental principles of light scattering and reflection are presented.

Derived from text

Cleaning; Cleanliness; Metal Surfaces; Infrared Detectors; Infrared Radiation; Diffuse Radiation

26
METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

19990070397 Technische Univ., Inst. fuer Werkstoffe, Brunswick, Germany

Life Extension of IN706 Type Disc Materials by Surface Modification With Boron

Roesler, J., Technische Univ., Germany; Mueller, S., Technische Univ., Germany; March 1999; 8p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

A novel process is described which is capable of protecting Ni-Base superalloys against stress accelerated grain boundary oxidation (SAGBO) by chemical modification of a surface zone with boron. The potential of the proposed technique in extending the lifetime of wrought Ni-base alloys is discussed performing creep crack growth, constant strain rate and Life cycle fatigue (LCF) experiments at 600C and 700C. Significant life extension under static loading condition is demonstrated. Under cyclic loading care has to be taken to avoid brittle boride layers on the component surface to make full use of the protective effect against SAGBO.

Author

Boron; Crack Propagation; Creep Properties; Cyclic Loads; Oxidation; Strain Rate; Wrought Alloys; Nickel Alloys; Heat Resistant Alloys; Grain Boundaries; Static Loads; Crack Arrest

19990071171 Duke Univ., Dept. of Mechanical Engineering and Materials Science, Durham, NC USA

Positron Annihilation Lifetime Studies of Deformed and Shock Loaded Tantalum ***Final Report, 1 Jun. 1995 - 30 Nov. 1998***

Stepp, David M.; Jones, Phillip L.; Feb. 26, 1999; 5p; In English

Contract(s)/Grant(s): DAAH04-93-D-0002

Report No.(s): AD-A365260; S3; ARO-34584.2-MS-SR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Shock loading and quasi-static loading has been examined in annealed high purity tantalum. Investigation with positron annihilation lifetime spectroscopy, microhardness testing and optical microscopy shows increased dislocation density with increased true strain, but no significant increases with increased strain rate, aside from small degrees of dynamic recovery and twinning observed in shock loaded sample. The authors conclude that these results support the theory that deformation in tantalum is controlled by dislocation drag above the Peierls stress and that strain rate effects, which are dearly observed in most other materials, are suppressed. Quench hardening in annealed high purity tantalum has also been investigated. Microhardness testing results show quench hardening alter quenching from temperatures above 1100 deg C with cooling rates of approximately 200 deg C/min; these observations appear to be consistent with vacancy clustering. However, the temperatures required to produce quench hardening exceed the maximum estimates of temperatures achieved during shock loading. The authors conclude that quench hardening is not expected to have any significant effect on shock loading in tantalum.

DTIC

Mechanical Shock; Tantalum; Positron Annihilation; Quenching (Atomic Physics)

19990071606 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan

Effect of Impact Velocity in Erosive Wear of Austempered Ductile Iron

Shimizu, Kazumichi, Oita National Coll. of Technology, Japan; Shiramine, Noboru, Hokkaido Univ., Japan; Fujita, Minoru, Hokkaido Univ., Japan; Noguchi, Toru, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 13-19; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Erosive wear tests were performed on austempered ductile iron (ADI) and mild steel (SS400) using a shot blast machine. Erosion damage was measured by the removed material volume at various impact angles between 10 deg and 90 deg and impact velocities of 100 and 145 m/s. The mechanism of erosive wear, the effect of impact angles (alpha) and impact velocity (V), and the differences in wear features of the specimens were discussed. After an initial stage, the eroded volume increases almost linearly with blasting time both in ADI and SS400, and the erosion rate in ADI is about 20% at 145 m/s, 23% at 100 m/s of SS400, showing that ADI has superior erosion resistance. The surface hardness of eroded ADI specimens increased up to HV 700 from the initial HV 350 after 600s of blasting. The amount of retained austenite was measured to be about 40% of the matrix before the test, but it decreased to less than 5% by transforming to martensite, hardening the surface and practically eliminating the erosion rate markedly, and so reduces the effect of impact velocity.

Author

Wear Tests; Austenite; Ductility; Erosion; Iron

19990075057 National Inst. of Standards and Technology, Materials Science and Engineering Lab., Boulder, CO USA

Constitutive Behavior Modeling of Steels Under Hot-Rolling Conditions: Materials Reliability Series

Cheng, Y. W.; Tobler, R. L.; Filla, B. J.; Coakley, K. J.; Apr. 1999; 120p; In English

Report No.(s): PB99-164071; NIST/TN-1500-6; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

The purpose of this work is to develop constitutive equations that predict the stress-strain curves of steels as functions of hot-rolling process variables, such as temperature, strain rate, and microstructural features. Eight steels, A36, DQSK, HSLA-V, HSLA-Nb, HSLA-50/Ti-Nb, HSLA-80/Ti-Nb and two interstitial-free (IF) grades, were selectively tested at temperatures in the range from 900 to 1200 degrees C, strain rates from 1 to 50/s, and austenite grain sizes from 0.012 to 0.29 mm. The data were analyzed to support the development of constitutive models. Models for predicting stress-strain behaviors for the eight steel grades have been developed. Model predictions correlate well with the experimental data, indicating that the models adequately describe the stress-strain behaviors of various steel grades under hot-rolling conditions. Model predictions for A36 and DQSK are further validated with high strain-rate (up to 150/s) data obtained at CANMET.

NTIS

Constitutive Equations; Rolling; Carbon Steels; Reliability

19990075856 Florida Univ., Southern Technology Application Center, Alachua, FL USA

Chromium Electroplating Alternatives Reference *Executive Summary*

Rice, T., Florida Univ., USA; Anderson, B., Florida Univ., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 83-87; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The Chromium Electroplating Alternatives Reference was developed by the Southern Technology Applications Center (STAC) to provide a useful comparison of chromium electroplating with other processes and to address the most important concerns of the metal finishing industry as reported in the Industry Overview included in Part I, Chapter 1. Specifically, these concerns relate to compliance with increasing environmental regulations, pollution prevention, use and properties of coating substitutes, cleaning and preparation needs, and economic criteria, all of which are addressed in this reference.

Derived from text

Chromium; Electroplating; Metal Finishing; Surface Finishing

19990075953 Department of the Navy, Washington, DC USA

Synthesis of Unagglomerated Metal Nano-Particles at Membrane Interfaces

Markowitz, Michael, Inventor; Chow, Gan–Moog., Inventor; Singh, Alok, Inventor; Mar. 02, 1999; 10p; In English; Supersedes US-Patent-Appl-SN-603296, AD-D017911.

Patent Info.: Filed 20 Feb. 96,; US-Patent-Appl-SN-603,296; US-Patent-5,876,480

Report No.(s): AD-D019395; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The present invention relates to a powder of unagglomerated metallic particles. More particularly, the present invention relates to a powder of unagglomerated metallic particles having an average diameter of about 1-100 nm and the process for making

the same. Additionally, the powder of unagglomerated metallic particles can be formed into a lyophilized form which upon reconstitution maintains the average diameter of between about 1-100 nm wherein the particles remain unagglomerated.
DTIC
Metal Particles; Membranes; Synthesis (Chemistry); Metal Powder

19990076096 Oak Ridge National Lab., TN USA
Neural Network method for Inverse Modeling of Material Deformation
Allen, J. D.; Ivezic, N. D.; Zacharia, T.; Jul. 10, 1999; 6p; In English; Intelligent Processing and Manufacturing in Materials 1999, 10-15 Jul. 1999, Big Hsland, HI, USA; Sponsored by Department of Energy, USA
Report No.(s): DE00-006156; ORNL/CP-102618; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

A method is described for inverse modeling of material deformation in applications of importance to the sheet metal forming industry. The method was developed in order to assess the feasibility of utilizing empirical data in the early stages of the design process as an alternative to conventional prototyping methods. Because properly prepared and employed artificial neural networks (ANN) were known to be capable of codifying and generalizing large bodies of empirical data, they were the natural choice for the application. The product of the work described here is a desktop ANN system that can produce in one pass an accurate die design for a user-specified part shape.
NTIS
Deformation; Metal Working; Forming Techniques; Neural Nets

19990076097 Oak Ridge National Lab., TN USA
Using Neural Networks to Describe Complex Phase Transformation Behavior
David, S. A.; Vitek, J. M.; May 24, 1999; 4p; In English; Solid-Solid Phase Transformations 1999, 24-28 May 1999, Kyoto, Japan; Sponsored by Department of Energy, USA
Report No.(s): DE00-006146; ORNL/CP-102650; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

Final microstructures can often be the end result of a complex sequence of phase transformations. Fundamental analyses may be used to model various stages of the overall behavior but they are often impractical or cumbersome when considering multicomponent systems covering a wide range of compositions. Neural network analysis may be a useful alternative method of identifying and describing phase transformation behavior. A neural network model for ferrite prediction in stainless steel welds is described. It is shown that the neural network analysis provides valuable information that accounts for alloying element interactions. It is suggested that neural network analysis may be extremely useful for analysis when more fundamental approaches are unavailable or overly burdensome.
NTIS
Phase Transformations; Network Analysis; Neural Nets; Microstructure

19990076103 Oak Ridge National Lab., TN USA
Point Defects in Binary Laves-Phase Alloys
Liaw, P. K.; Liu, C. T.; Pike, L. M.; Zhu, J. H.; Jan. 11, 1999; 38p; In English
Report No.(s): DE00-002723; ORNL/SUB/93-SP173/03; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

Point defects in the binary C15 NbCrQ and NbCoz, and C14 NbFe2 systems on both sides of stoichiometry were studied by both bulk density and X-ray lattice parameter measurements. It was found that the vacancy concentrations in these systems after quenching from 1000 deg C are essentially zero. The constitutional defects on both sides of stoichiometry for these systems were found to be of the anti-site type in comparison with the model predictions. Thermal vacancies exhibiting a maximum at the stoichiometric composition were obtained in NbCr2 Laves phase alloys after quenching from 1400 deg C. However, there are essentially no thermal vacancies in NbFe2 alloys after quenching from 1300 deg C. Anti-site hardening was found on both sides of stoichiometry for all the Laves phase systems studied, while the thermal vacancies in NbCr2 alloys quenched from 1400 deg C were found to soften the Laves phase. The anti-site hardening of the Laves phases is similar to that of the B2 compounds and the thermal vacancy softening is unique to the Laves phase. Neither the anti-site defects nor the thermal vacancies affect the fracture toughness of the Laves phases significantly.
NTIS
Point Defects; Laves Phases; Research; Binary Alloys

27
NONMETALLIC MATERIALS

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

19990070398 Rolls-Royce Ltd., Bristol, UK
TBC and Other Surface Coatings: Benefits and Lifing Procedures
Shaw, D. L., Rolls-Royce Ltd., UK; March 1999; 8p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

For the past two decades, thermal barrier coatings (TBC) have offered the promise of increased turbine capability in terms of increased temperature or reduced cooling flows. They have also held out the promise of life extension to existing hot end components by offering simple solutions to localised cooling problems. These goals have remained tantalizingly unattainable. That their potential is now within reach, is largely a result of the development of successful lifing methodologies. These lifing methodologies have identified the significant design parameters and enabled the development of process parameters that have ensured the survival of the coating for acceptable life attainment on both new and refurbished components. The lifing methodologies have highlighted the significance of the bond coat in ensuring coating integrity in terms of cracking, spallation and cyclic behaviour.
Author
Spallation; Thermal Control Coatings; Design Analysis; Cooling; Life (Durability); Failure Analysis; Plasma Spraying; Vapor Deposition; Cracking (Fracturing)

19990071114 National Inst. for Fusion Science, Theory and Computer Simulation Center, Toki, Japan
Simulation Study of the Structural Formation in Systems with Short-Range Interaction
Fujiwara, Susumu, National Inst. for Fusion Science, Japan; Sato, Tetsuya, National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 289-294; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

By carrying out the molecular dynamics simulations of 100 short polymer chains, each of which consists of 20 CH2 groups, we show that the orientationally ordered structure at low temperature is formed from a random structure at high temperature by a sudden cooling. The essentially extended chains form a monolayer structure. The ratio of the lattice constants a/b takes the hexagonal value square root of 3 at 400 K and decreases as the temperature decreases. From detailed analysis of the local orientational order, it is found that the growth of the local ordered clusters proceeds in a stepwise fashion. From the analysis of the molecular mobility, we find that the longitudinal chain motion increases dramatically with increasing temperature while the transverse chain motion is not so dependent on the temperature variation.
Author
Molecular Dynamics; Computerized Simulation; Plasma Physics

19990071248 Colorado State Univ., Applied Microwave Nondestructive Testing Lab., Fort Collins, CO USA
Microwave Detection of Rust Under Paint and Composite Laminates
Qaddoumi, N., Colorado State Univ., USA; Shroyer, A., Colorado State Univ., USA; Zought, R., Colorado State Univ., USA; Research in Nondestructive Evaluation; 1997; ISSN 0934-9847; Volume 9, No. 4, pp. 201-212; In English; Original contains color illustrations; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Accurate, reliable, and early detection of rust/corrosion under paint and laminate composites in many industrial and military applications is of great concern and interest. Although there are several methods for detecting rust under paint, they all have their respective limitations. Microwave nondestructive and noncontact inspection techniques are well suited for the early and reliable detection of rust under various paints and composite laminates. In this paper, the potential of utilizing open-ended rectangular waveguide sensors for detecting rust under paint and laminate composites is investigated theoretically and experimentally. An electromagnetic model describing the interaction of microwave signals radiating from an open-ended rectangular waveguide with a stratified dielectric structure is used to model the presence of rust under paint and a composite laminate coating. For the experimental investigations, we used a rusted steel specimen that was painted over by common spray paint to as much as ten coats of paint. These experiments are conducted at 24 and 10 GHz. The issue of detecting rust unambiguously while a certain paint thickness variation may exist is also addressed.
Author
Microwaves; Detection; Rusting; Paints; Military Technology; Coating

19990071308 Hokkaido Univ., Dept. of Nuclear Engineering, Sapporo, Japan

Desorption Behavior of H2O from Isotropic Graphites Dipped in Water

Okita, Masao, Hokkaido Univ., Japan; Hirohata, Yuko, Hokkaido Univ., Japan; Hino, Tomoaki, Hokkaido Univ., Japan; Yamashina, Toshiro, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 69-76; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

H2O desorption behavior of isotropic graphites dipped in water was investigated by a technique of thermal desorption spectroscopy (TDS). Gas species, H2, H2O, CO, CO2 and numerous hydrocarbons, were found to be desorped from the graphite. The temperature with the maximum desorption rate of H2O was around 873 K, for the ramp rate ranging from 0.083 to 0.83 K/s. The peak temperature of H2O became again around 873 K, even after the heat treatment for the graphite sample at 625 K for 7 hrs prior to the TDS measurement. Apparent activation energy of the desorption for H2O was obtained as 252+/- 24 kJ/mole. From the evaluation for value of the activation energy, it is presumed that the H2O desorption due to the recombination between -H and -OH groups adsorbed oil edge surfaces of the graphite.

Author

Desorption; Water; Isotropy; Graphite; Adsorption

19990071312 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan

Short-Hot-Wire Method for Measuring Total Hemispherical Emissivity of a Fine Fiber

Fujiwara, Seiji, Kyushu Univ., Japan; Zhang, Xing, Kyushu Univ., Japan; Fujii, Motoo, Kyushu Univ., Japan; The Reports of the Institute of Advanced Material Study, Kyushu University; 1998; ISSN 0914-3793; Volume 12, No. 21998; 7p; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this paper, a new short-hot-wire method for measuring total hemispherical emissivity of a fine fiber is proposed. This method is based on the theoretical solution of one dimensional steady heat conduction along the hot-wire and fiber. The hot-wire generates an uniform heat flux by supplying constant electric current, and both ends of wire are maintained initial temperature. Fiber is attached to the center area of two hot-wires. by using short-hot-wire technique, the fiber temperatures at the attached points and heat rates to the fiber from the hot-wires can be accurately obtained when the average temperature and heat rate of the hot wires are measured. Therefore, the emissivity of fiber can be easily estimated. According to the theoretical analysis, this method can obtain emissivity in the range of 0.1 to 1.0 within an error of +/- 1% for the fiber of 10 micrometers in diameter.

Author

Conductive Heat Transfer; Thermal Conductivity; Thermal Conductors; Hot-Wire Flowmeters; Emissivity; Thermal Emission

19990071465 Institute of Space Medico-Engineering, Beijing, China

Regularities of Carbon Monoxide Outgassing from Two Nonmetallic Materials at Different Temperatures

Zhang, Xiaochun, Institute of Space Medico-Engineering, China; Wei, Yongjia, Institute of Space Medico-Engineering, China; Yu, Bingling, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 198-201; In Chinese

Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

To investigate the regularity of carbon monoxide outgassing from nonmetallic materials in air tight cabin, two nonmetallic materials was observed. 30-9304 foam plastics and aluminum-plated polyester adhesive film were sealed in airtight glass ampules, and outgassed for 70 days at four different temperatures. The outgassing CO was determined continuously with transform/gas chromatography. Curve fitting and regression were used in data analysis. The results showed that: (1) when temperature was kept constant, the relation between the outgassed CO and outgassing time appeared to be a ”s” shaped or exponented curve; (2) at a fixed time the amount of outgassed CO increased with temperature exponentially; (3) the amount of CO outgassed in 12 h at 100 C from th e two materials corresponds those for 45 d at 50 C , there is an iso-effect principle for CO outgassing.

Author

Carbon Monoxide; Outgassing; Regularity

19990071602 Hokkaido Univ., Dept. of Nuclear Engineering, Sapporo, Japan

Conditionings for Boron-Carbon Plasma Facing Wall

Hino, Tomoaki, Hokkaido Univ., Japan; Yamauchi, Yuji, Hokkaido Univ., Japan; Yamashina, Toshiro, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 50-53; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

For plasma facing material with components of boron and carbon, the method of conditionings due to He discharge cleaning and baking is considered. The conditioning time required to suppress the hydrogen recycling is discussed. It is shown that the hydrogen trapped by the boron can be relatively easily removed only by the baking at 300 C or only by lie discharge cleaning with

current density of 0.1 mA/sq cm. It is not easy to remove the hydrogen trapped by the carbon by the baking since the temperature required becomes 500 C. The current density required also becomes high, 1 mA/sq cm, for the reduction of the hydrogen trapped by the carbon.
Author
Boron; Carbon; Plasmas (Physics); Walls

19990071603 Hokkaido Univ., Dept. of Nuclear Engineering, Sapporo, Japan
Model for Hydrogen Retention and Chemical Sputtering of Boron-Carbon Plasma Facing Material
Hino, Tomoaki, Hokkaido Univ., Japan; Yamauchi, Yuji, Hokkaido Univ., Japan; Yamashina, Toshiro, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 41-48; In English; No Copyright; Avail: Issuing Activity, Hardcopy

The model for hydrogen retention of boron carbide material used as the plasma facing wall in fusion devices is described. In this model, the hydrogen detrappings of C-H and B-H bondings are assumed as the rate determinig step of the desorption. The hydrogen retention is observed to more rapidly decrease with the temperature, compared with a case of graphite. This tendency is similar to the experimental observation. Several parameters of thermal desorption and ion impact desorption are discussed based on the model. For the chemical sputtering, the model is suggested to explain the yield and the peak temperature of boron carbide material. The comparison between the model and the experimental shows that the reduction of the yield in the boron carbide is due to one order of magnitude smaller reactivity of methane formation, compared with that of graphite.
Author
Models; Hydrogen; Sputtering; Chemical Reactions; Boron Carbides; Plasmas (Physics); Retaining

19990073228 City Univ. of New York, Dept. of Chemistry, Brooklyn, NY USA
Transport of Ions and Molecules in Biopolymeric Gels: Electroanalytical Studies*, 1 Oct. 1998 - 30 Jun. 1999*
Carlin, Richard T.; Ciszkowska, M.; Guillaume, M. D.; Jul. 15, 1999; 9p; In English
Contract(s)/Grant(s): N00014-98-1-0244; Proj-98PR03337-00
Report No.(s): AD-A366102; TR-1; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Transport of ions and molecules was studied in hydrogels of uncharged and anionic biopolymers, agarose and iota-carrageenan. Diffusion coefficients of neutral and ionic electroactive probes, the uncharged radical 2,2,6,6-tetramethyl-1-pipperidinyloxy, TEMPO, and Tl(I), were determined rapidly and precisely from steady-state transport-limited currents at platinum and mercury microelectrodes. Transport properties of both probes were studied in gels as effected by temperature, ionic strength and concentration of the biopolymer, and they were compared with those in solutions. The relation between macroscopic and local microscopic viscosity of biopolymeric gels was analyzed based on viscosity measurements and diffusion coefficient data.
DTIC
Gels; Ions; Molecules; Transport Properties; Biopolymers

19990073340 Wisconsin Univ., Madison, WI USA
Deposition of Nitride Coatings Using Plasma Surface Modification Technology*, 1Jan. 1995 - 31 Mar. 1998*
Conrad, John; Sridharan, Kumar; Malik, Shamim; Dec. 1998; 8p; In English
Contract(s)/Grant(s): DAAH04-94-G-0283
Report No.(s): AD-A365188; ARO-32144.7-MS; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The goal of this project is to investigate the Plasma Source Ion Implantation (PSII) process as an environmentally clean surface modification technique for defense related applications. Through this grant, considerable progress has been made in the understanding of the science and technology of the PSII process. A co-axial geometry technique has been developed and patented to deposit coatings on the inside surface of hollow cylinders and may have applications in gun barrels and recoil mechanisms. A perforated, staggered cathode configuration has been devised to deposit complex nitride coatings with properties superior to mono-nitrides. Erosion-resistant chrome-oxide coatings have been deposited and an optical emission spectroscopy diagnostic has been successfully used as a diagnostic for plasma chemistry. Enhancement of adhesion of titanium-nitride coatings to steel has been achieved by the use of titanium interlayers. Research has been conducted on wear-resistant diamond-like carbon coatings in collaboration with Army Research Lab. Computer models have been developed to predict plasma-workpiece interaction for different target shapes. The grant has provided the opportunity to establish interactions between the University of Wisconsin and personnel at Rock Island Arsenal, Corpus Christi Army Depot. Army Research Lab, and the Watervliet Arsenal.
DTIC
Plasmas (Physics); Protective Coatings; Deposition; Nitrides; Plasma Chemistry

19990074939 Research Inst. of National Defence, Avd. foer Vapen och Skydd, Tumba, Sweden
Coating of Titanium Nitride on the Windshield/Canopy of Military Aircrafts ***Belaeggning av Titannitrid pa Siktruta/Huv foer Militaera Flygplan***
Staaf, O.; Bjoerkqvist, M.; Mar. 1998; 16p; In Swedish
Report No.(s): PB99-161887; FOA-R-98-00741-615-SE; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

The mechanical properties of titanium nitride coated polymethylmethacrylate (PMMA) and polycarbonate (PC) have been investigated in a rain erosion test. The electromagnetic properties have been measured in the visual, the thermal infrared and in the radar wavelength bands. These investigations show that TiN is still a candidate as a coating material on the windshield/canopy.
NTIS
Titanium Nitrides; Windshields; Coating

19990075841 Department of the Navy, Washington, DC USA
Ceramic Structure with Backfilled Channels
Jessen, Todd, Inventor; Feb. 02, 1999; 6p; In English; Supersedes US-Patent-Appl-SN-771119, AD-D018357.
Patent Info.: Filed 20 Dec. 96,; US-Patent-Appl-SN-771,119; US-Patent-5,866,244
Report No.(s): AD-D019396; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Ceramic structure and process for its preparation wherein the structure is composed of a matrix having therein parallel and spaced reinforcing fibers and strands of backfilled ceramic material, the strands being parallel to the reinforcing fibers; and wherein the process includes the steps of arranging tows of fugitive and reinforcing fibers parallel to each other to form a fiber preform, contacting the preform with a matrix precursor whereby the precursor deposits around the fibers, removing the preform from the precursor wherein the fibers are coated with the precursor, drying the preform to solidify the precursor on the fibers and to convert the precursor to a matrix form, calcining the preform to convert the matrix form on the fibers to another matrix form, removing the fugitive fibers from the preform to form channels therein, backfilling the channels with a material, and hot pressing the preform for densification purposes to form the ceramic structure containing spaced fibers and spaced backfilled material strands disposed in the matrix.
DTIC
Ceramic Matrix Composites; Patents; Coatings; Reinforced Plates; Reinforcing Fibers

19990075842 Department of the Navy, Washington, DC USA
Nanostrutured Ceramic Nitride Powders and a Method of Making the Same
Kurihara, Lynn K., Inventor; Chow, Gan Moog, Inventor; Schoen, Paul E., Inventor; Mar. 02, 1999; 7p; In English; Supersedes US-Patent-Appl-SN-805529, AD-D018876.
Patent Info.: Filed 25 Feb. 97,; US-Patent-Appl-SN-805,529; US-Patent-5,876,682
Report No.(s): AD-D019384; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Near net-shapeable nanostructured ceramic nitride powder and a process for producing the same by nitriding molecular precursor powder in a nitrogen containing atmosphere, e.g., in ammonia, to form nanostructured ceramic nitride powder.
DTIC
Nitrides; Powder (Particles); Nitriding; Ceramics; Procedures

19990075855 Lockheed Martin Corp., Huntsville, AL USA
Cryogenic Bonding Primer Replacement for the External Tank
Groves, Larry A., Lockheed Martin Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 66-82; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The purpose of this presentation is to discuss and address the mission profile, environmental program scope, the external tank, and the key qualification constraints of the flight model.
CASI
Cryogenics; Bonding; Spacecraft Models; External Tanks

19990075857 Vacuum Arc Technologies, Inc., Scottsboro, AL USA
Vacuum Arc Vapor Deposition Electroplating Chrome Replacement
Weeks, Jack L., Vacuum Arc Technologies, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 99-103; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The Vacuum Arc Vapor Deposition process, VAVD, is a new process with several unique processing capabilities. The key feature of the VAVD process is the ability to utilize a high-energy, stable ionizing arc as a heat source in a vacuum environment. This feature provides a focused high-energy heat source that can melt a wide range of target materials. The stability of the arc eliminates the production of macro particles from the melted pool on the target material surface. The VAVD process, using the prototype system, can apply 3.5 microns of material per minute. This deposition rate will vary depending on the target material. With this system the pool size is limited to 0.5 inch diameter and a process time of 10 minutes. The thermal loads on the crucible dictate these process limits. The actively cooled prototype crucible is being installed in the VAVD system. This new design will allow the pool size to be increased to 2 inch and the process duration to be increased to 1 hour. This will allow deposition of coatings with thickness greater than 0.001 inch.
Derived from text
Vacuum; Arc Heating; Vapor Deposition

19990075858 Sermatech International, Inc., Limerick, PA USA
Health and Safety Issues of Compliant Aluminum Metallic-Ceramic Coating
Eddinger, K., Sermatech International, Inc., USA; Piacentino, A., Sermatech International, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 104-108; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

Aluminum pigmented metallic-ceramic coatings have been used to provide corrosion and oxidation resistance to steel turbine and aerospace components for thirty years. The metallic-ceramic coatings are spray applied overlay coatings which require a heat cure at temperatures from 176-371 C (350-700 F). They consist of aluminum metal dispersed in in aqueous solution of chromate and phosphate salts and generally meet the requirements of MIL-C-81751B, type 1. More recently these aluminum metallic-ceramic coatings have been used to replace cadmium and nickel cadmium plating in applications where sacrificial corrosion behavior is required. There is an environmental incentive to restrict the usage of cadmium since federally regulated exposure limits demand that a worker be exposed to no more than 5 microgram/cubic m. While the exposure are currently less stringent than cadmium, there are initiatives underway that recommend reducing exposure limits to levels similar to cadmium. This paper will discuss the environmental and health and safety issues related to the use of these chromate containing inorganic coatings. In addition, a review of the environmental and health and safety issues for new aluminum metallic-ceramic coatings that can replace the chromium containing coatings will be given. These new coatings contain no carcinogenic or toxic materials. They can be applied by conventional paint spraying equipment. Residues of the coatings are not considered hazardous waste and do not require hazardous or toxic solvents for clean up. The coatings do offer corrosion resistance and performance characteristics similar to the more conventional chromium containing coatings. Application process controls and waste disposal issues for the coatings including aluminum residues will also be discussed.
Author
Corrosion Resistance; Surface Finishing; Corrosion Prevention; Surface Treatment; Aluminum Coatings; Ceramic Coatings

19990075867 AmDyne Corp., Millersville, MD USA
Hazardous Material Minimization in Adhesives and Sealants Used in PATRIOT Missile System Maintenance
Morgan, R. E., AmDyne Corp., USA; Hagler, R. A., Army Aviation and Missile Command, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 208-214; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

In response to Executive Order (EO) 12856, the Army is reviewing all weapon systems maintenance documentation to identify hazardous materials and develop alternatives for hazardous material minimization. The goal of the effort is to reduce hazardous material usage by 50% based on the quantities established in 1994. This paper describes the effort to identify the hazardous materials and more specifically focus on the minimization of EPA-17 listed materials in the adhesives and sealants used to maintain the PATRIOT Missile System. The process and resources available that are being used for this effort are described in detail.
Author
Hazardous Materials; Adhesives; Sealers; Defense Program

19990075868 Surface Treatment Technologies, Inc., Tullahoma, TN USA
Surface Treatment Technology
Mitchell, James G., Surface Treatment Technologies, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 215-222; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

A newly invented process (patent pending) permits metal surfaces to be treated with additive materials that provide superalloyed surfaces, hard and high-wear surfaces, thermal barrier coatings, oxidation-resistant coatings, and high-temperature-melt-

ing-point surfaces. This process has demonstrated capability of producing a chosen alloy or refractory of a specified thickness on substrate materials. The resulting surface is nonporous and crack-free. The metallurgical bond of the alloy resists all attempts at delamination or peeling and can accommodate a wide range of temperatures and coefficients-of-expansion. Therefore, one can provide a permanent, thin layer of protective material over substrate materials. The innovation is entitled ”Laser Induced Surface Improvement”, or LISI. Many materials of interest have been used in two years of research and demonstration. LISI permits the component designer to select base metals for their material qualities (strength, weight, etc.), as well as cost, without regard to surface-interface properties. Unlike many other ”coatings”, the LISI process requires little surface preparation, needs no special environment for application, and is environmentally friendly. The University of Tennessee Space Institute (UTSI) has invented the process, and Surface Treatment Technologies, Inc. (ST(sup 2)) is a newly formed Tennessee corporation which has acquired a license for the process and is working with the inventors to explore and evaluate applications of the technology.
Author
Metal Surfaces; Surface Properties; Surface Treatment; Surface Finishing; Laser Applications

19990075884 Boeing Military Aircraft and Missile Systems, Aerospace Support, Saint Louis, MO USA
FLASHJET: Coatings Removal Process
Nied, Tom, Boeing Military Aircraft and Missile Systems, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 414-443; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This paper gives a general overview of the FLASHJET system. The following topics are included: end effector assembly, coatings removal process, discriminators, gantry system, customer requirements, products and services, application systems, the Boeing AH-64A apache system, the Boeing 747 fiberglass ”canoe” fairing, the stripping system, AAPS system, Hornet gantry paint stripping system, and the mobile manipulator program mention a few.
CASI
Coating; Surface Finishing; Surface Treatment; Paint Removal

19990075905 NASA Marshall Space Flight Center, Huntsville, AL USA
Development and Implementation of Environmentally Compatible Solid Film Lubricants
Novak, Howard L., United Space Boosters, Inc., USA; Hall, Phillip B., NASA Marshall Space Flight Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 651-656; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Multi-body launch vehicles require the use of Solid Film Lubricants (SFLs) to allow for unrestricted relative motion between structural assemblies and components during lift-off and ascent into orbit. The Space Shuttle Solid Rocket Booster (SRB), uses a dual coat, ceramic-bonded high temperature SFL in several locations such as restraint hardware between the SRB aft skirt and the Mobile Launch Platform (MLP), the aft SRB/External Tank (ET) attach struts, and the forward skirt SRB/ET attach ball assembly. Future launch systems may require similar applications of SFLs for attachment and restraint hardware. A family of environmentally compatible non-lead/antimony bearing alternative SFLs have been developed including a compatible repair material. In addition, commercial applications for SFLs on transportation equipment, all types of lubricated fasteners, and energy related equipment allow for wide usage’s of these new lubricants. The new SFLs trade named BOOSTERLUBE is a family of single layer thin film (0.001 inch maximum) coatings that are a unique mixture of non-hazardous pigments in a compatible resin system that allows for low temperature curing (450 F). Significant savings in energy and processing time as well as elimination of hazardous material usage and disposal would result from the non-toxic one-step SFL application. Compatible air-dry field repair lubricants will help eliminate disassembly of launch vehicle restraint hardware during critical time sensitive assembly operations.
Author
Space Shuttle Boosters; Launch Vehicles; Motors; Product Development; Engine Parts; Spacecraft Components

19990075908 Air Force Research Lab., Tyndall AFB, FL USA
What if We Could Purify and Reuse Our Waste Aircraft Hydraulic Fluid?
OSullivan, Dennis, Air Force Research Lab., USA; Seaman, Edward B., BDM International, Inc., USA; Werner, Neal C., Pall Aerospace Co., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 681-682; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

It is widely recognized that water and particulate contamination can degrade critical physical properties of hydraulic fluid, impair pump performance, and cause premature failure of the pump. by removing the water and particulates through filtration and purification, users can reuse the hydraulic fluid. The results of the initial evaluation and Pump Wear Test #1 should encourage consumers of large quantities of hydraulic fluid to consider purifying contaminated hydraulic fluid for reuse instead of immediate

disposal. Hydraulic fluid contaminated with other oils or fuel cannot be purified and reused through this process because it will not separate them.
Derived from text
Aircraft Hydraulic Systems; Hydraulic Fluids; Waste Treatment; Environmental Cleanup; Pollution Control; Filtration; Purification

19990075912 Pratt and Whitney Aircraft, West Palm Beach, FL USA
Zinc-Chromate Primer Alternatives for Aircraft Engine Inserts and Fasteners
Patel, Samir, Pratt and Whitney Aircraft, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 88-98; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The objective of this presentation is to discuss and address Zinc-Chromate alternatives. The presentation will focus on the quality of the alternate to zinc chromate primers used in the assembly of fasteners and inserts for galvanic corrosion protection.
CASI
Zinc; Chromates; Alternatives

19990075949 Department of the Navy, Washington, DC USA
Non-Solvent, General Use Exterior Aircraft Cleaner
Bevilacqua, Philip, Jr., Inventor; Clark, Kenneth G., Inventor; Gauntt, David L., Inventor; Mar. 09, 1999; 4p; In English
Patent Info.: Filed 4 Sep. 97,; US-Patent-Appl-SN-932,795; US-Patent-5,880,078
Report No.(s): AD-D019390; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The present invention relates to a cleaning composition having utility in cleaning aircraft exterior surfaces. The cleaning composition comprises from about 15% to about 40% of a mixture of linear alcohol ethoxylates having a HLB in the range of about 5.0 to about t5.0, from about 5% to about 25% capric diethanolamide, and the balance water. The mixture of linear alcohol ethoxylates comprises from about 5% to about 15% of a first linear alcohol ethoxylate having a HLB in the range of about 5.0 to 9.5 and from about 10% to about 25% of a second linear alcohol ethoxylate having a HLI3 in the range of about 10 to 15. The cleaning composition also includes from about 0.1% to about 5% of capryloamphopropionate, from about 0.1% to about 5.0% benzotriazole, from about 0.1% to about 5.0% of an inhibitor for reducing corrosion of magnesium parts, and from about 0.1% to about 5.0% of an inhibitor for reducing corrosion of cadmium plated steel parts.
DTIC
Cleaning; Alcohols; Cleaners; Solvents; Utility Aircraft

19990075983 Department of the Navy, Washington, DC USA
Nonlinear Optical Films From Pair-Wise-Deposited Semi-Ionomeric Syndioregic Polymers
Hollins, Richard A., Inventor; Lindsay, Geoffrey A., Inventor; Roberts, Marion J., Inventor; Zarras, Peter, Inventor; Stenger–Smith, John D., Inventor; Mar. 16, 1999; 25p; In English; Supersedes US-Patent-Appl-SN-800943
Patent Info.: Filed 23 Jan. 97,; US-Patent-Appl-SN-800,943; US-Patent-5,882,785
Report No.(s): AD-D019369; No Copyright; Avail: US Patent and Trademark Office, Microfiche

This invention is comprised of new nonlinear optic polymers and a new Langmuir-Blodgett (LB) film deposition scheme for which these polymers were designed. The invention is unique because it produces an electro-optic film which has never undergone electric-field poling nor high temperature treatment. It eliminates the dilution effect of the long hydrophobic alkyl groups, and creates stronger ionic bonds between the polymer chains. Finally, the invention reduces the time to make a film of a given thickness by at least half by virtue of depositing two polymer layers per stroke. The new polymers are comprised of asymmetric chromophores linked head-to-head by alternating two different kinds of bridging groups. One of the bridging groups contains one or more ionic groups, and the other bridging group contains one or more non-ionic, hydrophilic groups.
DTIC
Nonlinear Optics; Chromophores; Optical Materials; Polymeric Films; Langmuir-Blodgett Films

19990076133 Department of the Navy, Washington, DC USA
Siloxane Unsaturated Hydrocarbon Based Polymers
Keller, Teddy M., Inventor; Son, David Y., Inventor; Feb. 23, 1999; 9p; In English; Supersedes US-Patent-Appl-SN-437742, AD-D017524.
Patent Info.: Filed 9 May 95,; US-Patent-Appl-SN-437,742; US-Patent-5,874,514
Report No.(s): AD-D019386; No Copyright; Avail: US Patent and Trademark Office, Microfiche

This invention relates to a new class of novel linear inorgantc-organic hybrid polymers of varying molecular weight that are useful for making high temperature oxidatively stable thermosets, and these novel linear polymers arc in themselves oxidatively stable at high temperatures between 600 deg-1000 deg C. These new materials have repeat units that contain at least one alkynyl group and at least one siloxanyl group within the backbone of these novel linear polymers. These novel linear polymers can be further polymerized to form thermosets and ceramics.
DTIC
Siloxanes; Linear Systems; Molecular Weight; Ceramics; Polymerization

19990076135 Department of the Navy, Washington, DC USA
Making Aggregates and Articles Made Therefrom
Kahn, Manfred, Inventor; Chase, Mark, Inventor; Feb. 23, 1999; 5p; In English; Supersedes US-Patent-Appl-SN-826131
Patent Info.: Filed 26 Mar. 97,; US-Patent-Appl-SN-826,131; US-Patent-5,874,126
Report No.(s): AD-D019388; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The process for making a porous mass containing dense aggregates or granules includes the steps of mixing powder with more than 10% by weight of a binder to form agglomerated powder, heating the agglomerated powder to remove the binder and to grow crystallites in the powder to an average diameter exceeding 5 microns to form a porous mass containing the dense aggregates, and cooling the porous mass. The porous mass is broken up, if it is cohesive, into the aggregates containing the crystallites and the aggregates can be used to make an article, such as a transducer. The transducer is essentially a thick film and its thickness is that of the ceramic aggregates of granules. The electrodes connect to the top and to the bottom of the aggregates. As a result, the transducer material operates in the 1-3 mode.
DTIC
Aggregates; Technology Assessment; Binders (Materials); Ceramics; Piezoelectricity

28
PROPELLANTS AND FUELS

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

19990071166 NASA Glenn Research Center, Cleveland, OH USA
NASA Advanced Fuels Program
Palaszewski, Bryan, NASA Glenn Research Center, USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 69-75; In English; See also 19990071155; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

NASA with the USAF Research Laboratory and it's industry partners, has been conducting planning and research into advanced fuels. This work is sponsored under the NASA Advanced Space Transportation Program (ASTP). The current research focus is on Alternative Hydrocarbon fuels, Monopropellants, and Solid Cryogens for storing atoms of Hydrogen, Boron, Carbon, and Aluminum. Alternative hydrocarbons that are under consideration are bi cyclo propylidene, spiro pentane, and tri propargyl amine. These three fuels have been identified as initial candidates to increase the specific impulse of hydrocarbon fueled rockets by 10-15 seconds over 02/RP-1. Formulation of these propellants is proceeding this year, and rocket engine testing is planned for the near future. Monopropellant investigations are focused on dinitramine based fuels, and potential collaborations with the US Navy. The dinitramine fuel work is being conducted under an Small Business Innovation research (SBIR) contract with the team of Orbital Technologies Corp. (Madison, WI) and SRI (Menlo Park, CA). This work may lead to a high density, high specific impulse monopropellants that can simplify the operations for launch vehicles and spacecraft. Solid Cryogens are being considered to store atoms of Hydrogen, Boron, Carbon, and Aluminum. Stored atom propellants are potentially the highest specific impulse chemical rockets that may be practical. These fuels are composed of atoms, stored in solid cryogenic particles, suspended in a cryogenic liquid or gel. The fuel would be fed to a rocket engine as a slurry or gelled cryogenic liquid with the suspended particles with the trapped atoms. Testing is planned to demonstrate the formation of the particles, and then characterize the slurry flows. Rocket propellant and propulsion technology improvements can be used to reduce the development time and operational costs of new space vehicle programs. Advanced propellant technologies can make the space vehicles safer, more operable, and better performing. Five technology areas are described: Monopropellants, Alternative Hydrocarbons, Gelled Hydrogen, Metallized

Gelled Propellants, and High Energy Density Materials. The benefits of these propellants for future vehicles are outlined using mission study results and the technologies are briefly discussed.
Author
Energy Policy; NASA Space Programs; Hydrocarbon Fuels; Gelled Rocket Propellants; Monopropellants; Propellant Additives; Metal Propellants

29
MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications. For biological materials see 55 Space Biology.

19990070950 NASA Marshall Space Flight Center, Huntsville, AL USA
Effects of Gravity on the Double-Diffusive Convection during Directional Solidification of a Non-Dilute Alloy with Application to the HgCdTe
Bune, Andris, NASA Marshall Space Flight Center, USA; Gillies, Donald, NASA Marshall Space Flight Center, USA; Lehoczky, Sandor, NASA Marshall Space Flight Center, USA; 1999; 1p; In English; SD74 Materials Research in Low Gravity II, 18-23 Jul. 1999, Denver, CO, USA; Sponsored by International Society for Optical Engineering, USA; Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

General 2-D and 3-D finite element model of non-dilute alloy solidification was used to simulate growth of HgCdTe in terrestrial and microgravity conditions. Parametric research was undertaken to investigate effects of gravity level, gravity vector orientation and growth velocity on the pattern of melt convection, shape of crystal/melt interface and radial thermal gradient. Verification of the model was undertaken by comparison with previously published results. For low growth velocities plane front solidification occurs. The location and the shape of the interface was determined using melting temperatures obtained from the HgCdTe liquidus curve. The low thermal conductivity of the solid HgCdTe causes thermal short circuit through the ampoule walls, resulting in curved isotherms in the vicinity of the interface. Double-diffusive convection in the melt is caused by radial temperature gradients and by material density inversion with temperature. Cooling from below and the rejection at the solid-melt interface of the heavier HgTe-rich solute each tend to reduce convection. Because of these complicating factors dimensional rather then non-dimensional modeling was performed. For gravity levels higher then 10(exp -7) of terrestrial one it was found that the maximum convection velocity is extremely sensitive to gravity vector orientation and can be reduced at least by 50% by choosing proper orientation of the ampoule. The predicted interface shape is in agreement with one obtained experimentally by quenching.
Author
Convection; Diffusivity; Directional Solidification (Crystals); Mercury Cadmium Tellurides; Gravitational Effects

31
ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

19990070491 Kochi Univ., Faculty of Science, Akebono, Japan
On the Completeness of Metric Space Derived from Measure Space
Nizeki, Shozo, Kochi Univ., Japan; Matsuda, Takashi, Kochi Univ., Japan; Memoirs of the Faculty of Science, Kochi University. Series A: Mathematics; Mar. 1994; ISSN 0389-0252; Volume 15, pp. 1-7; In English
Contract(s)/Grant(s): MOE-C05640197; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The purpose of this paper is to prove that the metric space (M, d) is complete.
CASI
Metric Space; Set Theory

19990070735 Osaka Univ., Faculty of Engineering, Osaka, Japan
A Study on FRP Permanent Form for Reinforced Concrete Slabs
Matsui, Shigeyuki, Osaka Univ., Japan; Ishizaki, Shigeru, Sakai Iron Works, Japan; Kubo, Keigo, Sakai Iron Works, Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2196, pp. 295-307; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A permanent form of glass fiber reinforced plastics (FRP) was developed for a form of concrete slab. A series of tests including fatigue tests by using a wheel running machine was carried out in order to confirm the effect of the permanent form on static strength and durability of RC slab due to a composite action between the FRP form and concrete slab. This paper describes the results of these experimental studies and discusses the applicability of the forms to actual highway bridges.
Author
Composite Structures; Concretes; Glass Fiber Reinforced Plastics; Slabs; Fatigue Tests

19990070924 NASA Goddard Space Flight Center, Greenbelt, MD USA
Flight Test Results for the NICMOS Cryocooler
Dolan, F. X., Creare, Inc., USA; McCormick, J. A., Creare, Inc., USA; Nellis, G. F., Creare, Inc., USA; Sixsmith, H., Creare, Inc., USA; Swift, W. L., Creare, Inc., USA; June 1999; 8p; In English; Cryogenic Engineering, Jul. 1999, Montreal, Canada
Contract(s)/Grant(s): NAS5-31281
Report No.(s): TN-602; No Copyright; Avail: Issuing Activity, Hardcopy

In October 1998 a mechanical cryocooler and cryogenic circulator loop were flown on NASA's STS-95 as part of the Hubble Orbital System Test (HOST). The system will be installed on the Hubble Space Telescope (HST) during Service Mission #3 in 2000 and will provide cooling to the Near Infrared Camera and Multi-Object Spectrometer (NICMOS). It will extend the useful life of that instrument by 5 to 10 years. This was the first successful space demonstration of a turbobrayton cryocooler. The cooler is a single stage reverse Brayton type, using low-vibration high-speed miniature turbomachines for the compression and expansion functions. A miniature centrifugal cryogenic circulator is used to deliver refrigerated neon to the instrument. During the mission, the cooler operated without anomalies for approximately 185 hours over a range of conditions to verify its mechanical, thermodynamic and control functions. The cryocooler satisfied all mission objectives including maximum cooldown to near-design operating conditions, warm and cold starts and stops, operation at near-design temperatures, and demonstration of long-term temperature stability. This paper presents a description of the cooler and its operation during the HOST flight.
Author
Flight Tests; Coolers; Centrifugal Force; Cryogenics; Near Infrared Radiation; Spectrometers; Thermal Stability

19990071060 Osaka City Univ., Faculty of Engineering, Japan
Memoirs of the Faculty of Engineering, Osaka City University, Volume 39
December 1998; ISSN 0078-6659; 166p; In English; See also 19990071061 through 19990071066; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Contents include the following: Measuring Method for large aspherical surfaces with holographic optical elements. Conical pinched electron beam diode for an intense pulsed X-ray source. AN experimental study on dynamic response of deep beams by impact loading test. Computer simulation. Discriminating method of noise quantity in degraded speech and application for speech enhancement. an approach number of hidden units for three layered neural networks to parity discrimination.
CASI
Computerized Simulation; Conical Scanning; Holographic Optical Elements; Impact Loads; X Ray Sources

19990071169 Kirov (S. M.) Tomsk Polytechnic Inst., USSR
Thermal Characterization of Defects in Building Envelopes Using Long Square Pulse and Slow Thermal Wave Techniques
Vavilov, V., Kirov (S. M.) Tomsk Polytechnic Inst., USSR; Kauppinen, T., Technical Research Centre of Finland, Finland; Grinzato, E., Consiglio Nazionale delle Ricerche, Italy; Research in Nondestructive Evaluation; 1997; ISSN 0934-9847; Volume 9, No. 4, pp. 181-200; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Building infrared thermography is a well-established but still qualitative technique that is used mostly for detecting insulation deficiencies, air leaks, moist areas, and thermal bridges in envelopes. Characterization of buried defects requires replacing steady-state thermography with a transient technique. It is proposed to borrow for this purpose the inspection methodology developed in the thermal nondestructive evaluation of materials. This methodology is based on recording the image sequence in both the heating and cooling stages, with the thermal stimulus being delivered onto the surface with a Dirac, square, or harmonic heat pulse. The dedicated image treatment allows the substitution of a sequence of any length with a pair of images called the "maxigram" and "timegram." These images contain information needed for the characterization of defects. Some explicit inversion formulas discussed in the paper enable the determination of defect depth and thermal resistance. The proposed approach is illustrated with experimental results. Evaluation of internal corrosion in concrete and detection of underplaster delaminations are reported.
Author
Thermal Resistance; Defects; Thermography; Nondestructive Tests; Buildings

19990074937 Helsinki Univ. of Technology, Lab. of Materials Processing and Powder Metallurgy, Espoo, Finland
Sulphation Reactions of Oxidic Dust Particles in Waste Heat Boiler Environment. Literature Review
Ranki, T.; 1999; 54p; In English
Report No.(s): PB99-162331; TKK-MK-64; Copyright; Avail: National Technical Information Service (NTIS), Hardcopy
Table of Contents: Introduction; Gas-Solid Reactions Generally; Characteristics of Sulfation Reactions; Sulfation of Metal Oxides; Summary; and References.
NTIS
Sulfation; Metal Oxides; Boilers; Waste Heat

19990074943 Maryland Univ., Dept. of Mechanical Engineering, College Park, MD USA
Effect of Minute Water Droplets on a Simulated Sprinkler Link Thermal Response ***Final Report***
Gavelli, F.; Ruffino, P.; Anderson, G.; di Marzo, M.; Jul. 1999; 122p; In English
Contract(s)/Grant(s): 60NANB8D0012
Report No.(s): PB99-159907; NIST GCR 99-776; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy
The report presents the derivation of an improved model for the prediction of the transient thermal response of a ceiling-mounted fire detection sprinkler link in the event of a fire. The model expands the range of applicability of the current approach to include the presence of minute water droplets being carried by the hot gas plume. This situation has been observed experimentally in situations where a fire develops in an enclosed space equipped with an array of sprinklers: the activation of the first sprinkler releases a fine water spray, part of which is entrained by the rising plume and affects the operation of the surrounding devices.
NTIS
Water; Drops (Liquids); Transient Response; Thermal Analysis; Sprinkling

19990075055 Sumitomo Heavy Industries Ltd., Tokyo, Japan
Sumitomo Heavy Industries Technical Review
Apr. 1998; Volume 46, No. 136; 98p; In Japanese; Original contains color illustrations
Report No.(s): PB99-164329; Copyright; Avail: National Technical Information Service (NTIS), Hardcopy
Contents include the following: Acceleration Equipment; Laser Equipment; Power Transmission and Electrical Equipment; Plastics Machinery; Paper Machinery; Iron and Steel Making Equipment; Machine Tools and Press; Material Handling Equipment and System; Construction Machine and Folklift Truck; Ship and Offshore Steel Structure; Bridge, Steel Structure and Water Gate; Environmental Equipment and Chemical Plant; Pressure Vessel; and Cryogenic Equipment.
NTIS
Industrial Plants; Handling Equipment

19990075833 Department of the Navy, Washington, DC USA
Method and Apparatus for Inducing Fully-Reversed Three-Dimensional Loading on a Non-Rotating Beam
Troffer, Michael A., Inventor; Appleman, William M., Inventor; Korczynski, Joseph F., Jr, Inventor; Feb. 16, 1999; 14p; In English
Patent Info.: Filed 14 Mar. 97,; US-Patent-Appl-SN-819,561; US-Patent-5,872,318
Report No.(s): AD-D019405; No Copyright; Avail: US Patent and Trademark Office, Microfiche
The inventive fatigue-testing apparatus features a compact orbital mechanism which rotates a bending force around a non-rotating test section and a stationary test bed. In addition to applying a bending force, some inventive embodiments apply an axial force and a torsional force, thereby accomplishing full-scale evaluation of test sections under three-dimensional loading; the inventive practice for applying bending, torsional and axial loads compares favorably with conventional practice in terms of reliability and cost. The inventive orbital mechanism increases the reliability of the entire inventive test apparatus by reducing the number of moving parts, component wear, maintenance and complexity. The invention also provides maximum access to the test section for instrumentation, inspection, maintenance and modification. The inventive benefits will permit evaluations of larger test sections and will afford extended evaluations to more accurately determine fatigue limitations of complex joints.
DTIC
Fatigue Tests; Test Chambers; Loads (Forces); Torsion

19990075859 Bell Telephone Labs., Inc., Murray Hill, NJ USA
Fire Protection Considerations for Critical Electronic Equipment Facilities
Taylor, Gary, Bell Telephone Labs., Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 109-140; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The purpose of this presentation in to discuss various ways to prevent fire. This is done through sufficient investigation of the critical electronic equipment facilities. Sections of this presentation includes: the risk factors, location within the building, general construction materials, interior construction materials, electrical wiring, drainage, raise floors, computer equipments, cable openings and other penetration, automatic detection systems, automatic sprinkler systems, and gaseous fire protection systems.
CASI
Fire Prevention; Fires; Fireproofing; Electronic Equipment

19990075860 NASA Kennedy Space Center, Cocoa Beach, FL USA
NASA Issues Related to use of Halon: Past, Present, Future
Collins, Michelle M., NASA Kennedy Space Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 141-143; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

NASA began an official halon phaseout program in 1990. NASA has led the way in halon bank management and has participated in the search for halon alternatives. NASA representatives participate in technical committees of the National Fire Protection Association and United Nations Environment Program providing guidance on Halon Phaseout and acceptance, design, installation, and maintenance of Halon Alternatives. This paper addresses some of the key issues that are leading the agency away from dependence on halons for fire protection.
Derived from text
NASA Programs; Alternatives; Fire Prevention; Flame Retardants; Halocarbons

19990075862 Boeing Co., Rocketdyne Propulsion and Power, Canoga Park, CA USA
A Review of Production Cleaning Processes
Brown, Alan, Boeing Co., USA; Douglas, Vonnie, Boeing Co., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 153-159; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Rocketdyne has been using aqueous based cleaning processes since the successful elimination of all ozone-depleting chemicals in 1996. These new processes consist of an ultrasonic cleaning line, a high-pressure flush cleaning process for larger hardware, and both aqueous based and solvent based verification techniques. In addition, self-contained cleaning equipment has increased the reliability of in process cleaning of hardware. These systems have been fully implemented and have been working very successfully. The success of these processes has depended on the design of the new cleaning equipment and the results of Taguchi experiments in developing robustness. Added benefits from these new processes include reduced cycle time, cost advantages over solvent-based systems, as well as higher quality cleaning.
Author
Cleaning; Ultrasonic Cleaning; Freon; Solvents

19990075863 NASA Marshall Space Flight Center, Huntsville, AL USA
Precision Cleaning and Verification Processes Used at Marshall Space Flight Center for Critical Hardware Applications
Caruso, Salvadore V., NASA Marshall Space Flight Center, USA; Cox, Jack A., Artificial Intelligence Signal Research Corp., Inc.; McGee, Kathleen A., Artificial Intelligence Signal Research Corp., Inc.; Third Aerospace Environmental Technology Conference; April 1999, pp. 160-168; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

This presentation discuss the Marshall Space Flight Center Operations and Responsibilities. These are propulsion, microgravity experiments, international space station, space transportation systems, and advance vehicle research.
CASI
Flight Operations; Housekeeping (Spacecraft)

19990075864 NASA White Sands Test Facility, NM USA
Aqueous Cleaning and Validation for Space Shuttle Propulsion Hardware at the White Sands Test Facility
Hornung, Steven D., Allied-Signal Technical Services Corp., USA; Biesinger, Paul, Allied-Signal Technical Services Corp., USA; Kirsch, Mike, NASA White Sands Test Facility, USA; Beeson, Harold, NASA White Sands Test Facility, USA; Leuders, Kathy, NASA White Sands Test Facility, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 169-177; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The NASA White Sands Test Facility (WSTF) has developed an entirely aqueous final cleaning and verification process to replace the current chlorofluorocarbon (CFC) 113 based process. This process has been accepted for final cleaning and cleanliness verification of WSTF ground support equipment. The aqueous process relies on ultrapure water at 50 C (323 K) and ultrasonic

agitation for removal of organic compounds and particulate. The cleanliness is verified bv determining the total organic carbon (TOC) content and filtration with particulate counting. The effectiveness of the aqueous methods for detecting hydrocarbon contamination and particulate was compared to the accepted CFC 113 sampling procedures. Testing with known contaminants, such as hydraulic fluid and cutting and lubricating oils, to establish a correlation between aqueous TOC and CFC 113 nonvolatile residue (NVR) was performed. Particulate sampling on cleaned batches of hardware that were randomly separated and sampled by the two methods was performed. This paper presents the approach and results, and discusses the issues in establishing the equivalence of aqueous sampling to CFC 113 sampling, while describing the approach for implementing aqueous techniques on Space Shuttle Propulsion hardware.
Derived from text
Cleanliness; Cleaning; Cleaners; Chlorofluorocarbons

19990075875 NASA Marshall Space Flight Center, Huntsville, AL USA
High Pressure Water Stripping Using Multi-Orifice Nozzles
Hoppe, David, NASA Marshall Space Flight Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 314-322; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The use of multi-orifice rotary nozzles greatly increases the speed and stripping effectiveness of high pressure water blasting systems, but also greatly increases the complexity of selecting and optimizing the operating parameters. The rotational speed of the nozzle must be coupled with its transverse velocity as it passes across the surface of the substrate being stripped. The radial and angular positions of each orifice must be included in the analysis of the nozzle configuration. Orifices at the outer edge of the nozzle head move at a faster rate than the orifices located near the center. The energy transmitted to the surface from the impact force of the water stream from an outer orifice is therefore spread over a larger area than energy from an inner orifice. Utilizing a larger diameter orifice in the outer radial positions increases the total energy transmitted from the outer orifice to compensate for the wider distribution of energy. The total flow rate from the combination of all orifices must be monitored and should be kept below the pump capacity while choosing orifice to insert in each position. The energy distribution from the orifice pattern is further complicated since the rotary path of all the orifices in the nozzle head pass through the center section. All orifices contribute to the stripping in the center of the path while only the outer most orifice contributes to the stripping at the edge of the nozzle. Additional orifices contribute to the stripping from the outer edge toward the center section. With all these parameters to configure and each parameter change affecting the others, a computer model was developed to track and coordinate these parameters. The computer simulation graphically indicates the cumulative affect from each parameter selected. The result from the proper choices in parameters is a well designed, highly efficient stripping system. A poorly chosen set of parameters will cause the nozzle to strip aggressively in some areas while leaving the coating untouched in adjacent sections. The high pressure water stripping system can be set to extremely aggressive conditions allowing stripping of hard to remove adhesives, paint systems, and even cladding and chromate conversion coatings. The energy force can also be reduced to strip coatings from thin aluminum substrates without causing any damage or deterioration to the substrate's surface. High pressure water stripping of aerospace components has thus proven to be an efficient and cost effective method for cleaning and removing coatings.
Author
High Pressure; Water; Anodic Stripping; Cladding; Coating; Orifices

19990075876 Thiokol Corp., Brigham City, UT USA
ODC-Free Cleaning Experiences on Solid Rocket Motors
Sagers, Neil, Thiokol Corp., USA; Evans, Kurt, Thiokol Corp., USA; Saunders, Chad, Thiokol Corp., USA; Betenson, Brice, Thiokol Corp., USA; Rader, Alan, Thiokol Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 323-329; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

An aqueous cleaning system has proven effective to clean cases for the Reusable Solid Rocket Motor (RSRM). Contaminants included oil & grease, dust and incidental contamination. The bath life was extended to over four months by the addition of potassium hydroxide. OcCASIonal stains left on metal surfaces were greatly reduced by maintaining the rinse water conductivity at 275 micromhos or less. A replacement cleaner was investigated for removal of silicone release agents from paint brushes. The silicones are a part of the brush manufacturing process and must be removed before the brushes are used to apply adhesive, primer and paint to the RSRM. An initial screening showed four cleaners removed silicone well from brushes, three were aqueous. Detailed follow-on tests are in work to implement the brush cleaning process with a new cleaner.
Author
Aqueous Solutions; Cleaners; Cleaning; Waste Disposal; Silicones; Brushes

19990075877 Pratt and Whitney Aircraft, West Palm Beach, FL USA

Replacement of a Hazardous Solvent Degreasing Operation with an Automated Aqueous Precision Clean Line

Privett, Mal, Pratt and Whitney Aircraft, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 330-335; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Pratt & Whitney has developed alternatives to trichloroethylene used in precision cleaning operations for the manufacture of high pressure turbopumps for the Space Shuttle Main Engine program. Trichloroethylene has been traditionally used in a degreaser as the method for precision cleaning of components. Several methods were investigated to replace the degreasing operation. The aqueous ultrasonic method chosen to replace the degreasing operation was developed using the contaminants found in the manufacturing and assembly process. The process was validated using pilot scale ultrasonic equipment. Significant lessons were learned during the pilot scale trials, especially in the area of equipment design and optimization. Also, lessons learned from the implementation of a cleaning system used prior to fluorescent penetrant inspection were incorporated into the design of this system. The system chosen for implementation into the production environment was a customized, but cost effective, fully automated five station clean line. The system was designed to minimize both energy and water consumption and also to minimize process waste. In addition, this new process eliminates the use of all degreasers at the Pratt & Whitney - Florida facility.
Author

Precision; Cleaning; Cleanliness; Manufacturing; Turbine Pumps; Trichloroethylene; Solvents

19990075878 Thiokol Propulsion, Brigham City, UT USA

Wash Solution Bath Life Extension for the Space Shuttle Rocket Motor Aqueous Cleaning System

Saunders, Chad, Thiokol Propulsion, USA; Evans, Kurt, Thiokol Propulsion, USA; Sagers, Neil, Thiokol Propulsion, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 336-359; In English; See also 19990075847; Copyright Waived; Avail: CASI; A03, Hardcopy; A06, Microfiche

A spray-in-air aqueous cleaning system, which replaced 1,1,1 trichloroethane (TCA) vapor degreasing, is used for critical cleaning of Space Shuttle Redesigned Solid Rocket Motor (RSRM) metal parts. Small-scale testing demonstrated that the alkaline-based wash solution possesses adequate soil loading and cleaning properties. However, full-scale testing exhibited unexpected depletion of some primary components of the wash solution. Specifically, there was a significant decrease in the concentration of sodium metasilicate which forced change-out of the wash solution after eight days. Extension of wash solution bath life was necessary to ease the burden of frequent change-out on manufacturing. A laboratory study supports a depletion mechanism that is initiated by the hydrolysis of sodium tripolyphosphate (STPP) lowering the pH of the solution. The decrease in pH causes polymerization and subsequent precipitation of sodium metasilicate (SM). Further investigation showed that maintaining the pH was the key to preventing the precipitation of the sodium metasilicate. Implementation to the full scale operation demonstrated that periodic additions of potassium hydroxide (KOH) extended the useful bath life to more than four months.
Author

Air Filters; Air Purification; Cleaning; Hydrolysis

19990075879 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA

Advances in Environmentally Friendly Aerospace Electronic Cleaning Technologies

Kennedy, John Rider, Edgewood Research Development and Engineering Center, USA; Beeson, Leonard J., Edgewood Research Development and Engineering Center, USA; Klapper, Harold, Edgewood Research Development and Engineering Center, USA; Kinne, W. E., Edgewood Research Development and Engineering Center, USA; Vettraino, Lawrence G., Department of the Air Force, USA; Fuchs, Richard W., Independent Special Processes, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 360-372; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Chlorofluorocarbons (CFCs) are wonderful cleaning agents for electronics. They dissolve virtually anything. They easily clean the toughest grime that can contaminate a piece of electronic hardware and leave it all but spotless. Yet they will not harm even the most delicate circuitry. They are non-flammable and virtually non-toxic. They are stable and can be used over and over again. Unfortunately, they also have a ”minor” flaw, they deplete the ozone layer. The approach used in this project was to exploit to the fullest extent possible the research and development work that had already been done and to avoid the temptation to ”re-invent the wheel.” Further, the project sought to combine the best of the best from the available chemistries and equipment innovations to make the optimal electronic cleaning system.
Derived from text

Cleaners; Cleaning; Solvents; Trichloroethylene; Isopropyl Alcohol; Chlorofluorocarbons; Chlorofluoromethane; Ozone Depletion

19990075880 NASA White Sands Test Facility, NM USA

Evaluation of Solvent Alternatives for Cleaning of Oxygen Systems

Beeson, Harold, NASA White Sands Test Facility, USA; Biesinger, Paul, Allied-Signal Technical Services Corp., USA; Delgado, Rafael, Allied-Signal Technical Services Corp., USA; Antin, Neil, Naval Sea Systems Command, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 373-377; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The NASA White Sands Test Facility (WSTF) in a joint program with the Naval Sea Systems Command has evaluated a number of solvents as alternatives to the use of chlorofluorocarbons currently utilized for cleaning of oxygen systems. Particular attention has been given to the cleaning of gauges and instrumentation used in oxygen service, since there have been no identified aqueous alternatives. The requirements identified as selection criteria, include toxicity, physical properties consistent with application, flammability, oxygen compatibility, and cleaning ability. This paper provides a summary of results and recommendations for solvents evaluated to date.

Author

Solvents; Alternatives; Cleaning; Cleaners; Washers (Cleaners)

19990075885 General Lasertronics Corp., USA

Laser Coatings Removal

Fuchser, Terry L., General Lasertronics Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 444-460; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This presentation presents the coatings removal requirements, removal technologies, laser usage, current product status, environmental/social impact, system features/options, and the current programs being implemented by General LASERTRONICS Corp..

CASI

Laser Applications; Coatings; Coating; Removal; Anodic Stripping

19990075886 NASA Marshall Space Flight Center, Huntsville, AL USA

Interagency Depainting Study Status

Clark–Ingram, Marceia, NASA Marshall Space Flight Center, USA; Cook, Beth, NASA Marshall Space Flight Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 461-483; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This document discusses coating removal in general. Sections of this presentation include: regulatory background, the initial parameters of the study, the current parameters of the study, stages in each sequence, preparation of the test specimen, material evaluation testing, chemical stripping, CO2 blasting, Flashjet coating removal, plastic media blasting, sodium bicarbonate wet stripping, water stripping, and wheat starch stripping.

CASI

Coating; Anodic Stripping; Removal; Surface Treatment

19990075887 NASA Marshall Space Flight Center, Huntsville, AL USA

The Successful Transfer of Space Derived Convergent Spray Technology(TM): An Application for Industrial Roof Coatings and Interstate Bridge Repair

McMillan, Vernotto, NASA Marshall Space Flight Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 484-494; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Although the levels of volatile organic compound (VOC) emissions from industrial roof coatings and paint operations have been reduced in recent years, the roof coating partnership was an effort to further reduce VOC emission levels and to also demonstrate the use of reclaimed automobile tire rubber as a filler material in roof coating systems. Different materials and coatings were evaluated and tested before the final selection was used to coat the roofs of two small buildings at NASA's MSFC (Marshall Space Flight Center) during fiscal year 1997. The primary objective of the Bridge repair partnership was to strategically leverage public and private sector funds for the purpose of developing a bridge repair process that was cheaper, better, and faster than conventional methods. It was also, imperative that this process be environmentally friendly and capable of performing under extreme conditions for a period of not less than 2 years.

Derived from text

Convergence; Sprayers; Spraying; Roofs; Bridges (Structures); Highways; Maintenance

19990075888 BFK Solutions, Pacific Palisades, CA USA

Newer Cleaning Processes: Steam, CO2, Plasma, and Maximal Solvent Containment

Kanegsberg, Barbara, BFK Solutions, USA; Paquin, Don, Metroline, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 495-500; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

In evaluating and implementing new cleaning processes, components manufacturers are typically faced ,with juggling the requirements for consistent performance, affordable cost, worker safety, and a host of conflicting local, national, and global environmental and safety regulations. The political trend, and in many cases the economically astute trend, is toward self-contained, so-called zero-discharge processes which eliminate ozone depleting chemicals (ODC's) control volatile organic compounds (VOC's), and minimize the release of air toxics. The importance of cradle to grave responsibility for the chemicals has led to increasing costs of training, record-keeping, and disposal. Regulatory considerations, combined with ever-increasing contamination control requirements and increasingly close tolerances and miniaturization, has lead to the concept of cleaning by design. Cleaning by design can mean extra care in choosing the correct cleaning agent be it aqueous or organic solvent. It can also mean looking at what have been considered as non-traditional cleaning approaches and incorporating them into the build process. In the final analysis, cleaning by design implies stepping back and looking at the entire assembly process to devise more efficient, effective, environmentally sound approaches to manufacturing. Some examples of non-traditional approaches will be discussed. Derived from text

Cleaning; Steam; Carbon Dioxide; Plasmas (Physics); Solvents; Containment; Confinement

19990075889 Alabama Univ., Huntsville, AL USA

Alabama Rapid Prototyping and Manufacturing Alliance (ARPAMA)

Cranston, John A., Alabama Univ., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 501-507; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Through strategic partnering the Alabama Rapid Prototyping Advanced Manufacturing Alliance (ARPAMA) delivers rapid production tooling, coatings, advanced manufacturing, and composite technology. The initial focus of this Alliance is on four advanced manufacturing technologies: a vacuum arc vapor deposition process capable of thin, uniform coatings with minimal heating of the coated part patented by NASA and developed by Vacuum Arc Technologies, (VAT), surface transformation treatments capable of tailoring a surface to an alloy composition developed by University of Tennessee Space Institute and licensed by Surface Treatment Technologies, a spin-off company of Micro Craft,(MC), and thermal spray coatings of metallic and non-metallic materials developed by Plasma Processes Inc. (PPI). Lastly a tooling foam, (developed by UAH), used for tools, mandrels, and molds for elevated temperatures. The combination of these technologies has created technology to build metal tooling and parts near-net. Pressure vessels, rocket engines, tooling, and molds have been fabricated. Some of the metals used to date include aluminum, copper, steel and inconel. Researchers from UAH, MSFC, and the Alliance are jointly developing hardware that will lead to advanced manufacturing systems. These systems will incorporate advanced deposition technologies, CAD-CAM, robotics, CMM, analysis software tools and reverse engineering to produce a virtual product development system.
Derived from text

Vapor Deposition; Surface Treatment; Coating; Computer Aided Design; Technology Transfer; Reverse Engineering; Software Engineering; Prototypes

19990075894 Boeing Information, Space and Defense Systems, Environmental Engineering and Environmental Affairs, Seattle, WA USA

Development of an Environmental and Health Risk Assessment Tool for Materials and Processes

Weinberg, Laurence, Boeing Information, Space and Defense Systems, USA; Doubt, Roark, Boeing Information, Space and Defense Systems, USA; Bourcier, Denis, Boeing Information, Space and Defense Systems, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 539-549; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This paper describes a risk assessment tool developed at Boeing to permit the analysis of human health, environmental and regulatory risk associated with the use of hazardous chemicals in the processes employed by an aerospace manufacturer. Risk is evaluated from both a chemical hazard and a regulatory aspect, using existing health and environmental regulations and definitions while taking into account the process characteristics and the quantity of material being used. The risk is computed as a function of innate material properties adjusted for such factors as process exposure potential and amount of material used in the process. The material properties are chosen to be reasonably accessible in the literature, in order to facilitate use by organizations that do not possess toxicological investigative resources or capabilities. Information from the risk analysis can be used to compare chemicals and processes. Such comparisons are useful in determining where to concentrate resources in order to reduce risk and in evalu-

ating proposed alternatives from a risk standpoint. Various functions of the quantity of material used, such as log base x, are examined. The health and environmental portions of the analysis are separate, allowing the health and environmental aspects to treated by themselves as well as in a combined fashion. by adjusting the final tabulation formula, the weights assigned to health and to environment can be altered. This risk analysis tool represents a compromise between the time and resources required for a detailed scientific investigation and the need for a tool that can be efficiently applied to numerous combinations of processes and materials by an organization that wishes to examine potential risk to human health and the environment. It is constructed so that it can be modified as new health and environmental factors are identified.
Author
Health; Regulations; Environment Effects; Risk; Assessments

19990075895 Thiokol Propulsion, Brigham City, UT USA
Characterization of an Environmentally Friendly Cleaning Process with Surface Analysis
Lesley, Michael W., Thiokol Propulsion, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 550-561; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This paper describes the role of electron spectroscopy in support of the successful development and scale-up of an aqueous cleaning process for large metal parts. The results complement and explain trends in bonding data, and provide information on the causes of process anomalies such as corrosion. They also demonstrate equivalence of results between this process and a vapor degreasing process it replaced.
Author
Cleaning; Electron Spectroscopy; Aqueous Solutions; Solvents

19990075900 Petroferm, Inc., Fernandina Beach, FL USA
Semi-Aqueous and Vapor Degreasing Processes for Removing Waxes, Pitches, and Fixturing Compounds from Precision Parts
Bivins, Elizabeth A., Petroferm, Inc., USA; Hayes, Steven B., Petroferm, Inc., USA; Last, Frank J., III, Petroferm, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 610-619; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

This paper details the proper configuration and operation of semi-aqueous and vapor degreasing processes for removing wax, pitch, or fixturing compound from precision parts. These cleaning tasks have historically been performed in vapor degreasers using chlorinated solvents. For a variety of environmental, health and safety reasons, chlorinated solvents have fallen out of favor with many companies. Most of the alternative processes and chemistries which have been implemented have produced results which were unsatisfactory in one way or another. by contrast, the processes described in this paper have been implemented in several manufacturing facilities in the aerospace, optics, electronics, and general metalworking industries with excellent results. Critical issues for semi-aqueous cleaning such as cleaning equipment design, operating parameters, ventilation, bath recycling, air emissions, and waste disposal are addressed. For vapor degreasing, selection of non-NESHAP regulated solvents, cleaning equipment configuration, and system operating parameters will be discussed.
Author
Cleaning; Solvents; Waxes; Pitch (Material); Fixtures; Aqueous Solutions; Design Analysis

19990075901 Northrop Grumman Corp., Bethpage, NY USA
Environmentally Acceptable Hydraulic Oil Flush Solvent Cleaning Program for the Replacement of Freon, an Ozone Depleting Chemical
Weir, John, Northrop Grumman Corp., USA; Doria, Richard, Northrop Grumman Corp., USA; Sinowitz, Allen, Northrop Grumman Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 620-634; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Laboratory testing indicated that 3M's HFE 7100 and Petroferm's PFC 265-141 solvents can be used to replace Freon TF (CFC 113) for cleaning off hydraulic oil, MIL-H-83282 from the interior of E2C and F-14 aircraft surfaces. Hydraulic oil removal rates, as well as, material compatibility testing resulted in selecting PFC 265-141 solvent for oil removal followed by a final flush of HFE 7100 to assure the complete removal of the oil contaminated PFC 265-141 solvent. Testing indicated that 3M's HFE 71DE and Dupont's Vertrel SMT and Vertrel MCA were not compatible with MIL-L-81352 acrylic coatings used on the aforementioned production aircraft. The presentation reports the data generated during the test program and describes the methodology used to qualify the materials for this application. The methodology considered functional testing which included hydraulic oil removal rates, evaporation rate, and flash point considerations. Additionally, extensive material compatibility testing was accomplished

on aircraft materials to assure the selected solvents would not damage aircraft coatings, sealant, part markings, wiring, electrical connectors, tube markings as well as high strength steel.
Author
Cleaning; Solvents; Silicon; Rubber; Compatibility; F-14 Aircraft; Aircraft Parts

19990075902 NASA Kennedy Space Center, Cocoa Beach, FL USA
Wiltech Component Cleaning and Refurbishment Facility CFC Elimination Plan at NASA Kennedy Space Center
Williamson, Steve, Wiltech Corp. of Florida, Inc., USA; Aman, Bob, Wiltech Corp. of Florida, Inc., USA; Aurigema, Andrew, Wiltech Corp. of Florida, Inc., USA; Melendez, Orlando, NASA Kennedy Space Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 635-637; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The Wiltech Component Cleaning & Refurbishment Facility (WT-CCRF) at NASA Kennedy Space Center performs precision cleaning on approximately 200,000 metallic and non metallic components every year. WT-CCRF has developed a CFC elimination plan consisting of aqueous cleaning and verification and an economical dual solvent strategy for alternative solvent solution. Aqueous Verification Methodologies were implemented two years ago on a variety of Ground Support Equipment (GSE) components and sampling equipment. Today, 50% of the current workload is verified using aqueous methods and 90% of the total workload is degreased aqueously using, Zonyl and Brulin surfactants in ultrasonic baths. An additional estimated 20% solvent savings could be achieved if the proposed expanded use of aqueous methods are approved. Aqueous cleaning has shown to be effective, environmentally friendly and economical (i.e.. cost of materials, equipment, facilities and labor).
Author
Cleaning; Solvents; Aqueous Solutions

19990075907 Thiokol Propulsion, Brigham City, UT USA
Phase 2 ODC Elimination: Hand-Wipe Cleaning
Danieu, Dan, Thiokol Propulsion, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 665-680; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This presentation includes a discussion of the ozone depleting compounds (ODC) elimination through 3 phases over 9 years, the Phase II hand-wipe cleaning, and the Essential use exemption (EUE) extension requested throughout Space Shuttle life.
CASI
Cleaning; Washers (Cleaners); Cleaners

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COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications. 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.

19990070936 New Mexico State Univ., Klipsch School of Electrical and Computer Engineering, Las Cruces, NM USA
FPGA-Based Filter Bank Implementation for Parallel Digital Signal Processing
Berner, Stephan, New Mexico State Univ., USA; July 1999; 192p; In English
Contract(s)/Grant(s): NAG1-1491
Report No.(s): NMSU-ECE-99-005; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

It may be desired to apply Digital Signal Processing (DSP) to high bandwidth signals with a sampling rate too high for being handled by any commercially available processor. One approach to solve this problem is to divide the spectrum of the signal into subbands by an analysis filter bank, then process the subbands in parallel, and finally, recombine the processed subband signals by a synthesis filter bank. The key point is the fact, that the sampling rate in the subbands can be reduced by downsampling, because the bandwidth of the subband signals is reduced. This report describes a hardware implementation. The analysis and synthesis filter banks are implemented with Field Programmable Gate Arrays (FPGAs), the subband processing is accomplished with Motorola DSP 56302 Evaluation Modules (EVMs).
Author
Bandwidth; Signal Processing; Digital Filters

19990070945 Defence Science and Technology Organisation, Electronics and Surveillance Research Lab., Salisbury, Australia
An Application of Checkland's Soft Systems Methodology to the Development of a Military Information Operations Capability for the Australian Defence Force
Staker, R. J., Defence Science and Technology Organisation, Australia; March 1999; In English
Report No.(s): DSTO-TN-0183; AR-010-816; Copyright; Avail: Issuing Activity (DSTO Electronics and Surveillance Research Lab., PO Box 1500, Salisbury, South Australia, Australia 5108), Hardcopy, Microfiche

There is widespread concern throughout many advanced nations concerning the potential for Information Operations to influence the outcome of Military Operations. This concern is shared by elements of the Australian Defence Force and other Australian government agencies. In order to ensure that any such potential does not adversely affect Australian interests, there is a need to develop an Australian Military Information Operations capability. This document uses concepts from Checkland's Soft Systems Methodology to explore methods through which such a capability could be achieved.
Author
Systems Engineering; Information Management

19990071065 Osaka City Univ., Dept. of Information and Computer Engineering, Japan
Discriminating Method of Noise Quantity in Degraded Speech and Application for Speech Enhancement
Choi, Jae–Seung, Osaka City Univ., Japan; Nakajima, Shigeyoshi, Osaka City Univ., Japan; Okamoto, Jiro, Osaka City Univ., Japan; Hosokawa, Shoichi, Osaka City Univ., Japan; Suzuki, Yutaka, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 1998; Volume 39; 12p; In English; See also 19990071060; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

In order to reduce the noise in the noise speech, it is desirable to change the parameters of the speech processing system according to the intensity of the noise quantity in order to reproduce a good quality speech. This paper presents a three layered neural network which is able to train the three graded speeches containing three graded white noise. Experimental results demonstrate that the noise amount could be discriminated by a neural network, whose inputs are cepstral coefficient. We believe that the improvement of speech signals degraded by noise is fully accomplished by attaching this discriminating system to the signal processing system.
Author
Discriminators; Noise Reduction; Cepstral Analysis; Speech Recognition

19990071164 Teledesic Corp., Kirkland, WA USA
A Teledesic Space Infrastructure Overview
Matossian, Mark G., Teledesic Corp., USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 53-58; In English; See also 19990071155; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The Teledesic Network uses a constellation of 288 interlinked low-Earth orbit satellites to provide global access to a broad range of voice, data and video communication capabilities. Through its global partnerships, the Network provides switched digital connections between users of the Network and, via gateways, to users on other networks. A variety of terminals accommodate "on-demand" channel rates from 16 Kbps up to 2.048 Mbps ("E1"), and for special applications up to 1.24416 Gbps ("OC-24"). This allows a flexible, efficient match between system resources and the requirements of users' diverse applications. The constellation provides 24 hour seamless coverage to +/- 72 degrees latitude at near-circular orbits inclined at approximately 84.7 degrees and 1375 km. The 24 spacecraft in each of the unphased 12 orbital planes have ascending nodes separated by approximately 15 degrees. The Teledesic spacecraft are specifically designed to take advantage of the economies that result from high volume production and launch. All spacecraft are identical and use technologies and components that allow a high degree of automation for both production and test. to minimize launch cost and the deployment interval, the spacecraft are designed to be stacked so that multiple spacecraft can be launched on a single vehicle. Individual spacecraft, the constellation as a whole, and the constellation control centers are designed to operate with a high degree of autonomy.
Author
Network Synthesis; Satellite Networks; Communication Theory; Network Control; Communication Networks; Communication Satellites; Satellite Communication; Adaptive Control; Autonomy

19990071179 North Dakota State Univ., Upper Great Plains Transportation Inst., Fargo, ND USA
Tel8 Telecommunications Network: A Pooled Fund Study for Transportation Videoconferencing ***Interim Report, Jan. - Dec. 1998***
Benson, D. E.; May 1999; 32p; In English
Report No.(s): PB99-151433; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The document reports the 1999 research efforts and results of a telecommunication network dedication to transportation. These efforts include a major system-wide reconfiguration of the network's telecommunication technology, and the re-establishment of the network's program director and its governing organizational structure. The research results include the programming, training, educational activities, and communication's activities developed by the network and an evaluation of the technological and organizational changes.
NTIS
Telecommunication; Transportation; Communication Networks

19990071217 Helsinki Univ. of Technology, Electromagnetics Lab., Espoo, Finland
Electromagnetics Laboratory Reports 1-279, *1985-1998*
Nykaenen, K.; Mar. 1999; ISSN 1239-940X; 124p; In English
Report No.(s): PB99-159048; Rept-292; ISBN 951-22-4479-9; No Copyright; Avail: National Technical Information Service (NTIS), Microfiche, Hardcopy

The report series of the Electromagnetics Laboratory was launched right after the founding of the Laboratory in 1984, as a forum of preprints of articles to be published in international journals. After 14 years of activity, a cumulative inventory of reports deserves to appear. The present collection lists Electromagnetics Laboratory reports from the first one (April 1985) up to report number 279 (November 1998), which was the last report to be printed with the traditional visual style of the Helsinki University of Technology. The reports are listed with their abstracts and the bibliographic data of the later internationally published versions.
NTIS
Electromagnetism; Electromagnetic Radiation; Bibliographies

19990071229 Harvard Univ., Cambridge, MA USA
Discrete Event Dynamic Systems Modeling and Optimization with Applications to C3I Problems *Final Report*
Ho, Yu–Chi; Gong, Weibo; May 28, 1999; 6p; In English
Contract(s)/Grant(s): DAAH04-95-1-0148
Report No.(s): AD-A365251; ARO-33192.21-MA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The PI's have accomplished the following research tasks: (1) Established solid foundations of the Ordinal Optimization approach and applied it to a number of applications heretofore considered to be beyond reach or impractical. (2) Further analyzed and proposed new schemes for stochastic fidelity preservation issues in hierarchical simulation modeling. (3) Further developed the rational approximation approach for small probability estimation.
DTIC
Optimization; Dynamical Systems; Systems Simulation

19990071247 Joint Research Centre of the European Communities, Space Applications Inst., Ispra, Italy
Monitoring of Structural Changes by Radar Interferometry
Tarchi, D., Joint Research Centre of the European Communities, Italy; Ohlmer, E., Joint Research Centre of the European Communities, Italy; Sieber, A., Joint Research Centre of the European Communities, Italy; Research in Nondestructive Evaluation; 1997; ISSN 0934-9847; Volume 9, No. 4, pp. 213-225; In English; Original contains color illustrations; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In this paper we report the results of a feasibility test on the applicability of synthetic aperture radar (SAR) interferometry for monitoring structural changes. The experiment was performed in a controlled environment on an artificial target made up of reinforced concrete elements. SAR imaging techniques allow the mapping of the object under test with a spatial resolution in the order of a few centimeters while the use of differential interferometric techniques allow the measurements of the displacement of each pixel in the image with an accuracy in the order of a small traction of the wavelength of the radiation used. The achieved results validate the technique as a useful tool that may complement optical or in situ measurement techniques for such industrial applications as monitoring of large man-made structures.
Author
Controlled Atmospheres; Spatial Resolution; Traction; Feasibility Analysis

19990071330 California Univ., Berkeley, CA USA
QoS Based Evaluation of the Berkeley Continuous Media Toolkit
Wijesekera, D.; Varadarajan, S.; Parikh, S.; Srivastava, J.; Nerode, A.; Mar. 01, 1999; 30p; In English
Contract(s)/Grant(s): DAAHO4-96-1-0341
Report No.(s): AD-A365164; TR-98-08; ARO-35873.137-MA; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This paper presents a performance analysis of the Continuous Media service provided by the Berkeley, Continuous Media Tool kit (CMT). We show a development of metrics, validation by means of a user study, and a performance evaluation of a prototyping environment. The CMT is a popular environment that satisfies our need of being easily extendible and offers a quick prototyping environment. From a human user's perspective, in order for multimedia demonstrations to be comprehensible, the number of audio or video frames dropped and the timing delays in the ones that are displayed, and the degree of asynchrony between two streams such as audio and video, need to be kept within limits. Therefore, it is important to' know the frame dropping, timing delay and synchronization drift characteristics of CMT. In a series' of experiments we monitored the variation of these parameters with respect to processor, network and event loop loads. It was observed that loads affect aggregate frame drops at lower rates , and consecutive frame drops at higher rates. Because at a higher rates a large number of consecutive frames are dropped, the ones that are" played appear in a more timely manner. It is shown that according to metrics provided by other studies, CMT provides imperceptible audio-video mis-synchronization for about 10 seconds, and tolerable synchronization for about 13 seconds, from the start of the clips for local clients under low processor loads. It is also shown that under high loads, synchronization is achieved at the cost of losing media frames.
DTIC
Multimedia; Kits; Tools

19990072792 Communications Research Lab., Tokyo, Japan
Performance of Trellis Coded 16QAM/TDMA with Distortion Weighting Space Diversity Combining in Multi-Path Fading Environments
Kamio, Yukiyoshi, Communications Research Lab., Japan; Sampei, Seiichi; Review of the Communications Research Laboratory; Dec. 1994; ISSN 353-359; Volume 40, No. 4, pp. 353-359; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper investigates delay spread immunity of trellis coded 16 QANI/TDMA systems with a symbol rate 20 ksymbol/s. to improve delay spread immunity, symbol timing synchronization based on maximum amplitude estimation is applied. Moreover, improvements in the weighting function for both diversity combining and calculation of a metric are investigated. Computer simulation confirmed that the trellis coded 16 QAM/TDMA using the proposed modifications can achieve an average bit error rate of approximately 10 2 when maximum delay is up to 20 micro sec.
Author
Bit Error Rate; Coding; Computerized Simulation; Synchronism; Time Division Multiple Access

19990072793 Communications Research Lab., Tokyo, Japan
Analysis of Block Error Probability for Diversity Systems in Digital Indoor Radio Channels
Sasaoka, Hideichi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Dec. 1994; ISSN 0914-9279; Volume 40, No. 4, pp. 361-367; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Digital signal transmission over indoor radio channels is subject to multipath fading, and burst errors are produced by the fluctuation of error probability associated with this fading.The performance of error control schemes over such channels depends on error sequence characteristics, and to evaluate the performance of error corrections using block codes, we need to analyze the probability distribution of the number of errors in a block. This paper deals with the distribution of P(sub c) (M, N; gamma(sub 0)), which is the probability of more than of M digits as a function of average signal-to-noise ratio gamma(sub 0). For differentially coherent PSK over very slow Rayleigh fading channels and L-branch space diversity reception with maximal ratio combining, the conventional expression for P(sub c, sup (L)) (M, N; gamma(sub 0) is very complicated and not suitable for numerical calculation. This paper therefore presents a new expression, with a finite Product, that makes it easy to calculate numerical results for p(sub c, sop (L)) (M, N; gamma(sub 0)). The probability of more than M errors in a block of N digits is useful for evaluating the block error probability after correction of M or fewer errors.
Author
Error Analysis; Radio Frequencies; Signal Transmission; Digits

19990073001 Communications Research Lab., Tokyo, Japan
Height Dependence of Antenna Factors of Antennas for Disturbance Measurement
Tejima, Teruo, Communications Research Lab., Japan; Harima, Katsushige, Communications Research Lab., Japan; Koike, Kunimasa, Communications Research Lab., Japan; Masuzawa, Hiroshi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 151-157; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper investigates the height dependence of various antenna factors for tuned-dipole antennas, shortened-dipole antennas and the biconical antennas commonly used for electromagnetic disturbance measurements from 30 MHz to 300 MHz. The height dependence is measured by the three-antenna method at an open-field-test site. Our results indicate tuned-dipole antenna strongly depend on antenna height, and biconical antenna depend on antenna height above 75 MHz. This study is on the assumption that the antennas are properly calibrated.
Author
Antenna Design; Research; Field Tests

19990073002 Communications Research Lab., Tokyo, Japan
Analysis of a Biconical Antenna for EMC Measurements
Gyoda, Koichi, Communications Research Lab., Japan; Yamanaka, Yukio, Communications Research Lab., Japan; Shinozuka, Takashi, Communications Research Lab., Japan; Sugiura, Akira, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 159-165; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Broadband antennas, such as biconical antennas are widely used in automatic EMC measurements. However, there has been very little investigation of these types of antennas so far. Therefore, a numerical analysis is performed on a biconical antenna using moment methods. This paper presents calculation results of the input impedance, current distribution, height pattern of received voltage, and antenna factor. Measurement results of the height pattern and antenna factor are also presented and show very good agreement with calculated results.
Author
Conical Bodies; Antenna Design; Numerical Analysis; Electromagnetic Compatibility

19990073003 Communications Research Lab., Tokyo, Japan
Broadband Standard Dipole Antenna for Antenna Calibration
Koike, Kunimasa, Communications Research Lab., Japan; Sugiura, Akira, Communications Research Lab., Japan; Morikawa, Takao, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 167-175; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Antenna calibration of EMI antennas is mostly performed by the standard antenna method at an open-field test site using a specially designed dipole antenna as a reference. In order to develop broadband standard antennas, the antenna factors of shortened dipoles are theoretically investigated. First, the effects of the dipole length are analyzed using the induced emf method. Then, baluns and loads are examined to determine their influence on the antenna factors. It is found that transformer-type baluns are very effective for improving the height dependence of the antenna factors. Resistive loads are also useful for flattening the frequency dependence. Based on these studies, a specification is developed for a broadband standard antenna operating in the 30 to 150 MHz frequency range.
Author
Calibrating; Broadband; Standards; Dipole Antennas

19990073004 Communications Research Lab., Tokyo, Japan
Coded Multicarrier 16 QAM System for Land Mobile Communications
Sasaoka, Hideichi, Communications Research Lab., Japan; Omori, Youko, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 177-188; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper studies a coded multicarrier 16 QAM system for land mobile communications and proposes methods for improving quality and bit-rate and spectral efficiency. The proposed system uses a symbol-timing adjustment method in addition to a multicarrier transmission scheme to provide immunity against frequency-selective fading distortion which becomes more severe for high bit-rate transmission. The system uses pilot-symbol aided 16 QAM to increase special efficiency.It also uses methods of symbol allocation to carriers and symbol interleaving, in addition to Reed-Solomon coding with maximum likelihood decoding, to increase the bit error rate (BER) performance. Space diversity method, with maximum ratio combining, can be used to further improve the BER performance. A computer simulation of the proposed system is carried out with a bandwidth of 200 kHz and a total information rate of 256 kbit/s. The simulation results show that the proposed system provides immunity against frequency-selective fading and that space diversity further improves this. A BER of less than 10(exp -4) is obtained at a E(sub b)/N(sub o) of 30 dB and a delay spread of 3.4 microns in the case of non-diversity. A BER of less than 10(exp 4) is also obtained at a E(sub

b)/N(sub o) of 15 dB and a delay spread of 5.5 microns in the case of diversity. These results confirm that the proposed system can achieve high quality and high bit-rate transmission with high spectral efficiency.
Author
Research; Computerized Simulation; Decoding; Mobile Communication Systems; Procedures

19990073005 Communications Research Lab., Tokyo, Japan
Symbol Timing Synchronization Scheme for 16 QAM/TDMA Systems
Sampei, Seiichi, Communications Research Lab., Japan; Feher, Kamilo, Communications Research Lab., Japan; Kamio, Yukiyoshi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 189-196; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper proposes symbol timing synchronization schemes using maximum likelihood (ML) estimation for the block demodulation of the burst mode operated 16 QAM. The maximum amplitude method (MAM) and the wave difference method (WDM) are proposed, and their performance is compared with that of the zero-crossing method (ZCM) in stationary, flat fading, and frequency selective fading environments. An optimum symbol timing synchronization scheme for 16 QAM diversity receiver in frequency selective fading is also proposed. Computer simulation results show that the jitter performance of MAM or WDM is better than that of ZCM in any propagation path environments. Furthermore, it is demonstrated that the optimum sampling point at each branch of the diversity receiver in frequency selective fading environments is not the mean delay point, but the average maximum amplitude or zero-slope point of each diversity branch.
Author
Time Division Multiple Access; Time Measurement; Maximum Likelihood Estimates; Quadrature Amplitude Modulation; Computerized Simulation

19990073059 Communications Research Lab., Tokyo, Japan
Measuring Facilities for Radio Research: Introduction
Sugiura, Akira, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 107-108; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Space development in Japan started on a full scale in the latter half of the 1960's, and the Communications Research Laboratory (CRL) set to work on developing a couple of utility satellites for ionosphere sounding and space communications experiments. Accordingly, the first radio-wave anechoic chamber at CRL was completed to test the characteristics of satellite- borne antennas in 1968. At that time, it was the largest and most advanced one in Japan. For a period after its construction, this chamber belonged to the National Space Development Agency of Japan and served as an indispensable facility for development of small-scale satellites. Over the years, however, the chamber started to show signs of age and its performance characteristics deteriorated. On the other hand, the research themes at CRL that call for use of an anechoic chamber have increased considerably in recent years. For instance, CRL has moved into the research areas of electromagnetic compatibility, antenna calibration and radio equipment testing. to meet the demands of this increased activity at CRL, the existing anechoic chamber was totally overhauled and new comprehensive measuring facilities were built in 1992. These facilities are VHF/UHF bands anechoic chamber, SHF/EHF bands anechoic chamber, antenna near-field measurement facility, and open-field test site. The period allotted for construction was limited and extensive restrictions were placed on the scale of the facilities as the existing structure bad to be used. However, full consideration was given to specifications and design and the most sophisticated measuring equipment was installed so that the facilities could accommodate various measurements. As the only national research laboratory in the field of info-communications, CRL is setting its sights on the 21st century and conducting extensive research in the fields of information, communications and radio waves. Our newly constructed measuring facilities are envisaged to play an important role in present and future radio research and development activities.
Author
Anechoic Chambers; Research and Development; Radio Equipment; Communication Equipment; Construction

19990073062 Communications Research Lab., Tokyo, Japan
Near-Field Antenna Measurement System
Iigusa, Kyouich, Communications Research Lab., Japan; Fujita, Masaharu, Communications Research Lab., Japan; Hori, Yoshiaki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Jun. 1995; ISSN 0914-9279; Volume 41, No. 2, pp. 125-137; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A radio anechoic chamber and a control room were newly built for a Near Field Antenna Measurement (NFAM) system. An XY-scanner and other equipment were brought from an old NFAM building, and a new computer for system control/analysis was also introduced. This new NFAM facility was developed to improve the environment for measuring and working. to evaluate the

characteristics of the new NFAM system, we carried out the measurement for a standard horn antenna at a frequency of 1.6 GHz by using a planer and a cylindrical scanning method. The data and calculated patterns were compared with those measured before with the old NFAM facility and with data measured in the far-field region. It was found that the far field data are closer to the data measured by the new NFAM system than to the data measured by old one.
Author
Antenna Design; Anechoic Chambers; Systems Analysis; Near Fields; Integrated Mission Control Center

19990073344 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
Testing the FxEs Model using the E-MUF District Mode Approach from ASAPS ***Pengujian Model FxEs Dengan Pendekatan Mode Distrik E-MUF Dari ASAPS***
Rusnadi, Iyua Edi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Jiyo, Habirun, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; LAPAN supplementary Issue; July 1998; ISSN 0126-9754; Volume 22, No. 56, pp. 23-27; In Malay-Indonesian; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

ASAPS is a program packet for HF communication prediction. This program is based on data collected in several observation station in north and south hemisphere except Indonesia. The output are ALF (Absorption Low Frequency), OWF (Optimum Working Frequency), UD (Upper Decile), F-MUF (F-Maximum Useable Frequency), and E-MUF. E-MUF is maximum frequency that can be used if E layer of the ionosphere is the reflector. The output E-MUF in district mode of ASAPS can be derived to be fxEs model. Verification of E-MUF can be done by using fxEs and/or fxE data. This paper verify fxEs model for Biak during February 1992 to June 1996 which show correlation coefficient of 0.91, so that the result can be used to predict fxEs, especially during day time between 06.00 to 18.00 local time. Further research is necessary to predict fxEs during night time between 18.00 to 06.00, which the deviation is 2.96 MHz.
Author
Packets (Communication); Communication Networks

19990073346 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
Simulation and Optimization of Inter-Lan Satellite Link Connectivity ***Simulasi Dan Optimasi Konektivitas Link Satelit Antar LAN***
Yuba, Rakhim, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; LAPAN Supplementary Issue; July 1998; ISSN 0126-9754; Volume 22, No. 56, pp. 35-44; In Malay-Indonesian; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Satellite's link simulation program can be operate in a PC which completed with Hardware and Software. The simulation process for a result data used a Modula technic, structure and data flow. Input data in this Satellite's link simulation system is consist of parameters such as time delay, bandwidth and errorate. With those input data then the result is a succeed relationship parameter level between one station with other stations via simulation machine.
Author
Optimization; Computerized Simulation; Local Area Networks; Data Links

19990073347 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
Design and Implementation of a Router Link Radio at a Transfer Rate of 19200 Bps ***Rancangan Dan Implementasi Radio Link Router Pada Kecepatan Transfer 19200 Bps***
Yuba, Rakhim, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Mulyono, Djoko, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Purwanto, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; LAPAN Supplementary Issue; July 1998; ISSN 0126-9754; Volume 22, No. 56, pp. 45-52; In Malay-Indonesian; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In data communication network which is able to connect the some transmissions media, it needs an Instrument which is able to bridge between the access speed from DTE(Data Termination Equipment) with DCE(Data Circuit Equipment), especially during which accessing Image (picture) from one of the server. This thing has been supported by NOS communication software with TCP/IP(Transmission Control Protocol/Internet Protocol) Protocol. It needs to design the Radio Link Router as a prototype to be implemented in data communication radio network which is able to transfer the data in 19200 bps speed.
Author
Communication Networks; Computer Aided Design; Data Links

19990074955 Electrotechnical Lab., Ibaraki, Japan
A High Speed Optical Bus Network System Consisting of Optical Fiber and Star Coupler
Suzuki, Motohiro, Electrotechnical Lab., Japan; Hamazaki, Yoichi, Electrotechnical Lab., Japan; Sakamoto, Koji, Electrotechni-

cal Lab., Japan; Tsukamoto, Michiharu, Electrotechnical Lab., Japan; Okada, Yoshikuni, Electrotechnical Lab., Japan; Bulletin of the Electrotechnical Laboratory; 1994; ISSN 0366-9092; Volume 58, No. 1, pp. 27-38; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A high-speed optical communication system, called ”optical bus” is described. The optical bus is a token-passing bus network consisting of an optical transmission medium (composed of an optical star coupler and optical fibers) and optical bus interfaces. The optical bus interface could be divided into two parts, an optical bus controller and a dual-port memory (DPM) controller. The optical bus controller is hard-wired high-speed logic circuits which performs basic operations, i.e. token passing, packet transmission and reception. On the other hand, the DPM controller is a programmable controller which performs complex operation like logical-ring reconstruction, and provides DPM view of interface to host processor. The optical bus is designed to connect limited number of processors, up to several tens of them, on a floor. Simple transmission medium and its limited propagation delay, high performance optical bus controller and intelligent DPM controller make the optical bus high data transfer rate and low latency computer network. The developed prototype system achieves 400 Mbps of data transfer rate and 900 ns of token relay time.
Author

High Speed; Optical Relay Systems; Optical Communication; Optical Fibers; Couplers; Bus Conductors; Computer Networks; Fiber Optics

19990075965 Communications Research Lab., Tokyo, Japan

Research and Development Project for Effective Frequency Use in Broadcasting

Tsuzuku, Aiichiro, Communications Research Lab., Japan; Nagatsuka, Mamoru, Communications Research Lab., Japan; Fukuchi, Hajime, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Sep. 1995; ISSN 0914-9279; Volume 41, No. 3, pp. 259-269; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Since the first television broadcasts in Japan in 1953, TV has become a very important part of the communications media. The allocation of TV broadcasting frequencies now includes 62 regular channels, 12 VHF channels and 50 UHF channels. With 14,472 transmitting stations currently using these channels, the lack of available frequencies has became a serious problem. To combat this problem, we are conducting research and development of digital television broadcasting in order to more efficiently utilize broadcasting frequencies. The main advantages of digital television broadcasting are high immunity from noise, freedom from interference, high broadcasting capacity, and inter-compatibility with computers. to make digital broadcasting possible, we are currently under taking extensive research on hierarchical video coding, orthogonal frequency division multiplex (OFDM) modulation, broadcasting frequency bands, and service areas. In this paper, we describe the timetable and study areas of digital broadcasting, modulation methods, frequency allocation, and the principles of OFDM.
Author

Research and Development; Frequencies; Effectiveness; Broadcasting; Television Systems; Frequency Assignment; Digital Television

19990075966 Communications Research Lab., Tokyo, Japan

Research and Development Project and Experimental Equipment for SHF Land Mobile Communications

Mizuno, Mitsuhiko, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Sep. 1995; ISSN 0914-9279; Volume 41, No. 3, pp. 253-257; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Researches on the application of 3 to 10 GHz band to microcellular and indoor communications have been started in the CRL. The tentative target frequencies are 3.3 GHz, 5.2 GHz and 8.4 GHz. These bands will make possible to provide wider band communication services such as multi-media services, while voice communication services will be provided in UHF bands in the PCS or PCN systems. This multi-media concept is close to that of mobile computing. It will be also possible to use as a mobile terminal for ISDN. For the first stage, we are now conducting a propagation study in this band, and data transmission and wireless access studies follow it. These study plans and measuring equipment are described.
Author

Research and Development; Mobile Communication Systems; Data Transmission

19990075967 Communications Research Lab., Tokyo, Japan

Research and Development Project for Efficient Use of the Radio Spectrum Through Intelligent Technology

Yoshimoto, Shigetoshi, Communications Research Lab., Japan; Mizuno, Mitsuihiko, Communications Research Lab., Japan; Kamio, Yukiyoshi, Communications Research Lab., Japan; Sugimoti, Yuji, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Sep. 1995; ISSN 0914-9279; Volume 41, No. 3, pp. 245-252; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The expected increase in demand for mobile communications will require a much higher network capacity and increased flexibility in the handling time of varying communication traffic, than is offered by existing systems. to satisfy these requirements, we are researching intelligent technologies which are able to maximize spectrum efficiency by varying allocated frequencies, zone areas and modulation forms based on propagation conditions and traffic levels. This paper will introduce the outline of this project.
Author
Research and Development; Radio Spectra; Technology Utilization; Smart Structures

19990075969 Communications Research Lab., Tokyo, Japan
Project for Millimeter and Submillimeter-Wave and the Experimental Equipments
Hirose, Nobumitu, Communications Research Lab., Japan; Kiyokawa, Masahiro, Communications Research Lab., Japan; Matsui, Toshiaki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Sep. 1995; ISSN 0914-9279; Volume 41, No. 3, pp. 231-237; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In this paper, we describe a research and development program on millimeter and sub-millimeter wave devices. The facilities provided for this program are also described. In 1994, construction of the clean room was completed. Since then several machines and tools have been installed. We described some results which have been obtained using these machines and tools. For example, a resist pattern with a 40 nm width on a 400 nm thick PMMA film was obtained.
Author
Research and Development; Microwave Equipment; Product Development

19990075970 Communications Research Lab., Tokyo, Japan
Research and Development Project for Millimeter-Wave Premises Communications Systems
Ihara, Toshio, Communications Research Lab., Japan; Sugimoto, Yuji, Communications Research Lab., Japan; Fujita, Masaharu, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Sep. 1995; ISSN 0914-9279; Volume 41, No. 3, pp. 219-229; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

There is a growing need for high-speed wireless communication systems such as the wireless LANs used in the premises environment. In Japan, wireless LAN systems at 2.4 GHz and 19 GHz bands have recently been put into practical use and have been gaining popularity. Although these systems have the capability of handling data rates up to about 10 Mbps which are compatible with the wired Ethernet system, the increasing computational and handling capacities of personal computers and work-stations are pressing the development of more broadband and higher data rate wireless communication systems towards the multi-media era. The millimeter-wave band is promising for this field of application because of its wide frequency spectrum, compactness and light weight of equipment, and the ease of configuring systems which are free from interference. From this background, the Communications Research Laboratory has commenced a research and development program for millimeter-wave premises communication systems. The present paper will introduce the outline of this program.
Author
Research and Development; Millimeter Waves; Product Development; Wireless Communication; Telecommunication; Radio Communication

19990075971 Communications Research Lab., Tokyo, Japan
Research and Development Program for Frequency Resources
Harada, Yuji, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Sep. 1995; ISSN 0914-9279; Volume 41, No. 3, pp. 209-218; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Radio wave use in Japan has expanded dramatically as the economy has grown and as advances have been made in radio wave utilization technology. By the end of March 1995, there were 10,833,755 radio stations in Japan. Demand for mobile communications has increased the most. The demand for radio spectrum is expected to grow as new broadband and multimedia technologies take hold, and as mobile terminals become so common nearly everyone will carry one. to meet these needs, the MPT is: (1) Pursuing the development of additional frequency resources, such as through technologies enabling the use of new frequency bands; and (2) Pursuing the efficient shifting and reallocation of frequencies. The four principle ways in which the MPT is developing frequency resources is by developing unused frequency bands, redeveloping existing frequency bands, developing technologies for effective frequency use, and promoting shifts in frequency allocations. Communications Research Laboratory (CRL), MPT is the main place where these researches are being carried out; in addition, some research is being commissioned from the private sector.
Author
Research and Development; Frequencies; Millimeter Waves; Construction; Television Systems

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ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

19990070429 Defence Science and Technology Organisation, Airframes and Engines Div., Melbourne, Australia
Research Into Sensitivity of Electric Chip Detectors (ECDs), as Installed in ADF Black Hawk Helicopters: Splash Lubricated Environment in an Intermediate Gearbox
McVea, Grier, Defence Science and Technology Organisation, Australia; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 97-102; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

Contents include the following: determination of the electric chip detector (ECD) warning light activities in cockpit; land, check and removing material from ECD, replacing ECD, and ECD particle collection adjacent to radial gap.
CASI
Chips; Detectors

19990070741 Osaka Univ., Faculty of Engineering, Osaka, Japan
a.c. Conductance of Si MOS Diodes Degraded by Fowler-Nordheim Tunneling Current Stresses
Inoue, Masao, Osaka Univ., Japan; Shirafuji, Junji, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2190, pp. 243-251; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The a.c. conductance-voltage characteristics at various frequencies have been measured at room temperature on wet-processed MOS diodes which suffered constant current stresses for various periods by Fowler-Nordheim electron injection from Si substrate. A double-peak structure appears in the a.c. conductance-voltage curve and grows continuously with progressive current stress. From a simple analysis of the equivalent circuit of MOS diodes the growth of two kinds of interface states is deduced after subtracting the effect of oxide capacitance and substrate resistance which are in series with the Si/SiO2 interface.
Author
Capacitance; Diodes; Electric Potential; Electrical Resistivity; Silicon Dioxide; Alternating Current

19990071204 NASA Marshall Space Flight Center, Huntsville, AL USA
Sliding Mode Thermal Control System for Space Station Furnace Facility
Jackson Mark E., NASA Marshall Space Flight Center, USA; Shtessel, Yuri B., Alabama Univ., USA; IEEE Transactions on Control Systems Technology; September 1998; ISSN 1063-6536; Volume 6, No. 5, pp. 612-622; In English; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The decoupled control of the nonlinear, multiinput-multioutput, and highly coupled space station furnace facility (SSFF) thermal control system is addressed. Sliding mode control theory, a subset of variable-structure control theory, is employed to increase the performance, robustness, and reliability of the SSFF's currently designed control system. This paper presents the nonlinear thermal control system description and develops the sliding mode controllers that cause the interconnected subsystems to operate in their local sliding modes, resulting in control system invariance to plant uncertainties and external and interaction disturbances. The desired decoupled flow-rate tracking is achieved by optimization of the local linear sliding mode equations. The controllers are implemented digitally and extensive simulation results are presented to show the flow-rate tracking robustness and invariance to plant uncertainties, nonlinearities, external disturbances, and variations of the system pressure supplied to the controlled subsystems.
Author
Controllers; Furnaces; Nonlinearity; International Space Station; Temperature Control; Mathematical Models; Control Theory; Space Stations

19990071216 NASA Goddard Space Flight Center, Greenbelt, MD USA
Evacuated FM08 Fuses Carry a Sustained Arc in a Bus over 75 VDC
Leidecker, Henning, NASA Goddard Space Flight Center, USA; Slonaker, John, Unisys Corp., USA; 1999; 5p; In English; International Symposium for Testing and Failure Analysis (ISTFA), 14-18 Nov. 1999, Santa Clara, CA, USA; No Copyright; Avail: Issuing Activity, Hardcopy

The FM08 style fuse is specified to interrupt an overcurrent of up to 300 A in a bus of up to 125 VDC, but this applies only when its barrel is filled with air. When placed into a space-grade vacuum, the FM08 style fuse exhausts its air within a year. Then,

the probability of an enduring arc is high for all ratings when the bus is above 75 VDC, and the overcurrent is large. The arc endures until something else interrupts the current. The fuse can violently eject metal vapor or other material during the sustained arcing. The evacuated FM08 does not develop a sustained arc when interrupted in a bus of 38 VDC or less, at least when there is little inductance in the circuit. This is consistent with its successful use in many spacecraft having buses in the range 24 to 36 volts.
Author
Ratings; Probability Theory; Circuit Breakers; Electric Fuses

19990071228 Rochester Univ., Dept. of Electrical Engineering, NY USA
Low Temperature Digital Superconducting Electronics ***Final Report, 1 Jul. 1992 - 30 Jun. 1998***
Feldman, Marc J.; Mar. 15, 1999; 10p; In English
Contract(s)/Grant(s): DAAL03-92-G-0112
Report No.(s): AD-A365201; ARO-30407.54-EL-URI; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Our aim was to further the development of low temperature superconducting digital electronics, to the point where real world applications of this technology were practical. We concentrated on RSFQ (Rapid Single Flux Quantum) logic which should be capable of VLSI circuit operation at 100 Gbps with power of 100 nW per gate, if a semiconductor quality fabrication facility were available. We developed the infrastructure for RSFQ circuits including the first logic level simulator; the first industrial CAD environment; the first yield optimization; the first analysis of timing; the first HDL description. All software tools are available at our widely referenced web site. Our work continually emphasized the central importance of timing considerations for the design of RSFQ circuits, and we present many important results in this available. We developed the theory and performed the definitive experiments at 10 Gbps to understand the bit error rate of RSFQ circuits. Complex demonstration circuits were designed and demonstrated to work at speeds up to 20 Gbps. Finally, we developed a cryogenic electro-optic sampler which is a microvolt, subpicosecond, micron scale, contact free, fully automated system, and used this to perform the direct first observation of an SFQ pulse as well as a variety of other studies.
DTIC
Low Temperature; Digital Electronics; Semiconductors (Materials); Superconductivity; Quantum Electronics; Very Large Scale Integration

19990071253 Kyushu Univ., Faculty of Engineering, Fukuoka, Japan
Electrical Characteristics Variation of MOS Devices with Plasma-Excited H Radicals
Tsukamoto, Keiichi, Kyushu Univ., Japan; Kawaguchi, Yasunari, Kyushu Univ., Japan; Kuroki, Yukinori, Kyushu Univ., Japan; Technology Reports of Kyushu University; Jun. 1994; ISSN 0023-2718; Volume 67, No. 3, pp. 203-208; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Hydrogen plasma has a possibility of dry cleaning as the novel VLSI fabrication process in future, while it is reported that hydrogen atoms passivate the impurities in semiconductor, and reduce the carrier concentration. This paper investigates the variation of electrical characteristics of MOS devices after the hydrogen plasma treatment. Hydrogen plasma treatment gave remarkable reduction of carrier concentration, therefore the increasing of parasitic resistances at source and drain, the decreasing of built-in potential of pit junction, the negative MOS flatband-voltage shift were observed. The reduction in active impurity concentrations also decreased the effective channel length.
Author
Electric Potential; Radicals; Hydrogen Plasma; Metal Oxide Semiconductors

19990071271 New South Wales Univ., School of Physics, Sydney, Australia
Experimental and Theoretical Investigations of Electron Dynamics in a Semiconductor Sinai Billiard
Micolich, A. P., New South Wales Univ., Australia; Taylor, R. P., New South Wales Univ., Australia; Newbury, R., New South Wales Univ., Australia; Dettmann, C. P., Northwestern Univ., USA; Fromhold, T. M., Nottingham Univ., UK; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 547-555; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

We describe a surface gate defined mesoscopic semiconductor billiard with a square geometry which we can evolve continuously to a Sinai geometry by adjusting the bias on a circular gate located at the center of the square. We concentrate on clusters of magneto-conductance structure formed on two magnetic field scales, which emerged during the transition from the square to the Sinai geometry. This change in shape is accompanied by a transition from non-chaotic to chaotic electron dynamics, which has been a topic of considerable interest for many years. The observed structure is due to quant8um chaotic processes induced by the presence of the circle. Our experimental results agree with classical dynamics simulations which suggest the two field scales are determined by two families of electron trajectories which sample the full geometry and corner sub-geometry. Finally, we report

the observation fo striking similarities in the structures observed on the two different field scales. This indicates the emergence of self similarity with the introduction of the circle to the Sinai billiard geometry.
Author
Circles (Geometry); Electron Trajectories; Semiconductors (Materials); Quantum Theory; Quantum Electronics; Chaos

19990071647 New Mexico Univ., Dept. of Electrical Engineering and Computer Science, Albuquerque, NM USA
(DURIP-97) Upgrade of a Long Pulse, High Power Backward Wave Oscillator to Ultraclean Vacuum Conditions *Final Report, 1 Mar. 1997 - 28 Feb. 1999*
Schamiloglu, Edl; May 21, 1999; 16p; In English
Contract(s)/Grant(s): F49620-97-1-0102
Report No.(s): AD-A364741; AFRL-SR-BL-TR-99-0153; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
A brazed ceramic insulator stack has been designed and constructed for use on the University of New Mexico long pulse PI-110A electron beam accelerator that is being used to drive a high power backward wave oscillator. This ceramic insulator stack now establishes an environment within the high power tube that is similar to the environment found in commercially manufactured vacuum tubes such as klystrons. Detailed experiments will follow to establish whether this new environment leads to significant advances in the output energy that is radiated from these type of sources.
DTIC
Microwave Oscillators; Vacuum; Backward Waves

19990075054 Mitsubishi Electric Corp., Tokyo, Japan
Mitsubishi Electric Advance: Thin-Film Transistor LCDs Edition
Suzuki, S.; Jun. 1998; Volume 83; 36p; In English
Report No.(s): PB99-164352; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy
Contents include the following: Introducing the Special Edition of Thin-Film Transistors (TFTs)-Liquid-crystal displays (LCDs); The Concept and Vertical Ramp of the Shiscii TFT-LCD Fabrication Line; Static Electricity Control and Glass-Cutting Technique for Narrow Margins; Design Technologies for Low-EMI Notebook Personal Computers. An Optimum Pixel Light-Shield Pattern Design for TFT-LCDs; An LCD with a Wide Viewing Angle for PC Monitor Applications; A 15.1-Inch XGA LCD Monitor; and A TFT-LCD Panel for Thin Notebook Personal Computers.
NTIS
Electrodes; Transistors; Thin Films

19990075826 Research Inst. of National Defence, Weapons and Protection Div., Tumba, Sweden
Methods of Generation of Ultrahigh Pulsed Magnetic Field *Topical Report*
Almstroem, H.; Bjarnholt, G.; Golberg, S. M.; Liberman, M. A.; Jul. 1998; ISSN 1104-9154; 20p; In English
Report No.(s): PB99-159576; FOA-R-98-00829-612-SE; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
In this review the authors consider the possibilities and limitations to achieve ultra high magnitude fields in experiments with a single turn coil connected to a capacitor and by magnetic flux compression (MFC) driven by explosive. Ultrahigh magnetic fields up to about 1400T have been experimentally achieved by explosive MFC by Pavlovsky et al/1/. This field corresponds to an electromagnetic energy density of about 0.8 MJ/cm(cubed) which is about 100 times that of hig explosives (HE). Such high concentration of electromagnetic energy is of great interest both in science and for some military and civil applications. In the single turn magnetic field generator driven by a capacitor bank the maximum value of the magnetic field is restricted mainly by mechanical deformation and destruction to the coil. The reliably achieved magnetic field can not exceed approximately 300 T. In explosive MFC generators the maximum magnetic field is restricted to about 1500 T by, (1) diffusion of the magnetic flux into the walls of the contour, (2) Joule heating and melting of the surface of the liner resulting in decreased conductivity and by (3) growth of Rayleigh-Taylor instabilities on the surface of the liner. Shock wave driven MFC can be used to avoid Rayleight-Taylor instabilities during the compression phase.
NTIS
Magnetic Fields; Magnetic Flux

19990075834 Department of the Navy, Washington, DC USA
Multiple-Pass Reflection Filter
Justus, Brian L., Inventor; Huston, Alan L., Inventor; Feb. 02, 1999; 20p; In English; Supersedes US-Patent-Appl-SN-656535
Patent Info.: Filed 31 May 96,; US-Patent-Appl-SN-656,535; US-Patent-5,867,329
Report No.(s): AD-D019404; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An optical filter that uses multiple reflections to provide spectral bandpass filtering of ultraviolet, visible and infrared radiation with a very high transmission of wavelengths within a selected passband coupler with exceptional off-band rejection. The reflection filter uses dielectric-coated spherical reflections or mirrors manufactured with absorbing glass substrates. The multiple-pass feature of the reflection filter is achieved using a traditional long-path absorption cell such as a White Cell or Wilkes Cell. The light transmitted through the reflection filter is only that light which has undergone multiple reflections as the wavelengths of high mirror reflectivity reflect off the dielectric-coated substrates. All remaining light at wavelengths corresponding to high mirror transmission is attenuated by absorption in the mirror substrate. The degree of attenuation of light at wavelengths corresponding to high mirror transmission can be chosen simply by selecting an appropriate number of reflections in the multiple-pass reflection filter.
DTIC
Bandpass Filters; Reflectance; Optical Filters

19990075837 Department of the Navy, Washington, DC USA
Method of Improving the Spectral Respones and Dark Current Characteristics of an Image Gathering Detector
Russell, Stephen D., Inventor; Sexton, Douglas A., Inventor; Kelly, Eugene P., Inventor; Reedy, Ronald E., Inventor; Nov. 24, 1998; 20p; In English
Patent Info.: Filed 5 Jul. 94,; US-Patent-Appl-SN-273,445; US-Patent-5,840,592
Report No.(s): AD-D019401; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A method of simultaneously improving the spectral response and dark current characteristics of an image gathering detector is disclosed. The method uses an excimer laser to redistribute and activate ion implanted dopant species in the backside of an image gathering device such as a backside-illuminated CCD. Alternately, the excimer laser is used to incorporate dopants from a gaseous ambient into the backside of the image gathering device and simultaneously redistribute and activate the dopants. The redistribution of the dopant is controlled by the laser pulses and provides for a peak dopant concentration at the back surface of the image gathering device which provides for improved spectral response and simultaneously improves dark current characteristics.
DTIC
Patents; Pulsed Lasers; Charge Coupled Devices; Procedures; Dark Current

19990075839 Department of the Navy, Washington, DC USA
Amplification of Signals from high Impedance Sources
Straw, Timothy B., Inventor; Mar. 02, 1999; 17p; In English; Supersedes US-Patent-Appl-SN-840112, AD-D018518.
Patent Info.: Filed 24 Mar. 97,; US-Patent-5,877,612; US-Patent-Appl-SN-840,112
Report No.(s): AD-D019399; No Copyright; Avail: US Patent and Trademark Office, Microfiche
An analog signal conditioner for signals from high impedance sources adapted for ready implementation as an integrated circuit. The signal conditioner includes a preamplifier, a step gain amplifier and a low-pass filter. A calibration generator can inject a calibration signal into the system. The step gain amplifier includes analog switches that control paths through a voltage divider network to provide negative feedback on both sides of a fully differential operational amplifier. The design of the feedback networks minimizes the total resistance on the integrated circuit.
DTIC
Preamplifiers; Integrated Circuits; Patents; Analog Data; Amplification; Differential Amplifiers

19990075843 Department of the Navy, Washington, DC USA
Polarized Optical Emission Due to Decay or Recombination of Spinpolarized Injected Carriers
Jonker, Berend T., Inventor; Feb. 23, 1999; 7p; In English; Supersedes US-Patent-Appl-SN-83231
Patent Info.: Filed 29 Jun. 93,; US-Patent-Appl-SN-83,231; US-Patent-5,874,749
Report No.(s): AD-D019383; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A device for producing circularly polarized optical emission includes a light emitting semiconductor heterostructure, further including at least one semiconducting layer; a ferromagnetic contact having a magnetic moment, in electrical contact with a layer of the semiconductor heterostructure; and a contact electrically connected to a different region of the semiconductor heterostructure. This light emitting semiconductor heterostructure may be a light emitting diode (LED), or some other structure. The ferromagnetic contact injects spin polarized carriers (electrons or holes) into the semiconducting device, which recombine with their opposing carriers to produce circularly polarized light. A process for producing circularly polarized optical emission includes

applying a bias across a light emitting semiconductor heterostructure having a contact with a net magnetic moment, thereby injecting spin polarized carriers into the light emitting semiconductor heterostructure.
DTIC
Heterojunctions; Light Emitting Diodes; Light Emission; Polarized Light

19990075948 Department of the Navy, Washington, DC USA
Quadrifilar Helix Antenna
Josypenko, Michael J., Inventor; Oct. 13, 1998; 31p; In English
Patent Info.: Filed 13 Oct. 1998; US-Patent-Appl-SN-173,612
Report No.(s): AD-D019389; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
A quadrifial helical antenna is provided having feed points connected to the individual helical antenna elements through a spiral coupling path. The spiral coupling path additionally is wound contrarily to the winding of the helix. Moreover, each path has variable dimensions to provide impedance matching.
DTIC
Helical Antennas; Antenna Components

19990076124 Osaka Electro-Communication Univ., Japan
A Study of Non-Resonance Type Magnetically Tunable Filter
Chang, Nion Sock, Osaka Electro-Communication Univ., Japan; Memoirs of Osaka Electro-Communication University; 1995; ISSN 0386-4987, No. 30, pp. 35-47; In Japanese; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper is a description on the substances that the constituent elements of filter exerts on the characteristics of a non-resonance type magnetically tunable wideband microwave filter. In the yttrium iron garnet, a YIG filter with thickness of 0.79 micrometer, we obtained a considerably large Q-value, 1940 at 3 Giga Hertz region. and also we will show that a magnetically tunable filter with 3 octave bandwidth, 1-8 GHz can be realized by using a gallium substituted YIG film, Ga-YIG with thickness of 9 micrometers and saturation magnetization of 1100 G.
Author
Magnetostatics; Magnetostatic Fields; Tunable Filters; Microwave Filters; Magnetization

19990076126 Osaka Electro-Communication Univ., Japan
Equipotential Lines and Lines of Force in the Current Field 5: On the Two New Configurations of Electrodes
Sakoda, Shoichiro, Osaka Electro-Communication Univ., Japan; Memoirs of Osaka Electro-Communication University; 1995; ISSN 0386-4987, No. 30, pp. 1-11; In Japanese; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Two new configurations of electrodes are introduced in the experiment finding the equipotential lines and lines of force on a conductive rectangular sheet. Some devices are considered to get close contact between the plate of electrodes and the conductive sheet. As a result, the theoretical equipotential lines, which are obtained by the method of conformal mapping, and the experimental ones are found well to coincide.
Author
Equipotentials; Lines of Force; Electrodes

19990076132 Department of the Navy, Washington, DC USA
Bistable Photoconductive Switches Particularly Suited for Frequency-Agile, Radio-Frequency Sources
Stoudt, David C., Inventor; Richardson, Michael A., Inventor; Jan. 26, 1999; 21p; In English; Supersedes US-Patent-Appl-SN-788631
Patent Info.: Filed 24 Jan. 97,; US-Patent-Appl-SN-788-631; US-Patent-5,864,166
Report No.(s): AD-D019385; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A photoconductive switching device is disclosed that has an enhanced speed of response so that its closed (low) and open (high) resistive states are obtained in response to optical illumination in the less than nanosecond regime. The enhanced speed of response is achieved by neutron irradiation of a material preferably comprising GaAs:Si:Cu. An application of the improved photoconductive switching devices is disclosed which allows the realization of a high power, frequency agile RF source topology.
DTIC
Electric Switches; Photoconductivity; Gallium Arsenides

19990076136 Department of the Navy, Washington, DC USA
Broadband Direct Fed Phased Array Antenna Comprising Stacked Patches
Josypenko, Michael J., Inventor; Dec. 21, 1998; 34p; In English
Patent Info.: Filed 21 Dec. 1998; US-Patent-Appl-SN-9/226,628
Report No.(s): AD-D019411; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A broadband phased antenna is comprised of multiple patches which are directly feed. The multiple patches provide the broadband patch antenna having overlapping narrow frequency bands and comprise a ground-plane element, multiple antenna elements, multiple dielectric layers, an RF feed line, and a feed arrangement. The ground-plane element has predetermined length and width dimensions and an aperture therein at a predetermined location near its center. The multiple antenna elements have an uppermost antenna element. The multiple dielectric layers are respectively interposed between and separate the multiple antenna elements into a stacked arrangement having odd and even numbered antenna elements.
DTIC
Apertures; Antenna Components; Antenna Arrays; Broadband

34
FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

19990070925 NASA Goddard Space Flight Center, Greenbelt, MD USA
Flight Test Results for the HST Orbital Systems Test (HOST) Capillary Pump Loop Cooling System
Buchko, M., Swales Aerospace, Inc., USA; Kaylor, M., Swales Aerospace, Inc., USA; Kroliczek, E., Swales Aerospace, Inc., USA; Ottenstein, L., NASA Goddard Space Flight Center, USA; July 1999; 9p; In English; 29th; Environmental Systems, 12-15 Jul. 1999, Denver, CO, USA; Sponsored by Society for Automotive Engineers, Inc.
Report No.(s): 99ES-85; Copyright; Avail: Issuing Activity, Hardcopy

The Near Infrared Camera and Multi Object Spectrometer (NICMOS) was installed in the Hubble Space Telescope (MST) in February 1997. Shortly thereafter, the instrument experienced a thermal short in its solid nitrogen dewar system which will significantly shorten the instrument's useful life. A reverse Brayton cycle mechanical refrigerator will be installed during the Third Servicing Mission (SM3) to provide cooling for the instrument, and thereby extend its operations. A Capillary Pump Loop (CPL) and radiator system was designed, built and tested to remove up to 500 watts of heat from the mechanical cryocooler and its associated electronics. The HST Orbital Systems Test (HOST) platform was flown on the Space Shuttle Discovery (STS-95) as a flight demonstration of the cryocooler system, CPL control electronics, and the CPL/Radiator. This paper will present the flight test results and thermal performance of the CPL system in detail.
Author
Flight Tests; Hubble Space Telescope; Spectrometers; Near Infrared Radiation; Cameras; Space Transportation System Flights

19990070939 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
On the Stability of Three-Dimensional Boundary Layers, Pt. 2, Secondary Instability ***Final Report***
Janke, Erik, Old Dominion Univ., USA; Balakumar, Ponnampalam, Institute for Computer Applications in Science and Engineering, USA; June 1999; 26p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-1999-209341/PT2; NAS 1.26:209341/PT2; ICASE-99-19-Pt-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The secondary instability of three-dimensional incompressible boundary layers is studied using Floquet theory. Starting from the equilibrium solutions that we obtained from the PSE computations documented in Part 1, we investigate the region where a purely stationary crossflow disturbance saturates for its secondary instability characteristics utilizing developed global and local eigenvalue solvers that are based on the Implicitly Restarted Arnoldi Method, and a Newton-Raphson technique, respectively. The main focuses of this study are on the existence of multiple roots in the eigenvalue spectrum that could explain experimental observations of time-dependent occurrences of an explosive growth of traveling disturbances, on the routes by which high-frequency disturbances enter the boundary layer, as well as on gaining more information about threshold amplitudes for the growth of secondary disturbances.
Author
Stability; Incompressible Boundary Layer; Three Dimensional Boundary Layer; Floquet Theorem; Fluid Dynamics

19990071049 Rolls-Royce Ltd., Derby, UK

Forced Response Prediction in a High Pressure Ratio Fan Using a Linearized Method and Comparison With Test Results

Marshall, J. G., Rolls-Royce Ltd., UK; Lee, S. J., Rolls-Royce Ltd., UK; Edmonds, J. D., Rolls-Royce Ltd., UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 7.1 - 7.10; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

This paper presents a forced response prediction of 4 resonances in a high pressure ratio modern fan rotor. The incoming disturbances are due to variable inlet guide vanes (VIGVs) which may be articulated through -5 deg. to +70 deg. The resonances occur in the running range at 15 Engine orders in blade modes 9, 10, 11 and 12. The VIGV wakes have been measured using laser anemometry as well as being predicted using a 3D viscous CFD method. The wakes are found to be mainly vortical in nature, and increase strongly above 30 deg. closure angles; the CFD method does a good job of predicting the wakes up to about 40 deg., above which the strong separations which occur are underpredicted. Both CFD and laser measured wakes are then circumferentially decomposed into Fourier harmonics to produce forcing functions. A 3D linearized Euler code known as SLiQ is used to predict the resulting unsteady flow in the fan rotor, based on a non-linear steady inviscid flow. First the unsteady wake forcing is calculated, for various VIGV angles at both design and near stall aerodynamic conditions. Then the aerodynamic damping in the rotor has been evaluated using the same method, by applying the vibration modeshapes as moving mesh boundary conditions. The aerodynamic damping is very important in this case as the bladed disk (blisk) rotor has very little mechanical damping. The aero-forcing and -damping are then used to predict the blade vibratory response - these values have then been compared with experimental displacements obtained using FM Grid data. The predicted values show a high degree of correlation with the measured data, both in terms of ranking the 4 resonances considered, and in absolute values.

Author

High Pressure; Turbofans; Intake Systems; Nonlinearity; Pressure Ratio; Unsteady Flow; Forced Vibration; Dynamic Response

19990071053 Rolls-Royce Ltd., Derby, UK

The Numerical Simulation and Experimental Validation of Ventilation Flow and Fire Events in a Trent Nacelle Fire Zone

Mullender, A. J., Rolls-Royce Ltd., UK; Coney, M. H., Rolls-Royce Ltd., UK; Horrocks, D. M., Loughborough Univ. of Technology, UK; McGuirk, J. J., Loughborough Univ. of Technology, UK; Binks, D., Cranfield Univ., UK; Li, G., Cranfield Univ., UK; Moss, J. B., Cranfield Univ., UK; Rubini, P. A., Cranfield Univ., UK; Stewart, C. D., Cranfield Univ., UK; Verification of Design Methods by Test and Analysis: Proceedings; 1998, pp. 11.1 - 11.11; In English; See also 19990071044; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

Design for aircraft engine zone ventilation and fire certification has traditionally been driven by practical demonstration using standardised tests. For large structures in particular, the cost of carrying out such tests can become prohibitively expensive. Numerical simulation provides the opportunity to investigate structure and component performance both during normal operation and in the event of fire and thereby promote greater integrated design. One of the major problems in any numerical simulation of a complex geometrical system is obtaining a suitable representation of the geometry to be used in the simulation process - in this case structured and unstructured grid generation and Computational Fluid Dynamics (CFD) analysis. With current Computer Aided Design (CAD) practices, the geometry is not in a suitable form and with large datasets such as those used here, the problems are often exacerbated. The challenges associated with the identification of a suitable geometry subset from the full engine assembly tree, filtering oi unusable detail and additional CAD preparation for the grid generation are addressed. The realization of tractable but representative geometries is illustrated by examples characteristic of the Trent engine family. of the key physical processes. During normal operation this encompasses the ram inlet zone ventilation flow, including heat transfer from engine CASIngs and accessories, whilst for a fire event this will additionally include the interaction with the buoyantly driven fire plume. The scenario investigated in this paper is that of a burner-simulated gearbox fire. Predictions of the internal velocity field, gas temperatures and composition and wall heat fluxes are compared with experimental measurements on a 1/2 scale nacelle fire test rig and, for the ventilation flow, with visualisation using dye and bubble tracers in a Perspex model of similar scale by water analogy. The numerical simulations capture important features of this complex flowfield and are shown to identify a number of distinct opportunities for design refinement.

Author

Ventilation; Flow Distribution; Fires; Inlet Flow; Certification; Nacelles; Computerized Simulation; Component Reliability; Validity; Aircraft Engines; Design Analysis

19990071173 Rome Univ., Dept. of Mechanics and Aeronautics, Rome, Italy

Analysis of Unsteady Flow Phenomena: Shock - Vortex and Shock - Boundary Layer Interactions ***Final Report***

Grasso, Francesco, Rome Univ., Italy; [1999]; 11p; In English

Contract(s)/Grant(s): NAG1-2076; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The interaction of shock waves with vortices has received much attention in the past, mainly because shock-vortex interaction closely models the interaction of a shock wave with the coherent structures of a turbulent flow-field, and is a key feature in the broad-band shock noise for supersonic jets in off-project conditions. Chu and Kovasznay have shown that a weak disturbance in a viscous heat conducting fluid can be decomposed as the sum of three basic modes, namely acoustic, vortical and entropy mode; the interaction of any of these modes with a shock wave gives rise to all three disturbance modes downstream of the shock. The vortical mode is important since it constitutes the basis of the coherent structures that have been observed to dominate turbulence for low- to moderate-flow speed. Hollingsworth et al. have experimentally investigated the interaction of a cylindrical shock-induced starting vortex with a plane normal shock, and have shown that the interaction generates a cylindrical acoustic pulse that exhibits a quadrupolar structure consisting of four alternate compression and expansion regions centered around the transmitted vortex. The investigations of Hollingsworth and Richards have been extended by Dosanjh and Weeks that have analyzed the interaction of a columnar spiral vortex with a normal shock wave, thus obtaining quantitative measurements and confirming the generation of a progressive cylindrical wavefront of alternate compression-expansion nature. Naumann and Hermanns' have experimentally addressed the non-linear aspects of shock-vortex interaction, and have shown that the interaction causes both a diffraction and a reflection of the shock with a pattern consisting of either a regular-or a Mach-reflection depending on the shock and the vortex strengths. An attempt to theoretically explain the production of sound from the shock-vortex interaction was carried out by Ribner. Pao and Salas have numerically studied two-dimensional shock-vortex interactions.
Derived from text
Shock Waves; Vortices; Research; Unsteady Flow; Boundary Layer Transition; Normal Shock Waves

19990071311 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
Flow Pattern of Pure Refrigerant HFC134a Evaporating in a Horizontal Capillary Tube
Kuwahara, Ken, Kyushu Univ., Japan; Koyama, Shigeru, Kyushu Univ., Japan; Shimomura, Kingo, Kyushu Univ., Japan; Watanabe, Choyu, Kyushu Univ., Japan; Osa, Noburo, Kyushu Univ., Japan; The Reports of the Institute of Advanced Material Study, Kyushu University; 1998; ISSN 0914-3793; Volume 12, No. 2, pp. 107-113; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the present study, the characteristics of flow pattern are investigated experimentally for evaporation of pure refrigerant HFC134a in a capillary tube of 1.2 mm I.D. The capillary tube consists of a heating-copper tube section and a glass- tube section, which is located at the right after the outlet of the heating section. The flow pattern is observed through the glass tube section in the ranges of mass velocity of G = 80 - 1260 kg/(sq m.s) and vapor quality of x = 0.008 - 0.975 at a constant pressure of 920 kPa. The flow patterns observed are the bubble flow, the plug flow, the slug flow, the wavy annular flow and the annular flow. These flow patterns are typical for a relatively large diameter tube used as the heat transfer tube in commercial refrigeration and air-conditioning systems. However the transition points between each flow pattern are different from the modified Baker map and the Taitel-Dukler map, which are proposed for a relatively large diameter tube.
Author
Flow Distribution; Heat Transmission; Heat Transfer; Annular Flow; Refrigerants; Flow Visualization

19990071570 National Bureau of Standards, Thermophysics Div., Gaithersburg, MD USA
Dynamic Contact Angle of a Liquid Spreading on a Heated Plate
Ripple, D.; Jun. 1999; 32p; In English
Report No.(s): PB99-154817; NISTIR-6351; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

An equation determining the steady-state profile of a liquid meniscus advancing or receding across a heated plate is derived. The effects of liquid evaporation, intermolecular interaction with the plate, and thermocapillarity are included. Numerical and analytical estimates of the dynamic contact angle are calculated for water and the refrigerant 1,1,1,2 tetrafluoroethane. The dynamic contact angle depends primarily on three dimensionless parameters: one proportional to the velocity of the interface, one proportional to the rate of evaporation from the surface, and one proportional to the thermal coefficient of the liquid-vapor surface tension.
NTIS
Spreading; Heating; Liquid-Vapor Interfaces

19990071580 North Carolina State Univ., Dept. of Mechanical and Aerospace Engineering, Raleigh, NC USA
The Evaporation of Liquid Droplets in Highly Turbulent Gas Streams *Final Report*
Gould, Richard D.; May 31, 1998; 8p; In English
Contract(s)/Grant(s): DAAH04-95-1-0231
Report No.(s): AD-A365207; ARO-34119.2-EG; No Copyright; Avail: Defense Technical Information Center (DTIC), Hardcopy

Single acetone and heptane droplets were suspended from a hypodermic needle in turbulent airflow, and the Nusselt number was obtained from direct measurements of the droplet diameter and evaporation rate. Acetone was selected because it fluoresces when irradiated with ultraviolet laser radiation while heptane was selected because of its high volatility compared with water, methanol, and ethanol which were used previously. Planar laser induced fluorescence (PLIF) measurements were made to obtain qualitative concentration measurements of gaseous acetone in the boundary layer surrounding the droplet. The goal of these measurements was to give insight as to why the evaporation rate is increased by 50% when the gas phase turbulence is increased from the laminar flow case to the case where the freestream turbulence is 10%. The use of acetone droplets required that the influence of humidity on droplet evaporation rate be considered. Measurements of the turbulence intensity of heated freestream air were also made. Finally, many modifications to improve the experimental apparatus were made during this research project.
DTIC
Evaporation; Evaporation Rate; Drops (Liquids); Turbulent Flow; Turbulence; Gas Streams; Free Flow; Laminar Flow; Heat Transfer; Gas-Liquid Interactions; Mass Transfer

19990071785 Kurume Inst. of Tech., Japan
Critical Heat Flux in Subcooled Pool Boiling on a Horizontal Wire Effect of Subcooling on Critical Heat Flux
Inoue, Toshiaki, Kurume Inst. of Tech., Japan; Kawae, Nobuji, Kurume Inst. of Tech., Japan; Monde, Masanori, Kurume Inst. of Tech., Japan; Bulletin of Kurume Institute of Technology; 1997; ISSN 0389-6897, No. 21, pp. 15-22; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Critical heat flux (CHF) is measured during pool boiling of water and R113 on a heated horizontal wire submerged in a subcooled liquid. Experiments are conducted over a pressure range from 0.1 to 3.0 MPa and a subcooling level up to 220 K. CHF data reveal that the CHF increases in a linear fashion with an increase in the subcooling, Delta T(sub sub) and that the increment in CHF with increasing subcooling becomes large at high pressures. The CHF data at high pressures deviate from the values predicted by existing correlations, while the CHF data rises in a linear fashion with Delta T(sub sub). A new correlation is derived by taking into account the effect of both density ratio, rho(sub L)/rho(sub v), and Peclet number, Pe, on CHF and it succeeds in predicting the CHF data up to higher pressure as well as higher subcooling better than the applicable ranges of existing correlations. Key words: Subcooled Boiling, Critical Heat Flux, Phase Change, Pool Boiling, Horizontal Heated Wire
Author
Heat Flux; Boiling; High Pressure

19990073229 Cornell Univ., Sibley School of Mechanical and Aerospace Engineering, Ithaca, NY USA
Turbulence Modeling/Training ***Final Report, 1 Jul. 1994 - 30 Jun. 1998***
Greene, Charles; Apr. 21, 1999; 7p; In English
Contract(s)/Grant(s): F49620-92-J-0038; F49620-94-1-0332; AF Proj. 3484
Report No.(s): AD-A366085; AFRL-SR-BL-TR-99-0119; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Beginning with the code flo 103 of Jameson and Martinelli, a robust, flexible numerical platform has been constructed which can accept O and R meshes as well as C, accepts a variable number of PDEs in the turbulence models, has consistent gradient compensation, enhanced multi-grid sequencing, a restart option, various post-processing options, the option of recording convergence histories, accepts K-e, k-e-S, second order and Baldwin-Lomax turbulence models, has dynamical memory allocation, vectorized data structure and UNIX integration, and computes subsonic, transonic and supersonic flows. Virtually any turbulence model can be run in essentially any two-dimensional geometry, so that they can be compared on an equal footing. The following cases have been computed: homogeneous grid turbulence; plane jet and mixing layer; flat plate boundary layers; semi-infinite plate (subsonic (Clauser) and supersonic (Delery)); finite plate (subsonic (ONERA)); supersonic compression ramp (Settles et al - Mach 2.93); Delery bump.
DTIC
Turbulence Models; Computational Fluid Dynamics; Subsonic Flow

19990075035 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
Condensation of Pure Refrigerants in Microfin Tubes: A Correlation for Local Heat Transfer Coefficient
Yu, Jian, Kyushu Univ., Japan; Koyama, Shigeru, Kyushu Univ., Japan; The Reports of Institute of Advanced Material Study, Kyushu University; 1996; ISSN 0914-3793; Volume 10, No. 2, pp. 145-150; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the present study the local condensation heat transfer characteristics in horizontal microf'm tubes were investigated experimentally with pure refrigerants HFC134a, HCFC123 and HCFC22. From the experiments, it was found that the heat transfer coefficients for microfin tubes are about 2 times higher than those of smooth tubes with the same inner diameter. This enhancement

effect on heat transfer coefficient seems mainly caused by the enlargement of heat transfer area. From this point of view, a correlation, which is modified from the correlation of Haraguchi et al. for smooth tubes, is proposed for the condensation in microfin tubes with pure refrigerants.
Author
Refrigerants; Tube Heat Exchangers; Heat Transfer Coefficients; Research; Condensing

19990075036 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
Heat Transfer and Flow Characteristics of Pure Refrigerant HCFC123 in Falling Film Type Plate-Fin Evaporator
Koyama, Shigeru, Kyushu Univ., Japan; Ohara, Junichi, Kyushu Univ., Japan; Kuwahara, Ken, Kyushu Univ., Japan; Nishiyama, Hiroyasu, Kyushu Univ., Japan; The Reports of Institute of Advanced Material Study, Kyushu University; 1996; ISSN 0914-3793; Volume 10, No. 2, pp. 137-144; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the present study, the characteristics of heat transfer and flow pattern are investigated experimentally for the falling film evaporation of pure refrigerant HCFC123 in a rectangular channel with a serrated-fin surface. The distributor is set at the top of the channel to supply the refrigerant liquid uniformly. The liquid flowing down vertically is heated electrically from the rear wall of the channel. A transparent vinyl chloride resin plate is placed as the front wall in order to observe the flow pattern in evaporation process directly. The experimental ranges are as follows: the mass velocity G = 28 approx. 70 kg/(sq m/s), the heat flux q = 20 approx. 5O kW/sq m and the pressure P approx. = 100 kPa. It is clarified that the heat transfer coefficient alpha depends on G and q in the region of vapor quality x greater than or equal to 0.3, while there is little influence of G and q in the region x less than or equal to 0.3. From the direct observation, the relation between heat transfer and flow pattern is clarified. The results of alpha are also compared with some previous correlation equations.
Author
Heat Transfer; Flow Characteristics; Refrigerants; Evaporators; Fins; Fluid Films

19990075037 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
An Approximate Solution for Film Condensation of Pure Refrigerant on a Finned Vertical Surface
Koyama, Shigeru, Kyushu Univ., Japan; Yu, Jian, Kyushu Univ., Japan; Matsumoto, Tatsuya, Kyushu Univ., Japan; The Reports of Institute of Advanced Material Study, Kyushu University; 1996; ISSN 0914-3793; Volume 10, No. 2, pp. 129-136; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A numerical analysis for the laminar film condensation of pure refrigerant on a finned vertical surface is carried out to clarify the heat transfer characteristics of plate-fin condensers. The fin and liquid film shapes are simplified, and the governing equations of the liquid film and one-dimensional heat conduction equation in the fin are solved numerically using the finite difference method. Three dimensional distribution of the fin temperature and the distribution of liquid film thickness along vertical direction are obtained. The effects of fin shape parameters on heat transfer enhancement ratio and fin efficiency are examined. A dimensionless correlation equation for liquid film heat transfer is also proposed.
Author
Approximation; Film Condensation; Refrigerants; Numerical Analysis; Fins; Finite Difference Theory; Conductive Heat Transfer

19990075825 Research Inst. of National Defence, Weapons and Protection Div., Tumba, Sweden
Numerical Modeling of Magnetic Flux Compression by a Cylindrical Imploding Ionizing Shock Wave ***Topical Report***
Almstroem, H.; Goldberg, S. M.; Liberman, M. A.; Jul. 1998; ISSN 1104-9154; 22p; In English
Report No.(s): PB99-159584; FOA-R-98-00830-612-SE; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Generation of electromagnetic radiation (HPM, NNEMP) with extremely high power from compact sources driven by high explosives (HE) is of interest in defense applications. A computer code has been developed that models shock wave driven compression of magnetic flux. The authors outline a 1-D cylindrical MHD code that allows them to perform computer simulations of cylindrical MFC by SW in a media with variable conductivity. The code accounts for real features of the conductivity growth. Conservative finite difference schemes are used to approximate the governing equations. An effective rezoning procedure is used, which allows the authors to perform calculations up to 1000-fold radial compression. The code was benchmarked using a solution of MHD equations that corresponds to a self-similar motion with uniform deformation. by choosing different models for the conductivity growth, the authors demonstrate that the time history of the magnetic field ahead of the shock front (SF) and the distribution of the magnetic field in the conducting matter as well is essentially dependent on the possible ways of conductivity growth.
NTIS
Magnetic Flux; Cylindrical Waves; Cylindrical Bodies; Shock Waves; Implosions

19990075957 Hiroshima Univ., Faculty of Science, Japan

Nonstationary Flows of Nonsymmetric Fluids with Thermal Convection

Kagei, Yoshiyuki, Hiroshima Univ., Japan; Skowron, Maria, Warsaw Univ., Poland; Hiroshima Mathematical Journal; Jul. 1993; ISSN 0018-2079; Volume 23, No. 2, pp. 343-363; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The main objective of this paper is to investigate nonstationary flows of nonsymmetric fluids with thermal convection. During this investigative process, consideration was given to the general case of stress tensor and the two-term representation of the total stress whose components stand for the scalar equilibrium stress as well as viscous stresses.

CASI

Computational Fluid Dynamics; Incompressible Flow; Navier-Stokes Equation; Free Convection; Stress Tensors

19990076051 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Implementation of a Two-Dimensional Hydrodynamic Shock Code Based Upon the Weighted Average Flux Method

Wittig, Mark P., Air Force Inst. of Tech., USA; Jun. 1999; 147p; In English

Report No.(s): AD-A365941; AFIT/GAP/ENP/99J-02; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

Numerical modeling of shock propagation and reflection is of interest to the Department of Defense (DoD). Propriety state-of-the-art codes based upon E. F. Toro's weighted average flux (WAF) method are being used to investigate complex shock reflection phenomena. Here we develop, test, and validate a one-dimensional hydrodynamic shock code. We apply WAF to Gudonov's first-order upwind method to achieve second-order accuracy. Oscillations, typical of second-order methods, are then removed using adaptive weight limiter functions based upon total variation diminishing (TVD) flux limiters. An adaptive Riemann solver routine is also implemented to improve computational efficiency. This one-dimensional code is then extended into two dimensions via Warming and Beam's variation on dimensional splitting. The numerical capabilities of the two-dimensional code are demonstrated by modeling the detonation of a cylindrically symmetric explosive with the axis of the cylinder oriented horizontally above an ideal surface.

DTIC

Mechanical Shock; Two Dimensional Flow; Shock Waves; Flow Stability; Flux Density; Hydrodynamic Coefficients

35
INSTRUMENTATION AND PHOTOGRAPHY

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

19990070743 Osaka Univ., Faculty of Engineering, Osaka, Japan

Development of Coincidence Transmission Electron Microscope, 2, Time-Correlation Between Characteristic X-Rays and Transmitted Electrons

Yasuno, Motohide, Osaka Univ., Japan; Kimura, Yoshihide, Osaka Univ., Japan; Shimizu, Ryuichi, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2188, pp. 229-234; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A new type of electron microscope, called coincidence electron microscope, has been developed. This electron microscope enables an elemental mapping image to be obtained by detecting those electrons that generated characteristic X-rays during penetrating through a sample. to identify whether or not the transmitted electrons generated the characteristic X-rays, we have taken the coincidence between the X-rays and the relevant electrons. Time-correlation between characteristic X-rays and inelastically scattered electrons was examined by measuring time-correlation-spectrum (time-spectrum). The time-spectrum has confirmed detection of the coincidence between these signals. The SIN of the coincidence detection, however, is not high enough to obtain an elemental mapping image.

Author

Electron Microscopes; X Rays; Electrons; Transmission Electron Microscopy

19990071211 NASA Goddard Space Flight Center, Greenbelt, MD USA

Design and Performance of the Astro-E/XRS Signal Processing System

Boyce, K. R., NASA Goddard Space Flight Center, USA; Audley, M. D., NASA Goddard Space Flight Center, USA; Baker, R. G., NASA Goddard Space Flight Center, USA; Dumonthier, J. J., NASA Goddard Space Flight Center, USA; Fujimoto, R., Institute of Space and Astronautical Science, Japan; Gendreau, K. C., NASA Goddard Space Flight Center, USA; Ishisaki, Y., Tokyo

Metropolitan Univ., Japan; Kelley, R. L., NASA Goddard Space Flight Center, USA; Stahle, C. K., NASA Goddard Space Flight Center, USA; Szymkowiak, A. E., NASA Goddard Space Flight Center, USA; Winkert, G. E., NASA Goddard Space Flight Center, USA; [1999]; 10p; In English; No Copyright; Avail: Issuing Activity, Hardcopy

We describe the signal processing system of the Astro-E XRS Instrument. The Calorimeter Analog Processor (CAP) provides bias and power for the detectors and amplifies the detector signals by a factor of 20,000. The Calorimeter Digital Processor (CDP) performs the digital processing of the calorimeter signals, detecting X-ray pulses and analyzing them by optimal filtering. We describe the operation of pulse detection, pulse height analysis, and risetime determination. We also discuss performance, including the three event grades (hi-res, mid-res, and low-res), anticoincidence detection, counting rate dependence, and noise rejection. Author

Signal Processing; Design Analysis; Performance Prediction; Calorimeters

19990071212 NASA Goddard Space Flight Center, Greenbelt, MD USA

Design and Performance of the Astro-E/XRS Microcalorimeter Array and Anti-Coincidence Detector

Stahle, C. K., NASA Goddard Space Flight Center, USA; Audley, M. D., NASA Goddard Space Flight Center, USA; Boyce, K. R., NASA Goddard Space Flight Center, USA; Brekosky, R. P., NASA Goddard Space Flight Center, USA; Fujimoto, R., Institute of Space and Astronautical Science, Japan; Gendreau, K. C., NASA Goddard Space Flight Center, USA; Gygax, J. D., NASA Goddard Space Flight Center, USA; Ishisaki, Y., Tokyo Metropolitan Univ., Japan; Kelley, R. L., NASA Goddard Space Flight Center, USA; McClanahan, R. A., NASA Goddard Space Flight Center, USA; 1999; 10p; In English, 18-23 Jul. 1999, Denver, CO, USA; Sponsored by International Society for Optical Engineering; No Copyright; Avail: Issuing Activity, Hardcopy

The XRS instrument has an array of 32 micro-calorimeters at the focal plane. These calorimeters consist of ion-implanted silicon thermistors and HgTe thermalizing x-ray absorbers. These devices have demonstrated a resolution of 9 eV at 3 keV and 11 eV at 6 keV. We will discuss the basic physical parameters of this array, including the array layout, thermal conductance of the link to the heat sink, operating temperature, thermistor size, absorber choice, and means of attaching the absorber to the thermistor bearing element. We will present representative performance data, though a more detailed presentation of the results of the instrument calibration is presented elsewhere in these proceedings. A silicon ionization detector is located behind the calorimeter array and serves to reject events due to cosmic rays. We will briefly describe this anti-coincidence detector and its performance in conjunction with the array.

Author

Calorimeters; Design Analysis; Performance Prediction; Arrays; Spectroscopy; Thermal Conductivity

19990071213 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Astro-E/XRS Calibration Program and Results

Gendreau, Keith C., Maryland Univ., USA; Audley, M. Damian, Institute of Space and Astronautical Sciences, Japan; Arnaud, Keith A., Maryland Univ., USA; Boyce, Kevin R., NASA Goddard Space Flight Center, USA; Fujimoto, Ryuichi, Institute of Space and Astronautical Sciences, Japan; Ishisaki, Yoshitaka, Tokyo Metropolitan Univ., Japan; Kelley, Richard L., NASA Goddard Space Flight Center, USA; Mihara, Tatehiro, Institute of Physical and Chemical Research, Japan; Mitsuda, Kazuhisa, Institute of Space and Astronautical Sciences, Japan; Porter, F. Scott, NASA Goddard Space Flight Center, USA; [1999]; 12p; In English; No Copyright; Avail: Issuing Activity, Hardcopy

XRS is the microcalorimeter X-ray detector aboard the US-Japanese ASTRO-E observatory, which is scheduled to be launched in early 2000. XRS is a high resolution spectrometer- with less than 9 eV resolution at 3 keV and better than 14 eV resolution over its bandpass ranging from about 0.3 keV to 15 keV. Here we present the results of our first calibration of the XRS instrument. We describe the methods used to extract detailed information about the detection efficiency and spectral redistribution of the instrument. We also present comparisons of simulations and real data to test our detector models.

Author

X Ray Detectors; Calorimeters; X Ray Spectrometers; Calibrating

19990071226 NASA Goddard Space Flight Center, Greenbelt, MD USA

Astro-E/XRS Blocking Filter Calibration

Audley, Michael D., Institute of Space and Astronautical Science, Japan; Arnaud, Keith A., Maryland Univ., USA; Gendreau, Keith C., Maryland Univ., USA; Boyce, Kevin R., NASA Goddard Space Flight Center, USA; Fleetwood, Charles M., NASA Goddard Space Flight Center, USA; Kelley, Richard L., NASA Goddard Space Flight Center, USA; Keski–Kuha, Ritva A., NASA Goddard Space Flight Center, USA; Porter, F. Scott, NASA Goddard Space Flight Center, USA; Stahle, Caroline K., NASA Goddard Space Flight Center, USA; Szymkowiak, Andrew E., NASA Goddard Space Flight Center, USA; [1999]; 12p; In English; No Copyright; Avail: Issuing Activity, Hardcopy

We describe the transmission calibration of the Astro-E XRS blocking filters. The XRS instrument has five aluminized polyimide blocking filters. These filters are located at thermal stages ranging from 200 K to 60 mK. They are each about 1000 A thick. XRS will have high energy resolution which will enable it to see some of the extended fine structure around the oxygen and aluminum K edges of these filters. Thus, we are conducting a high spectral resolution calibration of the filters near these energies to resolve out extended fine structure and absorption lines.
Author
Calibrating; Electric Filters; Spectral Resolution; Optical Filters; Aluminum

19990071578 Centre National de la Recherche Scientifique, Toulouse France
18th International Congress on Instrumentation in Aerospace Simulation Facilities (ICIASF)
Jun. 18, 1999; 384p; In English; 18th, 14-18 Jun. 1999, Toulouse, France
Contract(s)/Grant(s): F61775-99-W-F050
Report No.(s): AD-A365203; EOARD-CSP-99-5050; No Copyright; Avail: CASI; A17, Hardcopy; A03, Microfiche
The Final Proceedings for 18th International Congress on Instrumentation in Aerospace Simulation Facilities (ICIASF), 14-18 June 1999. This is an interdisciplinary conference. Topics include: (1) New and improved mechanical, electrical, and optical measurement devices; (2) Measurement in high temperature and cryogenic environments; (3) Instrument research in subsonic, supersonic, hypersonic, and real gas flows; (4) Analog and digital acquisition and analysis techniques; (5) Propulsion systems and turbomachinery in flight sensors; (6) New testing techniques and test environments in space applications; and (7) Future instrumentation and simulation requirements in flow field diagnostics.
DTIC
Wind Tunnel Tests; Particle Image Velocimetry; Mechanical Measurement; Propulsion System Configurations; Propulsion System Performance; Technology Utilization; Gas Flow; Turbomachinery

19990072764 NASA Langley Research Center, Hampton, VA USA
First International Symposium on Strain Gauge Balances, Part 2
Tripp, John S, Editor, NASA Langley Research Center, USA; Tcheng, Ping, Editor, NASA Langley Research Center, USA; First International Symposium on Strain Gauge Balances; March 1999; 322p; In English; 1st; International Symposium on Strain Gauge Balances, 22-25 Oct. 1996, Hampton, VA, USA; Sponsored by NASA, USA; See also 19990072765 through 19990072788
Contract(s)/Grant(s): RTOP 992-35-12-18
Report No.(s): NASA/CP-1999-209101/PT2; NAS 1.55:209101/PT2; L-17809B; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
The first International Symposium on Strain Gauge Balances was sponsored and held at NASA Langley Research Center during October 22-25, 1996. The symposium provided an open international forum for presentation, discussion, and exchange of technical information among wind tunnel test technique specialists and strain gauge balance designers. The Symposium also served to initiate organized professional activities among the participating and relevant international technical communities. Over 130 delegates from 15 countries were in attendance. The program opened with a panel discussion, followed by technical paper sessions, and guided tours of the National Transonic Facility (NTF) wind tunnel, a local commercial balance fabrication facility, and the LaRC balance calibration laboratory. The opening panel discussion addressed ”Future Trends in Balance Development and Applications.” Forty-six technical papers were presented in 11 technical sessions covering the following areas: calibration, automatic calibration, data reduction, facility reports, design, accuracy and uncertainty analysis, strain gauges, instrumentation, balance design, thermal effects, finite element analysis, applications, and special balances. At the conclusion of the Symposium, a steering committee representing most of the nations and several U.S. organizations attending the Symposium was established to initiate planning for a second international balance symposium, to be held in 1999 in the UK.
Author
Conferences; Strain Gage Balances; Calibrating; Instrument Errors; Wind Tunnel Apparatus; Dynamometers; Wind Tunnels

19990072765 Beijing Inst. of Aerodynamics, Beijing, China
A Water-Cooled Six-Component Internal Balance
Liao, Li Xin, Beijing Inst. of Aerodynamics, China; Tao, Yu, Beijing Inst. of Aerodynamics, China; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 431-445; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The design, calibration and use of a water-cooled six-component internal balance are described in detail, and some improvement had been gotten on the computation and heat protection methods of balances. The calibration and testing results indicate that the design of this balance is successful.
Author
Design Analysis; Calibrating; Performance Prediction; Coolers

19990072766 China Aerodynamics Research and Development Center, Mianyang, China
Single Load and Multicomponent Balance Calibration System (SL and MBCS) of Piezoelectric Balance in Shock Tunnel
Hongshan, Liu, China Aerodynamics Research and Development Center, China; Zhiguo, Lu, China Aerodynamics Research and Development Center, China; Xuequn, Qi, China Aerodynamics Research and Development Center, China; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 447-453; In English; See also 19990072764; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper describes a new type balance calibration system (SL&MBCS) in HAI (Hypervelocity Aerodynamics Institute) of CARDC and shows that its principles is remarkable, and its application in shock tunnel is very successful.
Author
Calibrating; Balancing; Piezoelectricity

19990072767 Modern Machine and Tool Co., Newport News, VA USA
Free Oscillation Dynamic Stability Balance System
Parker, Peter A., Modern Machine and Tool Co., USA; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 455-466; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A dynamic stability balance system has been designed and implemented using a large amplitude free oscillation technique to determine the damping characteristics of a wind tunnel model containing a moving payload which causes changes in the center of gravity during flight. The ceiling mounted system consists of a dynamic stability balance, a variable angle of attack tunnel interface plate, a model strut which passes into the tunnel test section, and a remote operation control panel. The balance consists of four load carrying flexures and one measurement flexure. Two full strain gage bridges, a foil resistive strain gage bridge and a piezoresistive strain gage bridge, were installed on the measurement flexure. Angular deflection is collected from the foil strain gage bridge and dynamic response data is recorded from the piezoresistive bridge. The dynamic stability balance was designed with removable load carrying flexures which allows the system spring constant to be changed for transonic and subsonic testing of a model. A removable inertial disk is used in conjunction with the removable flexures to change the frequency and damping time constant of the balance oscillation. The nominal angle of attack of the model is set using the tunnel interface plate which allows for plus and minus ninety degree rotation. Operation of the balance is accomplished by remotely cocking and latching the balance to an initial angle of five degrees and then releasing the latch to begin oscillation. The damping time, frequency and amplitude are recorded with the model subjected to controlled aerodynamic conditions. Comparison of the data obtained at the various aerodynamic conditions yields the damping characteristics of the model.
Author
Oscillations; Dynamic Response; Dynamic Stability; Design Analysis; Balancing; Aerodynamic Balance; Systems Engineering

19990072768 Defence Research Establishment Valcartier, Valcartier, Quebec Canada
A Stiff Monopiece Wind Tunnel Balance
Drouin, Gedeon, Defence Research Establishment Valcartier, Canada; Girard, Bertrand, Defence Research Establishment Valcartier, Canada; Mackay, Ken, Martec Ltd., Canada; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 467-479; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Overloads generated at the start and stop of airflow in the DREV Indraft Wind Tunnel necessitated the development of strong and still sensitive aerodynamic balances. Semiconductor strain gages were considered for instrumenting the sensing structures but concerns were expressed on their sensitivity to temperature and implementation of necessary compensating circuits. A computer simulation tool was developed by Martec Ltd. to conduct statistical predictions of the effect of temperature on Zero-load balance outputs and on the sensitivity of bridges taking into account tolerances provided by component manufacturers. It can compute temperature effect compensating circuits and predict resulting performance.
Author
Wind Tunnel Apparatus; Weight Indicators; Balance; Computerized Simulation

19990072769 Aeronautical Research Inst. of Sweden, Stockholm, Sweden

A New Master Balance for the MK15 Calibration Rig at FFA

Johnson, G. I., Aeronautical Research Inst. of Sweden, Sweden; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 481-492; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The automated MK 15 rig is used at FFA for calibration of wind tunnel balances with up to six components and typically a normal force of up to 50 kN. This rig is equipped with a dedicated computer for control of calibration loads and for processing of calibration results. For convenient production calibration the MK 15 rig is optionally equipped with a master balance attached to the rig table. After an initial separate calibration of the master balance, the wind tunnel balance, here called the object balance, is installed on the master balance, whereby the two balances are coupled in series. Calibration loads are then applied to the object balance for production calibration, based on common load components as indicated by the master balance. However, application of the master balance has implied an extension of the distance from the object balance to the calibration rig table. Accompanying long moment arms from normal and side force load lines to the plane of master balance sensors, may induce relatively strong interactions from these components leading to impaired resolution and accuracy of the balance. Similarly high parting forces may occur in the attachment joints as magnifications of normal and side forces by the moment arms. This may lead to slippage and relocation of contact forces, which would appear as hysteresis in calibration results. It is reported here how above difficulties can be avoided by appropriate design of the master balance, with the purpose of also maintaining calibration accuracy over an extended range of calibration loads for a variety of object balances.

Author

Wind Tunnel Apparatus; Weight Indicators; Calibrating; Balance

19990072770 Modern Machine and Tool Co., Newport News, VA USA

Development of a Five Component Balance as an Integral Part of a Control Surface

Patel, Naresh R., Modern Machine and Tool Co., USA; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 493-510; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A five component balance has been designed, manufactured and calibrated at Modern Machine & Tool Co., Inc.. The balance is used to measure aerodynamic forces on wind tunnel test models. The balance was designed to measure Normal Force, Axial Force, Pitching Moment, Rolling Moment and Yawing Moment generated on a horizontal stabilizer of a wind tunnel test model. A unique feature of the balance is that the load carrying strain gaged flexures were machined as an integral part of the control surface due to space limitations. This was accomplished by using the electrical discharge machining process. The integral design eliminates mechanical joints and greatly reduces errors due to hysteresis. The five component integral control surface balance has demonstrated performance comparable to wind tunnel balances used currently in the aerospace industry.

Author

Design Analysis; Balance; Fabrication; Calibrating; Components; Aerodynamic Forces; Wind Tunnel Apparatus; Stabilizers (Fluid Dynamics)

19990072771 Indian Inst. of Science, Dept. of Aerospace Engineering, Bangalore, India

Design Features of Some Special Strain Guage Balances

Ramaswamy, M. A., Indian Inst. of Science, India; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 511-524; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Some special strain gauge balances were designed and developed in the Department of Aerospace Engineering, Indian Institute of Science, Bangalore to cater to special requirements, which could not be met using standard type of balances. Some of the special requirements, for which special balances were required are given below.

Author

Strain Gage Balances; Design Analysis; Fabrication; Loads (Forces); Moments; Weight Measurement

19990072772 NASA Langley Research Center, Hampton, VA USA

NASA LaRC Strain Gage Balance Design Concepts

Rhew, Ray D., NASA Langley Research Center, USA; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 525-541; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The NASA Langley Research Center (LaRC) has been designing strain-gage balances for more than fifty years. These balances have been utilized in Langley's wind tunnels, which span over a wide variety of aerodynamic test regimes, as well as other ground based test facilities and in space flight applications. As a result, the designs encompass a large array of sizes, loads, and environmental effects. Currently Langley has more than 300 balances available for its researchers. This paper will focus on the design concepts for internal sting mounted strain-gage balances. However, these techniques can be applied to all force measure-

ment design applications. Strain-gage balance concepts that have been developed over the years including material selection, sting, model interfaces, measuring, sections, fabrication, strain-gaging and calibration will be discussed.
Author
Design Analysis; Strain Gage Balances; Wind Tunnel Tests; Fabrication; Calibrating; Aerodynamic Characteristics

19990072773 Helsinki Univ. of Technology, Lab. of Aerodynamics, Espoo, Finland
An Easy-to-Use Calibration and Readout System for Small Internal Beam-Type Wind Tunnel Balances
Fagerstroem, Bo R., Helsinki Univ. of Technology, Finland; Kemppainen, Pasi P., Helsinki Univ. of Technology, Finland; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 543-554; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A calibration system based on dead weight loads in a simple and relatively inexpensive calibration rig was developed. Interactive software based on a graphical environment and running on a standard low-cost PC plays a central role in this system. Off-the-shelf data acquisition hardware is utilised. The system is intended for small balances with load ranges small enough to make manual handling of dead weights practical. The scheme used allows a full set of second-order interference terms. to account for possible rollover errors, unsigned first order (absolute value) terms are included, as are some third order terms to improve the handling of main non-linearity. This leads to a maximum of 39 calibration coefficients for each component. Not all of these are of significance in all cases, and individual coefficients can be disabled by the operator. Attention is paid to ergonomics in the user interface (visual and logical clarity, support for correct procedures, autodocuinentation). Due to the nature of the platform software, it is easy to integrate auxiliary measurement and control functions (such as the control and measurement of attitude angles in tunnel tests).
Author
Weight Indicators; Readout; Calibrating; Data Acquisition; Fabrication; Loads (Forces)

19990072774 China Aerodynamics Research and Development Center, Mianyang, China
Development of BFH Series Strain Gages
Xingruo, Gu, China Aerodynamics Research and Development Center, China; Jinqing, Hu, China Aerodynamics Research and Development Center, China; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 555-563; In English; See also 19990072764; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

BFH-series strain gages are specially developed for wind tunnel strain gage balances. It can be cured without being pressed so as to easy the operation of strain gage installation on Wind tunnel balance. This article concentrates on some techniques in the development of BFH-series strain gages, the test result and the application. The test results include the appraisal opinions and the dynamic calibration situations of balances with BFH-series strain gages being used. All that has reached the expected development goal.
Author
Strain Gages; Fabrication; Measuring Instruments; Dynamic Tests

19990072775 NASA Langley Research Center, Hampton, VA USA
Strain Gauge Balance Calibration and Data Reduction at NASA Langley Research Center
Ferris, A. T. Judy, NASA Langley Research Center, USA; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 565-572; In English; See also 19990072764; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper will cover the standard force balance calibration and data reduction techniques used at Langley Research Center. It will cover balance axes definition, balance type, calibration instrumentation, traceability of standards to NIST, calibration loading procedures, balance calibration mathematical model, calibration data reduction techniques, balance accuracy reporting, and calibration frequency.
Author
Balance; Calibrating; Data Reduction

19990072776 China Aerodynamics Research and Development Center, Mianyang, China
An Investigation of Temperature Effects of Strain Gauge Balances for Conventional Hypersonic Wind Tunnels
Wei, Liu, China Aerodynamics Research and Development Center, China; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 573-580; In English; See also 19990072764; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In hypersonic wind tunnels, it is necessary to heat the air in the upstream of the nozzle so as to avoid air condensation. When Mach number increases, the heated air temperature increases rapidly. In the 0.5m hypersonic wind tunnel, the stagnation tempera-

ture in the settling chamber is up to 800 C at Mach number 10. Therefore, the temperature effects of balance on test results can't be ignored during 60 - 200 seconds running time. This paper gives a brief introduction to the performance of balances in hypersonic wind tunnels. It mainly analyzes the factors causing temperature effects of balances in the 0.5m hypersonic wind tunnel and introduced the temperature characteristics calibration equipment, temperature compensation methods and the relevant results.
Author
Hypersonic Wind Tunnels; Strain Gage Balances; Temperature Effects; Wind Tunnel Apparatus

19990072777 Office National d'Etudes et de Recherches Aerospatiales, Chatillon, France
ONERA Balances and Dynamometers
Brazin, Maurice, Office National d'Etudes et de Recherches Aerospatiales, France; Milliat, Francis, Office National d'Etudes et de Recherches Aerospatiales, France; Girard, Daniel, Office National d'Etudes et de Recherches Aerospatiales, France; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 581-594; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The quality of most wind tunnel tests depends directly on the quality of the balances and other experimental dynamometric elements. In this paper, there is not enough room to review in detail all the techniques and know-how acquired at ONERA over the years, not only in its research laboratory, but also throughout a long experience, sanctioned by a mass of test data using many different balances. The most important principles we have developed are now general knowledge, and can be found in many published papers. The authors here have placed their emphasis on synthesizing this knowledge. sometimes in a somewhat didactic form, especially as far as the structural and mastery of the thermal effects are concerned. As manufacturers' requests for accuracy are always increasing especially as concerns the drag count (1 x 10(exp -4)), the balance definition and the manufacturing techniques have changed, drawing from benefits of powerful design optimization systems (CAD and finite elements), of the quality of commercially available components, and of the development of methods for selecting and associating these components. The paper gives an overview of ONERA's experience with different types of balances, calibration, and computational methods.
Derived from text
Dynamometers; Balance; Computer Aided Design; Optimization; Temperature Effects

19990072778 NASA Langley Research Center, Hampton, VA USA
Finite Element Analysis of a NASA National Transonic Facility Wide Tunnel Balance
Lindell, Michael C., Editor, NASA Langley Research Center, USA; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 595-606; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper presents the results of finite element analyses and correlation studies performed on a NASA National Transonic Facility (NTF) Wind Tunnel balance. In the past NASA has relied primarily on classical hand analyses, coupled with relatively large safety factors, for predicting maximum stresses in wind tunnel balances. Now, with the significant advancements in computer technology and sophistication of general purpose analysis codes, it is more reasonable to pursue finite element analyses of these balances. The correlation studies of the present analyses show very good agreement between the analyses and data measured with strain gages and therefore the studies give higher confidence for using finite element analyses to analyze and optimize balance designs in the future.
Author
Finite Element Method; Transonic Wind Tunnels; Balancing; Correlation

19990072779 Technische Univ., Darmstadt, Germany
Optimization of Internal Strain-Gage Windtunnel Balances with Finite Elements Computation
Zhai, Junnai, Technische Univ., Germany; Hufnagel, K., Technische Univ., Germany; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 607-617; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The internal strain gage balance is one of the most important instrumentation in the wind tunnel. The more and more intensive competition in the airplane industry has set higher demands on the balance. to design and construct such a balance that can meet those demands all aspects of the balance technology must be investigated. In this paper only the structure of the internal strain gage balance is considered. From the point of view of structure these high demands on the balance can be expressed as: (1) lower interference; (2) higher stiffness Lower stress level at the strain gage positions and the related parts; (3) capability of tolerating errors from the temperature gradients. Among these demands the interference and stiffness are most important for a transport balance, thus only these two properties are studied in this paper. For this study the Finite Elements Method (FEM) is best suitable. With this method the various influence factors can be systematically analyzed. Based on the analysis the structure of the balance can be optimized in three levels. At first the balance structure is optimized by choosing the key geometric parameters. Then various

shapes for the parts of an internal balance are discussed. Finally different configurations for the internal strain gage balance are studied. Through a parameter optimization the total linear interference on the drag can be reduced from 6.1% to 3.8% of the F.S. signal. by using the configurations with two symmetrical planes the interference can be reduced to 2.5% of the F.S. signal. by using the point symmetrical configuration the interference on the drag can be reduced to 0.5% of the F.S. signal. This is almost interference-free. The stiffness in axial direction is mainly affected by the parallelograms. by choosing proper dimensions for the drag measuring beam, the stiffness of the balance in X-axis can be doubled. But the stiffness in other directions is hardly changed. The stiffness in normal and side direction is mainly affected by the main beams and the moment measuring elements. by using the new main beams, the combined main beams, the stiffness of the balance in Z-axis can be 21% than that of the dovetail matched form. An further improvement of the stiffness can be achieved by using the shear spring as moment measuring element. A new moment measuring element of this kind is therefore put forward. The FEM computation shows that alone with this element the stiffness in Z-axis can be raised by 65%. It is to recognize from this study that at the present level of technology there is no structure for a balance that is optimal in all respects. The best solution may be a requirement-oriented design, i.e., to design a balance structure according to the concrete requirements.
Author
Optimization; Strain Gages; Wind Tunnels; Finite Element Method; Stress-Strain Relationships; Strain Gage Balances

19990072780 Central Research Inst. of Machine Building, Korolev, Russia
New Design of Tubular Type Strain-Gage Balances
Lagutin, Vyacheslav I., Central Research Inst. of Machine Building, Russia; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 619-624; In English; See also 19990072764; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Widely world used type of strain-gage balances (like the symbol of the Symposium) possesses some imperfections caused mainly by nonsymmetry of the balance structure and difficulties of their fabrication. Last years new type of the balances based on combination of ring and tubular type dynamometers is successfully used in aerogasdynamic tests provided by TSNMIMASH. In the article several designs of such types dynamometers and typical designs of tubular aerodynamic strain-gage balances for various application are presented. The balances have a symmetrical structure of springy bodies. As a result it is possible to decrease of loading components interaction and to improve fabrication properties.
Author
Dynamometers; Design Analysis; Strain Gage Balances

19990072781 Technische Univ., Dept. of Aerodynamics and Measuring Techniques, Darmstadt, Germany
The Development of Advanced Internal Balances for Cryogenic and Conventional Tunnels
Ewald, Bernd, Technische Univ., Germany; Hufnagel, K., Technische Univ., Germany; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 625-643; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The ever rising accuracy requirements in wind tunnel testing for aeroplane development enforce continuous improvement of force testing technology. The introduction of the cryogenic tunnel is an additional challenge for the force balance, since now even better or at least the same balance accuracy is requested over an operational temperature range of 200 Kelvin. In more than 12 years of research at the Technical University of Darmstadt all aspects of force testing technology have been dealt with and developed to new standards by the authors in co-operation with Deutsche Aerospace, Airbus GmbH, Bremen. Most of the work was financed by the German Ministry for Research and Technology as a preparation for the ETW Technology. Basic research on the aspects of metallic spring materials resulted in new understanding about material selection and material treatment for optimum results. Principal balance design optimizations are done with finite element analysis. For the routine balance design an interactive computer programme was developed. The very successful technique of the Electron Beam Welded Balance, which offers new structural design possibilities, was developed. The balance structure is fabricated from parts, which are welded together by electron beam welding. For cryogenic balances the main problems are zero shift and sensitivity shift over the large temperature range and false signals especially in the axial force element due to temperature gradients. The problems were overcome by a very careful strain gage matching process, by use of special gages, by application of numerical corrections and by a special design of the axial force system with tandem measuring elements in the flexure groups. For the calibration of the balance a new third order numerical algorithm was developed. The algorithm works with arbitrary load combinations. This was a requirement for the development of a fully automatic balance calibration machine. The machine (the first specimen is already operational at the ETW) performs a six component calibration including all single loads and all combinations of two loads in one working shift. So all components

of the wind tunnel force testing technology have been developed to new standards with the result of considerable accuracy improvements of the wind tunnel results.
Author
Algorithms; Balance; Calibrating; Cryogenics; Fabrication; Measuring Instruments; Optimization; Research; Structural Design; Wind Tunnel Tests

19990072782 National Aerospace Lab., Bangalore, India
A New Balance Calibration Methodology for Long Slender Bodies in a Blowdown Tunnel
Rajendra, G., National Aerospace Lab., India; Murthy, H. Sundara, National Aerospace Lab., India; Kumar, G. Vijaya, National Aerospace Lab., India; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 645-651; In English; See also 19990072764; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Accurate measurement of forces and moments on long slender models in blowdown wind tunnels poses certain special problems at supersonic speeds. While the balances are required to be of high capacity to withstand large starting and stopping loads, the steady loads on the model are usually small fractions of the balance capacity, resulting in reduced measurement accuracies. A large reduction of start and stop loads would permit the use of a sensitive low range balance tailored to the small loads on models. Alleviation methods developed so far have not met with much success to enable this option. The floating frame balances built by ABLE Corporation, USA are able to overcome this problem to some extent due to their inherent ability to provide high accuracy, even at very low loads. However there is a strong need to reassess the balance calibration methodologies to be able to achien,e acceptable accuracies for measurement of low loads using these high range balances. This paper presents a brief description of the problems faced in obtaining accurate data on long slender models and a new balance calibration method to overcome some of these problems.
Author
Procedures; Calibrating; Balance; Mechanical Measurement; Load Distribution (Forces); Slender Bodies; Loads (Forces)

19990072783 Eidetics International, Inc., Torrance, CA USA
Development of a 5-Component Balance for Water Tunnel Applications
Suarez, Carlos J., Eidetics International, Inc., USA; Kramer, Brian R., Eidetics International, Inc., USA; Smith, Brooke C., Eidetics International, Inc., USA; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 653-668; In English; See also 19990072764
Contract(s)/Grant(s): NAS2-13571; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The principal objective of this research/development effort was to develop a multi-component strain gage balance to measure both static and dynamic forces and moments on models tested in flow visualization water tunnels. A balance was designed that allows measuring normal and side forces, and pitching, yawing and rolling moments (no axial force). The balance mounts internally in the model and is used in a manner typical of wind tunnel balances. The key differences between a water tunnel balance and a wind tunnel balance are the requirement for very high sensitivity since the loads are very low (typical normal force is 90 grams or 0.2 lbs), the need for water proofing the gage elements, and the small size required to fit into typical water tunnel models. The five-component balance was calibrated and demonstrated linearity in the responses of the primary components to applied loads, very low interactions between the sections and no hysteresis. Static experiments were conducted in the Eidetics water tunnel with delta wings and F/A-18 models. The data were compared to forces and moments from wind tunnel tests of the same or similar configurations. The comparison showed very good agreement, providing confidence that loads can be measured accurately in the water tunnel with a relatively simple multi-component internal balance. The success of the static experiments encouraged the use of the balance for dynamic experiments. Among the advantages of conducting dynamic tests in a water tunnel are less demanding motion and data acquisition rates than in a wind tunnel test (because of the low-speed flow) and the capability of performing flow visualization and force/moment (F/M) measurements simultaneously with relative simplicity. This capability of simultaneous flow visualization and for F/M measurements proved extremely useful to explain the results obtained during these dynamic tests. In general, the development of this balance should encourage the use of water tunnels for a wider range of quantitative and qualitative experiments, especially during the preliminary phase of aircraft design.
Author
Strain Gage Balances; Fabrication; Research and Development; Dynamic Tests; Static Tests; Calibrating; Data Acquisition

19990072784 China Aerodynamics Research and Development Center, Mianyang, China
Development and Application of Microbalance in Hypersonic Low Density Wind Tunnel
Zhigong, Tang, China Aerodynamics Research and Development Center, China; Yianguang, Yang, China Aerodynamics Research and Development Center, China; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp.

669-676; In English; See also 19990072764; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper summarized the study of aerodynamic measuring technique in Hypersonic Low Density Wind Tunnel (HLDWT) of CARDC, and described the development and application of microbalance, and discussed the directions of development of microbalance in HLDWT.

Author

Research; Microbalances; Measuring Instruments; Flight Simulation

19990072785 Indian Inst. of Science, Dept. of Aerospace Engineering, Bangalore, India

Novel Oil Filled Bellow Type Internal Strain Gauge Balance for Water Tunnel Applications

Vasudevan, B., Indian Inst. of Science, India; Ramaswamy, M. A., Indian Inst. of Science, India; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 677-688; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The balance described in this paper was developed in response to a particular need that arose in the measurement of forces and moments over models placed in a return circuit water tunnel facility at the Department of Civil Engineering, Indian Institute of Science, Bangalore. Conventional balances were first tried with several types of water-proofing compounds applied over the foil type strain gages by following the procedures suggested by the manufacturer but over a short period of use, the strain gages failed repeatedly. It was felt that one of the major causes of failure could be due to delamination of the strain gages and the water-proofing coatings due to successive cyclical operations wherein the static pressure in the tunnel was varied in the range - 13 psi to + 13 psi with reference to ambient. Large negative pressures were required to simulate the cavitating conditions at different flow velocities and these cyclic operations had presumably caused a rapid deterioration in the functioning of the strain gage sensors resulting in the insulation resistances to drop to alarmingly low values. Over a period of testing, it was realized that no useful result could be obtained even after trying to improve the quality of water proofing as suggested by the international suppliers of strain gages such as Micromeasurements, USA. It was therefore decided to isolate the strain gage sensors from the medium of flow, in this case, water, by the introduction of a suitable bellow. Initially experiments were planned with the sensors being kept in air at ambient pressure inside the bellow with suitable PVC ducting for carrying the electrical lead wires from the strain gauge bridges at the rear end of the balance. However, a simple calculation revealed that such an arrangement would result in large axial loads appealing as balance output even in the absence of any flow at large negative/positive static pressure in the test section. In fact, for the 25 mm dia balance in use, a one atmosphere difference in pressure would give an axial load of about 5 kgs whereas the axial load expected at the maximum flow velocity and angles of incidence was less than 50% of this value. Since this axial load appeared because of the pressure difference between the inside and outside of the bellow, it was decided to introduce an electrically neutral incompressible oil medium inside the bellow and the bellow be made of reasonably thin rubber material such that differential pressure cannot be sustained across it as the tunnel pressure varied from large negative to positive pressures. Also, for the pressure equalization to automatically take place very little volume change of oil is needed for the pressure range under discussion. Thus, the conceptually new, oil filled bellow type balance was expected to give very little output due to a change in tunnel static pressure while completely protecting and giving the same life for the strain gage sensors as that obtained with 'air' as the flow medium. An additional advantage noticed was that the output of the balance kept in an oil bath inside the bellow was extremely steady without any drift unlike in a regular balance where a small drift could be noticed due to ambient temperature changes. This paper describes the Indian Institute of Science water tunnel facility, the experience of using conventional sting type balances in the facility, details of the test rig built to duplicate the absolute pressures obtained in the water tunnel, design details and the performance of the oil filled balance under varying absolute pressures both above and below ambient conditions in this test fig and finally conclusions.

Author

Oils; Strain Gage Balances; Momentum; Measuring Instruments; Models; Static Pressure; Field Theory (Physics)

19990072786 Boeing Defense and Space Group, Seattle, WA USA

Measurement of Full-Scale STOVL Propulsion Loads using Multiple 6-Component Strain Gage Balances

Shelton, Duane P., Boeing Defense and Space Group, USA; Lieberg, Steven F., Boeing Defense and Space Group, USA; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 689-710; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A unique approach to measurement of six degree of freedom (DOF) aero-propulsion loads was successfully used at the Boeing Hover Test Facility (BHTF) during hover testing of a full-scale, Advanced Short Take-Off Vertical Landing (ASTOVL) powered model. The force measurement approach was based on the use of three custom designed strain gage balances to measure the six components of force and moment at each of three model attachment points. Details of facility operational features, model/facility interface, balance design & calibration, and force measurement system (FMS) performance issues are discussed. Basic prin-

ciples and attributes of the shear cell flexure (SCF) for balance design and associated design parameters are covered with reference to previous SCF applications of multi-component balance systems at the Boeing Defense & Space Group.
Author
Balance; Calibrating; Design Analysis; Loads (Forces); Powered Models; Propulsion

19990072787 Changsha Inst. of Tech., Dept. of Automatic Control, China
The Technology Research of 15cm x 15cm Magnetic Suspension and Balance System (MSBS)
Li–ming, Yin, Changsha Inst. of Tech., China; Long–hua, Shen, Changsha Inst. of Tech., China; Quan–ling, Yang, Changsha Inst. of Tech., China; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 711-726; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The 15 cm x 15 cm Magnetic Suspension and Balance System (MSBS) is developed in 1995 on the base of research work of MSBS technology since 1987 under the economic support of China CARDC. The mathematic representations of control model and the principle of the system position control are derived, using the method of the dynamic circuit theory in electro- magnetic system for the MSBS. The ”H” PWM power amplifier, the electro-optical position detector and the 5 component calibration model are introduced tentatively in this paper.
Author
Technology Assessment; Balance; Magnetic Suspension; Fabrication; Numerical Analysis; Models

19990072788 NASA Langley Research Center, Hampton, VA USA
Summary Report of the First International Symposium on Strain Gauge Balances and Workshop on AoA/Model Deformation Measurement Techniques
Tripp, John S., NASA Langley Research Center, USA; Tcheng, Ping, NASA Langley Research Center, USA; Burner, Alpheus W., NASA Langley Research Center, USA; Finley, Tom D., NASA Langley Research Center, USA; First International Symposium on Strain Gauge Balances; March 1999, Pt. 2, pp. 727-738; In English; See also 19990072764; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The first International Symposium on Strain Gauge Balances was sponsored under the auspices of the NASA Langley Research Center (LaRC), Hampton, Virginia during October 22-25, 1996. Held at the LaRC Reid Conference Center, the Symposium provided an open international forum for presentation, discussion, and exchange of technical information among wind tunnel test technique specialists and strain gauge balance designers. The Symposium also served to initiate organized professional activities among the participating and relevant international technical communities. The program included a panel discussion, technical paper sessions, tours of local facilities, and vendor exhibits. Over 130 delegates were in attendance from 15 countries. A steering committee was formed to plan a second international balance symposium tentatively scheduled to be hosted in the UK in 1998 or 1999. The Balance Symposium was followed by the half-day Workshop on Angle of Attack and Model Deformation on the afternoon of October 25. The thrust of the Workshop was to assess the state of the art in angle of attack (AoA) and model deformation measurement techniques and to discuss future developments.
Author
Conferences; Strain Gage Balances; Angle of Attack

19990072801 National Lab. for High Energy Physics, Tsukuba, Japan
Application of Bragg-Curve Counters to a Target Multifragmentation Measurement
Ochiishi, H., National Lab. for High Energy Physics, Japan; Ito, H., Kyoto Univ., Japan; Kouda, S., National Lab. for High Energy Physics, Japan; Kimura, K., Nagasaki Inst. of Applied Science, Japan; Murakami, T., Kyoto Univ., Japan; Shimooka, M., Kyoto Univ., Japan; Sugaya, Y., Tokyo Univ. of Agriculture and Technology, Japan; Tanaka, K. H., National Lab. for High Energy Physics, Japan; Toyama, S., Kyoto Univ., Japan; Yamanoi, Y., National Lab. for High Energy Physics, Japan; Yamamoto, K., Kyoto Univ., Japan; Yasuda, K., Kyoto Univ., Japan; Nuclear Instruments and Methods, A; 19950601; 12p; In English
Contract(s)/Grant(s): MOESC-06640423; MOESC-06640389; MISRP-06041115; MISRP-07041103
Report No.(s): KEK-Preprint-95-66; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have constructed Bragg-curve counters (BCCs) to detect the intermediate-mass fragments (IMFs) emitted during target multifragmentation induced by 12- GeV primary protons on Au, Ag targets. An energy resolution of approx. 1.0% and an atomic-number resolution of 2.0% have been achieved, Long-term stability of the output pulse-heights, which was necessary for actual IMF measurements, was realized by employing a continuous gas-flow system with a constant pressure.
Author
Bragg Curve; Counters; Fabrication; Fragments; Mass

19990073630 Research Inst. of National Defence, Div. of Sensor Technology, Linkoeping, Sweden
Users Guide to the Tool MatchIR ***Anvaendarmanual till Verktyget MatchIR***
Karlsson, M.; May 1998; 24p; In Swedish
Report No.(s): PB99-161978; FOA-R-98-00771-408-SE; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

In the project Irmm, a staring mm-wave sensor is under development. The aim is to produce a sensor that contains 8x8 elements. During this development, an investigation has been made of how this sensor can be used in a multi-sensor system, in combination with an IR-camera. The way the simulation is performed has the disadvantage that the radar data and the IR data are obtained at different times, which means that they must be fitted together (synchronized). In order to do this, local correlation between different regions in the IR image sequence is used. This guide describes a tool that has been developed as an aid in this work. The tool utilizes a graphical interface for Matlab 5.1.
NTIS
User Manuals (Computer Programs); Infrared Photography

19990075835 Department of the Navy, Washington, DC USA
Moving Target Indicator With No Blind Speeds
Lewis, Bernard L., Inventor; Feb. 09, 1999; 5p; In English; Supersedes US-Patent-Appl-SN-458006
Patent Info.: Filed 10 Dec. 82,; US-Patent-Appl-SN-458,006; US-Patent-5,870,054
Report No.(s): AD-D019403; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A moving target indicating system wherein a pulse source which generates radiofrequency drive pulses at a predetermined pulse repetition frequency is connected to the inputs of a pair of channels. The first channel includes a phase-dispersive litter having a first phase-slope dispersion characteristic, while the second channel has a phase-dispersive filter having a phase-slope dispersion characteristic which is the negative of that of the first filter. A pulse group comprising the output of the first and the second channels is transmitted periodically as each drive pulse is applied. The pulse repetition frequency is sufficiently low that when transmitted, echos of only one pulse of each group are received at a time. Due to the
DTIC
Frequencies; Moving Target Indicators; Targets; Patents; Radial Velocity

19990075951 Department of the Navy, Washington, DC USA
Monolithic Piezoelectric Accelerometer
Corsaro, Robert D., Inventor; Klunder, Joseph, Inventor; Feb. 09, 1999; 6p; In English; Supersedes US-Patent-Appl-SN-757415, AD-018 312.
Patent Info.: Filed 27 Nov. 96,; US-Patent-Appl-SN-757,415; US-Patent-5,869,762
Report No.(s): AD-D019393; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A monolithic piezoelectric accelerometer of the longitudinal type having a mass element, a piezoelectric accelerometer sensor element and electrodes interconnecting the mass and sensor elements, in which the mass and sensor elements are formed as a monolithic structure. Included is the method for making the monolithic piezoelectric accelerometer.
DTIC
Accelerometers; Piezoelectric Transducers

36
LASERS AND MASERS

Includes parametric amplifiers. For related information see also 76 Solid-State Physics.

19990070738 Osaka Univ., Faculty of Engineering, Osaka, Japan
Spatial and Temporal Behaviours of Laser Pulse Propagating in Resonant Atomic Vapor
Nomaru, Keiji, Osaka Univ., Japan; Chen, Yen–Wei, Osaka Univ., Japan; Izawa, Yasukazu, Osaka Univ., Japan; Nakai, Sadao, Osaka Univ., Japan; Yamanaka, Chiyoe, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2193, pp. 269-276; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We report the experimental results on spatial and temporal behaviours of laser pulse propagating in a resonant atomic medium by making use of samarium vapor. It was shown that the pulse is broken up into several pulses with small propagation velocity

by the coherent interaction of photon with atoms. The propagation velocities and the temporal modulations of the laser pulses are in good agreement between the experiments and the calculations.
Author
Pulsed Lasers; Temporal Distribution; Spatial Distribution; Vapors; Samarium; Electromagnetic Radiation; Wave Propagation

19990070739 Osaka Univ., Faculty of Engineering, Osaka, Japan
Growth and Optical Characterization of Cr(3+): Y(Ga,Al)3(BO3)4 Crystal for New Tunable Laser
Iwai, Makoto, Osaka Univ., Japan; Mori, Yusuke, Osaka Univ., Japan; Sasaki, Takatomo, Osaka Univ., Japan; Nakai, Sadao, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2192, pp. 261-268; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We have grown Cr(3+): YAl3(BO3)4 (Cr(3+):YAB) and Cr(3+):Y(Ga, Al)3(BO3)4 (Cr(3+): YGAB) crystals by TSSG (Top-Seeded Solution Growth) method. We report on the optical characteristics such as absorption and fluorescence spectra, fluorescence lifetimes and calculated emission cross sections of these crystals. These crystals have a broad fluorescence ranging from red to near-IR spectral region and relatively large emission cross section compared with other Cr(3+)-doped materials. These crystals belong to the high-field site with Dq/B approx. equivalent to 2.4 and their vibronic levels are estimated to be 1400 cm(exp -1), so that they can provide four-level systems. Consequently these crystals seem to be suitable for tunable laser-active media. YAB crystal is also well known as an NLO (Non-Linear Optical) crystal, therefore lasing in the phase-matching direction of the crystal will make it possible to obtain a self-frequency doubled UV laser.
Author
Doped Crystals; Optical Properties; Crystal Growth; Laser Materials; Tunable Lasers; Semiconductor Lasers; Lasing

19990070740 Osaka Univ., Faculty of Engineering, Osaka, Japan
Two-Dimensional Thermal- and Mechanical-Stress-Induced Birefringence Measurements in Laser-Diode-Pumped Solid-State Laser Materials
Ohmi, Masato, Osaka Univ., Japan; Akatsuka, Masanori, Osaka Univ., Japan; Yonezawa, Yoshiyuki, Fuji Electric Co. Ltd., Japan; Yamanaka, Masanobu, Osaka Univ., Japan; Izawa, Yasukazu, Osaka Univ., Japan; Nakai, Sudao, Osaka Univ., Japan; Nishida, Yoshio, Osaka Municipal Konohana High School, Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2191, pp. 253-260; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A novel polarimeter is proposed for measuring the two-dimensional(2D) thermal- and mechanical-stress-induced birefringence in laser-diode pumped solid-state laser materials. Using this device, we could measure the direction of principal birefringence axes as well as the phase shift with sign. The 2D thermal- and mechanical-stress-induced birefringence in a laser-diode pumped Nd:YAG rod was successfully measured using the proposed polarimeter. Then we found for the first time an active quarter wave Nd: YAG phase retarder (active wave plate), which had a laser gain of 1.15 at 1064 nm due to 808-nm laser-diode pumping.
Author
Birefringence; Laser Materials; Stress Measurement; Thermal Stresses; Solid State Lasers

19990071319 Michigan Univ., Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI USA
Upconversion-Pumped Cerium Lasers ***Final Report, 1 Feb. 1998 - 31 Jan. 1999***
Rand, Stephen C.; Apr. 29, 1999; 44p; In English
Contract(s)/Grant(s): F49620-98-1-0189
Report No.(s): AD-A364280; UM/EECS-98-1467; AFRL-SR-BL-TR-99-0150; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project investigated the optical emission of new materials doped with Ce(3+) for indications of practical alternatives to conventional excitation of Ce light sources. Two approaches were tried: one was based on Nd(3+) upconversion dynamics in co-doped samples, and the other utilized electron beam pumping of Ce-doped nanopowders. Electron excitation showed exceptional promise for achieving bright emission from powders in which particle sizes averaged less than 50 nm.
DTIC
Ultraviolet Lasers; Cerium; Lasers; Light Emission

19990071327 Stanford Univ., Dept. of Mechanical Engineering, Stanford, CA USA
DURIP 98-99 Visible/Near-IR Optical Parametric Oscillator System for Kinetic Studies of Nonequilibrium Air Plasma ***Final Report, 1 Mar. 1998 - 28 Feb. 1999***
Kruger, Charles H.; Zare, Richard N.; May 31, 1999; 11p; In English
Contract(s)/Grant(s): F49620-98-1-0331; AF Proj. 3484

Report No.(s): AD-A365111; AFRL-SR-BL-TR-99-0152; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The DURIP grant funds of $122,000 were used in conjunction with $14,103 of institutional non-federal cost-sharing funds to purchase a Continuum Optical Parametric Oscillator (OPO) system. This system comprises a Powerlite 8000 Nd:YAG laser system, a DS-1 temperature stabilized second and third harmonic generator and output, a SL-500 injection seeder, and a Sunlite2 visible OPO/Amplifier. In addition, funds from separate sources in the amount of $26,016.98 were used to purchase a FX-1 frequency doubler in order to extend the system's capabilities to the ultraviolet spectral range. The OPO system was ordered on March 25, 1999 and delivered to Stanford University on August 30, 1999. The complete system is paid in full and all funds from the present DURIP grant have been expended.

DTIC

Near Infrared Radiation; Parametric Amplifiers; Nonequilibrium Plasmas; Oscillators

19990071579 Imperial Coll. of Science and Technology, Blackett Lab., London UK

High-Power Diffraction-Limited Diode Lasers Using Self-Adaptive Resonator Design ***Final Report***

Damzen, Michael J.; Jan. 1999; 20p; In English

Contract(s)/Grant(s): F61775-98-W-E014

Report No.(s): AD-A365204; EOARD-SPC-98-4021; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Imperial College of Science, Technology, and Medicine as follows: The contractor will investigate the feasibility of obtaining diffraction limited beam quality from high power semiconductor amplifier devices by incorporating a novel self adaptive resonator design.

DTIC

Cavity Resonators; Power Amplifiers; Semiconductor Lasers

19990076098 Sandia National Labs., Albuquerque, NM USA

Stress Evaluation and Model Validation Using Laser Ultrasonics

Dike, J. J.; Lu, W.; Peng, L. W.; Wang, J. C. F.; Feb. 01, 1999; 14p; In English

Report No.(s): DE00-005981; SAND99-8232; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

Rayleigh surface waves can be used to evaluate surface stresses and through- thickness stress gradients based on acoustoelasticity. Laser based ultrasonic techniques, which generate and detect surface waves, have the advantages of good spatial resolution and remote operation. The techniques have many potential applications. This is the final report of a LDRD project that is the first to exploit the benefits of laser ultrasonics for stress and stress gradient evaluation.

NTIS

Stress Analysis; Lasers; Ultrasonic Radiation; Rayleigh Waves; Stress Distribution

37
MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

19990070428 Newcastle-upon-Tyne Univ., Design Unit, Newcastle, UK

Gear Noise and Vibration Research at National Gear Technology Centre

Rosinski, Jarek, Newcastle-upon-Tyne Univ., UK; Workshop on Helicopter Health and Usage Monitoring Systems; March 1999, Pt. 2, pp. 75-96; In English; See also 19990070423; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

Contents include the following: Gear, gearbox and transmission system design and development for low noise and high strength, gear system dynamic analysis (experimental and theoretical), special measurement and data analysis, gear material surface and bending fatigue strength and heating treatment, gear noise and vibration measurement, and gear manufacture and metrology.

CASI

Transmissions (Machine Elements); Vibration; Bending Fatigue; Noise Measurement; Low Noise; Gears

19990071184 Beijing Inst. of Aeronautics and Astronautics, China

Progress of Cutting and Grinding (With Some Topics in Advanced Manufacture Technology)

Chen, Ding–Chang, Editor, Beijing Univ. of Aeronautics and Astronautics, China; Narutaki, Norihiko, Editor, Hiroshima Univ., Japan; Yamane, Yasuo, Editor, Hiroshima Univ., Japan; Chen, Wu–Yi, Editor, Beijing Univ. of Aeronautics and Astronautics,

China; 1998; 576p; In English; Progress of Cutting and Grinding, 5-9 Oct. 1998, Urumqi and Turpan, China; Sponsored by National Natural Science Foundation of China, China; Meeting sponsored by China Machine Tool and Tool Builders Association, China Society of Aeronautics, China Society of Inertial Technology, Chinese Mechanical Engineering Society and Committee of International Conferencing on Machining Technology; ISBN 7-80003-429-1; Copyright Waived; Avail: CASI; A25, Hardcopy; A04, Microfiche

A mathematical model of lapping paths for the flat lapping processes using Fractal Tool Paths (FTP) has been developed in this paper. Past studies have shown the feasibility of fractal tool paths for machining and automated surface finishing processes. In this paper, the flat lapping process with the FTP is designed to rotate the workpiece by a rotating table and the lap moving with FTP, Experiments were preliminary performed with a prototype automated surface finishing system (ASFS) using a 3-axis CNC machining center installed with a rotary table for flat lapping of workpieces. The distribution of lapping paths is strongly dependent on rotating speed of workpiece and feed rate of lap. Slow workpiece rotating speed (7.8 rpm) and high feed rate (200 mm/min) are recommended to have less overlapping density of lapping paths.

Author

Cutting; Machining; Mathematical Models; Surface Finishing

19990075832 Department of the Navy, Washington, DC USA

Roller Excitation Device

Wiedenheft, John H., III., Inventor; Gray, Charles E., Inventor; Mar. 23, 1999; 10p; In English; Supersedes US-Patent-Appl-SN-976132, AD-D018998.

Patent Info.: Filed 29 Sep. 97,; US-Patent-Appl-SN-976,132; US-Patent-5,884,877

Report No.(s): AD-D019412; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The arrangement is directed to a roller excitation device for frictionally engaging and turning rollers of a roller box assembly. The roller box assembly is of the type that includes a generally U-shaped housing having a partial tube which covers the open end of the housing, and a plurality of rollers captured by the housing. The rollers and partial tube define a space through which a able is received. The arrangement being such that the rollers are adapted to roll upon engaging the cable located in the space defined by the tube and rollers. The roller excitation device includes a body portion fabricated from resilient material and sized for occupying the space defined by the tube and roller and for frictionally engaging the rollers, and means for moving the body portion over the rollers. Preferably, the body portion has an outer surface with a plurality of ribs extending outwardly along the circumference of the body portion. The ribs engage the rollers for causing them to turn upon moving the body portion thereover.

DTIC

Rollers; Fabrication

19990075840 Department of the Navy, Washington, DC USA

Elastomeric Cut-off Valve

Quartarone, James R., Inventor; Quartarone, John J., Inventor; Mar. 09, 1999; 5p; In English; Supersedes US-Patent-Appl-SN-954886

Patent Info.: Filed 09 Oct. 97,; US-Patent-Appl-SN-954,886; US-Patent-5,878,778

Report No.(s): AD-D019398; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The present invention relates generally to valves and more, particularly to a valve for cutting off flow when the pressure differential there across exceeds a predetermined threshold. (2) Description of the Prior Art. Traditional (high or low-pressure) cut-off valves require mechanical or electrical actuation. However the complexity and or cost associated with such cut-off valves can make them impractical from many applications. Further a particular application may not have the space needed for the installation of the valves associated actuation mechanism Finally, since many cut-off valves close and re-open at the same pressure threshold the valve will tend to chatter if the pressure differential there across rapidly fluctuates about the close re-open pressure threshold.

DTIC

Elastomers; Valves; Inventions; Actuators

19990075845 Department of the Navy, Washington, DC USA

Adjustable Bearing System With Selectively Optimized Installational Clearances

Plangetis, Gus F., Inventor; Mar. 23, 1999; 6p; In English; Supersedes US-Patent-Appl-SN-885132

Patent Info.: Filed 30 Jun. 97,; US-Patent-Appl-SN-885,132; US-Patent-5,885,007

Report No.(s): AD-D019365; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The invention pertains to angularly spaced Sector portions of a bushing element attached by its annular flange to a housing, adjustably positions angularly spaced bearing elements and wedge shaped spacers for bearing support of a shaft with desired radial

and axial clearances maintained by fasteners extending into the housing parallel to the shaft axis horn the flanges of the bushing and the bearing elements to accommodate radial adjustment, while fastener studs extending perpendicular to the shaft axis through enlarged holes in all of the elements of the hearing assembly accommodate axial adjustment before attachment of the bearing elements in their adjusted positions to the housing is finalized.
DTIC
Shafts (Machine Elements); Journal Bearings; Antifriction Bearings; Foil Bearings; Bushings

19990075848 NASA Marshall Space Flight Center, Huntsville, AL USA
Effect of Bearing Cleaning on Long Term Bearing Life
Jett, Tim, NASA Marshall Space Flight Center, USA; Thom, R. L., NASA Marshall Space Flight Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 1-13; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

For many years chlorofluorocarbon (CFC) based solvents, such as CFC-113 and 1,1,1, trichloroethane (TCA), were used as bearing cleaning solvents for space mechanism bearings. The 1995 ban on the production of ozone depleting chemicals (ODC) such as CFCs caused a change requiring the use of ODC-free cleaners for precision bearing cleaning. With this change the question arises; what effect if any do these new cleaners have on long term bearing life? The purpose of this study was to evaluate this effect. A one year test using 60 small electrical motors (two bearings per motor) was conducted in a high vacuum environment (2.0 x 10(exp -6) torr) at a temperature of 90 C. Prior to testing the bearings were cleaned with one of four cleaners. These cleaners included two aqueous based cleaners, a CFC based cleaner and supercritical carbon dioxide. Three space compatible greases were tested. After testing, the mass of each lubricated bearing was measured both pre and post test. Along with mass loss measurements a profilometer trace of each bearing was taken to measure post test wear of the bearings. In addition, the bearings were visually examined and analyzed using an optical microscope.
Author
Cleaners; Cleaning; Solvents; Trichloroethylene; Chlorofluorocarbons; Ozone Depletion

38
QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

19990070404 Standard Aero Ltd., Winnipeg, Manitoba Canada
Propeller Barrel Cam Life Extension
Tandon, Kedar, Standard Aero Ltd., Canada; Junkin, Brent, Standard Aero Ltd., Canada; Thomas, Wayne, Standard Aero Ltd., Canada; March 1999; 6p; In English; See also 19990070390; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

Overhaul inspection instructions and acceptance criteria provided by the OEM are sometimes not adequate to assess the suitability of the part for continued service. Propeller barrel cams with helical cam tracks were found to have pitting on the surface, which caused the inspectors to reject them. An engineering analysis of the wear surface using scanning electron microscope and metallographic techniques was performed. Based on this analysis, the inspection data, (including techniques and interpretation) was reevaluated. The careful evaluation of the service degradation damage resulted in an improvement of inspection methods and guidance material. The reject rate of the cams was dramatically reduced and thus their life was safely extended.
Author
Inspection; Microstructure; Cams; Pitting; Wear; Manuals; Maintenance; Equipment Specifications; Specifications

19990070938 NASA Marshall Space Flight Center, Huntsville, AL USA
Exploiting Defect Clustering to Screen Bare Die for Infant Mortality Failure: An Experimental Study
Lakin, David R., II, NASA Marshall Space Flight Center, USA; Singh, Adit D., Auburn Univ., USA; 1999; In English; International Test, 28-30 Sep. 1999, Atlantic City, NJ, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We present the first experimental results to establish that a binning strategy based on defect clustering can be used to screen bare die for early life failures. The data for this study comes from the SEMATECH test methods experiment.
Author
Semiconductors (Materials); Semiconductor Devices; Manufacturing; Defects; Wafers; CMOS

19990071246 Colorado State Univ., Applied Microwave Nondestructive Testing Lab., Fort Collins, CO USA

Microwave Nondestructive Determination of Sand-to-Cement Ratio in Mortar

Bois, K. J., Colorado State Univ., USA; Benally, A., Colorado State Univ., USA; Nowak, P. S., Gonzaga Univ., USA; Zought, R., Colorado State Univ., USA; Research in Nondestructive Evaluation; 1997; ISSN 0934-9847; Volume 9, No. 4, pp. 227-238; In English

Contract(s)/Grant(s): EPRI-WO-8031-09; NSF CMS-95-23264; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Microwave nondestructive testing methods have shown great promise for the inspection of cement-based materials. Previously it has been shown that the magnitude of reflection coefficient from cement paste specimens can be correlated to their water-to-cement (w/c) ratios and more importantly to their compressive strengths. For mortar specimens, the sand-to-cement (s/c) ratio plays an important role in its physical, mechanical, and microwave reflection properties. to determine the w/c ratio and other properties of mortar specimens, one also needs to know its s/c ratio. to illustrate the ability of microwave reflection measurements for this purpose, two sets of four mortar specimens are produced with w/c ratios of 0.50 and 0.60 and with s/c ratios of 1.0, 1.5, 2.0, and 2.5. The microwave reflection coefficients of these specimens are measured using an open-ended rectangular waveguide sensor, in the G- (3.95-5.85 GHz), J- (5.85-8.2 GHz), and X-band (8.2-12.4 GHz) frequency ranges. It is shown that a simple relationship between the standard deviation of the magnitude of the reflection coefficient of mortar and its s/c ratio exists, and a more sensitive relationship exists for higher frequencies (waveguide bands). This approach may be extended to nondestructively determine the aggregate volume content and size distribution in concrete specimens.

Author

Nondestructive Tests; Microwaves; Cements; Sands; Inspection; Mechanical Properties

19990075838 Department of the Navy, Washington, DC USA

System for Determining Size and Location of Defects in Material by Use of Microwave Radiation

Liu, John M., Inventor; Jan. 12, 1999; 8p; In English

Patent Info.: Filed 12 Feb. 97,; US-Patent-Appl-SN-798,683; US-Patent-5,859,535

Report No.(s): AD-D019400; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Microwave radiation emitted from a single antenna is focused on a targeted material from which reflected radiation is received by the same antenna to provide signal measurement data from which detected material defects are calculated by determination of void location and size. Antenna position and orientation is adjusted to obtain the signal measurement data from of the microwave radiation reflection along at least two target incidence paths from the same target location, one of which is normal to said targeted surface of the material and the other oblique thereto at a scattering angle at which the signal radiation intensity is minimized.

DTIC

Microwaves; Patents; Signal Measurement; Radiation Measurement; Position (Location); Defects

39
STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

19990070734 Osaka Univ., Faculty of Engineering, Osaka, Japan

Experimental Study of Steel-to-Concrete End-Plate Connections Under Combined Thrust and Bending

Dunai, Univ, Technical Univ. of Budapest, Hungary; Ohtani, Yasuhiro, Kobe Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2197, pp. 309-320; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Experimental study is completed on the behaviour of steel-to-concrete end-plate connections under combined thrust and bending. Main focus of the research is on the rotational stiffness of the mixed connection. The initial elastic stiffness is analyzed under different constant normal force levels. The interpretation and the definition of rotational stiffness are introduced. The bending deformation of the end-plate - as a dominant aspect of the joint's rigidity - is measured and analyzed. The observed relationship between axial force and rotational stiffness is presented. Features of the ultimate behaviour are determined under increasing cyclic bending moment and constant axial force. The tested connections are classified according to strength and rigidity using the moment-rotation envelope curves.

Author

Bending; Structural Analysis; End Plates; Concretes; Steels

19990070736 Osaka Univ., Faculty of Engineering, Osaka, Japan

Buckling Coefficients of Deck Arches with Continuous Stiffening Girder

Nishimura, Nobuo, Osaka Univ., Japan; Omori, Kunio, Yokogawa Bridge Corp., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2195, pp. 287-293; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper describes an approximate calculation method of the buckling coefficients of deck arches with continuous stiffening girder. The coefficients by this method are compared with those by eigenvalue analysis. This shows that the buckling coefficients by this method are accurate enough for the practical design.

Author

Buckling; Arches; Stiffening; Structural Strain; Structural Analysis

19990071063 Osaka City Univ., Dept. of Civil Engineering, Japan

An Experimental Study on Dynamic Response of Deep Beams by Impact Loading Test

Matsuura, Mikiyoshi, Osaka City Univ., Japan; Sumino, Taichi, Nishimatsu Construction Co. Ltd., Japan; Kobayashi, Harutoshi, Osaka City Univ., Japan; Sonoda, Keiichiro, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 1998; Volume 39, pp. 33-38; In English; See also 19990071060; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The weights-dropping test on four different kinds of specimens was executed to obtain stress wave propagation characteristics. Steel bar as weight and synthetic resin mortar as specimen's material are used in the present experiment. Applied impact load on the specimen is measured from the strain of the dropping steel bar. Strain gauges were attached to some points of specimens, and stress responses were recorded. From these experimental results, the velocity of stress wave is compared with theoretical values. Furthermore, experimental dynamic response curves are compared with results of 2D FEM analyses.

Author

Experimentation; Dynamic Response; Stress Waves; Impact Loads

19990071607 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan

Studies of the Elasto-Plastic Analysis of Reinforced Concrete Walls Subjected to Cyclic Temperature Changes

Asari, Tetsuhiro, Hokkaido Univ., Japan; Obata, Mamoru, Hokkaido Univ., Japan; Kushiyama, Shigeru, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 1-12; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper describes an analytical method which is applicable to two dimensional stress fields. The method is applied to cyclic thermal stress analysis of reinforced concrete walls. Effects of reinforcement ratio and boundary condition of the wall to the analytical results are discussed. The conclusion are as follows: (1) the wall in an outer span has higher probability of cracking caused by temperature change than the wall in inner spans. At the cracked portion of the wall, some of steel reinforcing bars yielded regardless of the amount of reinforcement ratio; and (2) the wall in the center span has many cracks when the temperature decreases, but has no cracks when the temperature increases. When the wall reinforcement ratio is 0.5 % or more, the cracks are minute and not visible, because the stress of the reinforcement is below yield level.

Author

Elastoplasticity; Reinforcement (Structures); Concretes; Walls; Thermal Stresses

19990071783 Kurume Inst. of Tech., Japan

Rectangular Array and Zig-Zag Array of Elliptical Holes in Solids Under Uniaxial Tension

Igawa, Hidenobu, Kurume Inst. of Tech., Japan; Isida, Makoto, Kurume Inst. of Tech., Japan; Bulletin of Kurume Institute of Technology; 1997; ISSN 0389-6897, No. 21, pp. 1-9; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper is concerned with a theoretical analysis of a rectangular array and a zig-zag array of elliptical holes in solids under uniaxial tension. In the analyses, we choose suitable Unit regions, and express Laurent series expansions for the complex potentials in forms satisfying the traction-free conditions along the elliptical hole edges. Then the unknown coefficients in the Laurent series are determined from the boundary conditions at the outer edges of the used unit regions. At this stage, we use a procedure based on element wise resultant forces and displacements in order to get highly accurate results. Numerical results of the maximum stresses represented in dimensionless forms in the whole range of the shapes of the holes including cracks, and the tensile stiffnesses of the solids with the holes, are given for various values of the parameters. The results are fitted to reliable polynomial formulae for convenience of engineering applications.

Author

Numerical Analysis; Rectangles; Arrays; Holes (Mechanics); Ellipticity; Boundary Conditions

19990071784 Kurume Inst. of Tech., Japan

Photoelastic Analysis of Principal Stresses Using Boundary Element Method

Igawa, Hidenobu, Kurume Inst. of Tech., Japan; Hayashi, Yosihiko, Kurume Inst. of Tech., Japan; Hirano, Teizo, Kurume Inst. of Tech., Japan; Bulletin of Kurume Institute of Technology; 1997; ISSN 0389-6897, No. 21, pp. 11-14; In Japanese; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper is concerned with an effective method to obtain the principal stresses throughout the whole interior region of a two dimensionally stressed photoelastic model. We compute the interior distribution of the sum of the principal stresses over the photoelastic model by using the boundary element method based on Laplace's differential equation, and carry out the separation of the principal stresses by combining this sum with the principal stress-difference obtained from the photoelastic stress pattern. This method is a brief and accurate technique to separate the principal stresses.

Author

Photoelastic Analysis; Stress Analysis; Two Dimensional Models

19990076134 Department of the Navy, Washington, DC USA

Continuous Strength Member

Miller, Howard A., Inventor; Dec. 01, 1998; 10p; In English; Supersedes US-Patent-Appl-SN-540827

Patent Info.: Filed 23 May 90,; US-Patent-Appl-SN-540,827; US-Patent-5,844,860

Report No.(s): AD-D019387; No Copyright; Avail: US Patent and Trademark Office, Microfiche

At least one vibration isolation module (VIM) and at least one acoustic sensor module of an elongate array are uniquely accommodated by a continuously extending, hose shaped strength member dimensioned to define a space for noncompressively containing the acoustic sensor module and allow responsive sensing. The strength member has a nonelastic first portion to contain the length of the acoustic sensor module and includes a plurality of longitudinally extending juxtaposed cords. The cords are held in an equidistantly spaced side by side relationship by an appropriate fill weave that assures sufficient flexibility. A coextensive portion of the strength member is fabricated from the plurality of longitudinally continuously extending juxtaposed cords to extend in an exaggerated sine wave configuration throughout the length of the VIM. A plurality of elastic warp bogies are disposed in between the cords and are held in a side by side relationship by substantially the same appropriate fill weave. The elastic warp bogies and sine wave configuration of the cords allow the strength member to be longitudinally stretched as it bears the array's dynamic drag. increased loads can stretch the elastic warp bogies to a maximum length to where the cords carry any additional load. Opposite ends of the coextensive portion of the strength member are secured to the elastic sheath for load sharing with the sheath. Optionally, the VIM could be separate to accommodate existing arrays or other vibration isolation applications.

DTIC

Vibration Isolators; Arrays; Acoustics; Signal Detectors; Fabrication

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GEOSCIENCES (GENERAL)

19990071134 NASA Goddard Space Flight Center, Greenbelt, MD USA

Program for Arctic Regional Climate Assessment (PARCA)

Gogineni, Sivaprasad, Kansas Univ., USA; Thomas, Robert H., EG and G Services, USA; Abdalati, Waleed, Editor, NASA Goddard Space Flight Center, USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999; 104p; In English; Greenland Science and Planning, 5-6 Oct. 1998, Wallops Island, VA, USA; See also 19990071135 through 19990071154; Original contains color illustrations

Report No.(s): NASA/TM-1999-209205; NAS 1.15:209205; Rept-99E01109; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Program for Arctic Regional Climate Assessment (PARCA) is a NASA-sponsored initiative with the prime objective of understanding the mass balance of the Greenland ice sheet. In October 1998, PARCA investigators met to review activities of the previous year, assess the program's progress, and plan future investigations directed at accomplishing that objective. Some exciting results were presented and discussed, including evidence of dramatic thinning of the ice sheet near the southeastern coast. Details of the investigations and many of the accomplishments are given in this report, but major highlights are given in the Executive Summary of the report.

Author

Arctic Regions; Climatology; Climate Models; Climate Change

19990071157 NASA, Washington, DC USA

NASA's Current Earth Science Program

Charles, Leslie Bermann, NASA, USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 9-13; In English; See also 19990071155; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

NASA's Earth science program is a scientific endeavor whose goal is to provide long-term understanding of the Earth as an integrated system of land, water, air and life. A highly developed scientific knowledge of the Earth system is necessary to understand how the environment affects humanity, and how humanity may be affecting the environment. The remote sensing technologies used to gather the global environmental data used in such research also have numerous practical applications. Current applications of remote sensing data demonstrate their practical benefits in areas such as the monitoring of crop conditions and yields, natural disasters and forest fires; hazardous waste clean up; and tracking of vector-borne diseases. The long-term availability of environmental data is essential for the continuity of important research and applications efforts. NASA's Earth observation program has undergone many changes in the recent past.

Author

Earth Observations (From Space); Remote Sensing; Earth Observing System (EOS); EOS Data and Information System; Artificial Satellites; Satellite Observation

19990071178 National Inst. of Standards and Technology, Mathematical and Computational Sciences Div., Gaithersburg, MD USA

Triangulation-Based L1-Fitting of Terrain Surfaces

Bernal, J.; Witzgall, C.; Jun. 1999; 36p; In English

Contract(s)/Grant(s): DARPA/TEC MIPR 97-5039

Report No.(s): PB99-152779; NISTIR-6346; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Given a planar triangulation, the goal is to select elevations at its vertices so that resulting piecewise-linear triangulated surface approximates specified elevations using the L(sub 1)-norm as the primary measure-of-fit. Several suboptimal algorithms relating to that problem have been devised and implemented, and are described here, as part of TIN prototype software for terrain modeling in the context of distributed simulation as well as elevation data editing. L(sub 1)-approximation acts as a median filter and thus provides advantages for 'bare earth' representation. For added flexibility, a 'sign-oriented scaling' scheme has been developed, which generalizes standard norm-based measures-of-fit. L(sub 1)-approximation is either tackled directly or by iterating suitably weighted L(sub 2)-approximations. Numerical experiments are reported.

NTIS

Triangulation; Fitting; Terrain

19990071181 Geological Survey, Water Resources Div., Austin, TX USA

Water Resources Data for Texas, Water Year 1998, Volume 3, Colorado River Basin, Lavaca River Basin, Guadalupe River Basin, Nueces River Basin, Rio Grande Basin, and Intervening CoastaL Basins ***Annual Report, 1 Oct. 1997 - 30 Sep. 1998***

Gandara, S. C.; Gibbons, W. J.; Andrews, F. L.; Barbie, D. L.; Apr. 1999; 520p; In English

Report No.(s): PB99-152688; USGS/WDR/TX-98/3; No Copyright; Avail: CASI; A04, Microfiche; A22, Hardcopy

Volume 3 contains records for water discharge at 126 gaging stations; stage only at 3 gaging stations; stage and contents at 15 lakes and reservoirs; water quality at 62 gaging stations; and data for 35 partial-record stations comprised of 8 flood-hydrograph, 14 low-flow, and 18 crest-stage, and 5 miscellaneous stations. Also included are lists of discontinued surface-water discharge or stage-only stations and discontinued surface-water-quality stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements.

NTIS

Water Resources; Water Quality; Hydrology; Data Acquisition; River Basins

19990071182 Geological Survey, Water Resources Div., Austin, TX USA

Water Resources Data for Texas, Water Year 1998, Volume 2, San Jacinot River Basin, Brazos River Basin, San Bernard River Basin, and Intervening Coastal Basins ***Annual Report, 1 Oct. 1997 - 30 Sep. 1998***

Gandara, S. C.; Gibbons, W. J.; Andrews, F. L.; Barbie, D. L.; Apr. 1999; 344p; In English

Report No.(s): PB99-152670; USGS/WDR/TX-98/2; No Copyright; Avail: CASI; A03, Microfiche; A15, Hardcopy

Volume 2 contains records for water discharge at 74 gaging stations; stage only at 9 gaging stations; stage and contents at 21 lakes and reservoirs; water quality at 32 gaging stations; and data for 73 partial-record stations comprised of 43 flood-hydrograph, 9 low-flow, and 16 crest-stage, and 5 miscellaneous stations. Also included are lists of discontinued surface-water discharge or

state-only stations and discontinued surface-water-quality stations. Additional water data were collected at various sites,not part of the systematic data-collection program, and are published as miscellaneous measurements.
NTIS
Data Acquisition; Water Resources; Water Quality; Hydrology

19990071202 NASA Marshall Space Flight Center, Huntsville, AL USA
Comparison of Continuous-Wave CO2 Lidar Calibration by use of Earth-Surface Targets in Laboratory and Airborne Measurements
Jarzembski, Maurice A., NASA Marshall Space Flight Center, USA; Srivastava, Vandana, Global Hydrology and Climate Center, USA; Applied Optics; Oct. 20, 1998; Volume 37, No. 30, pp. 7120-7127; In English
Contract(s)/Grant(s): NCC8-142; 95-193; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche
Backscatter of several Earth surfaces was characterized in the laboratory as a function of incidence angle with a focused continuous-wave 9.1 micro meter CO2 Doppler lidar for use as possible calibration targets. Some targets showed negligible angular dependence, while others showed a slight increase with decreasing angle. The Earth-surface signal measured over the complex Californian terrain during a 1995 NASA airborne mission compared well with laboratory data. Distributions of the Earth's surface signal shows that the lidar efficiency can be estimated with a fair degree of accuracy, preferably with uniform Earth-surface targets during flight for airborne or space-based lidar.
Author
Airborne Equipment; Backscattering; Calibrating; Earth Surface; Optical Radar; Signal to Noise Ratios

19990071657 Geological Survey, Water Resources Div., Lemoyne, PA USA
Water Resources Data for Pennsylvania, Water Year 1998, Volume 1, Delaware River Basin ***Annual Report, 1 Oct. 1997 - 30 Sep. 1998***
Durlin, R. R.; Schaffstall, W. P.; Jun. 1999; 434p; In English
Report No.(s): PB99-158271; USGS/WDR/PA-98/1; No Copyright; Avail: CASI; A04, Microfiche; A19, Hardcopy
This report, Volume 1 contains (1) discharge records for 76 continuous-record streamflow-gaging stations, 5 partial-record stations and 16 special study and miscellaneous streamflow sites; (2) Elevation and contents records for 14 lakes and reservoirs; (3) water-quality records for 23 gaging stations and 44 ungaged streamsites; and (4) water-level records for 38 network observation wells; and (5) water-quality analyses of groundwater from 5 special-study ground-water wells. Additional water data collected at various sites not involved in the systematic data-collect program are also presented.
NTIS
Water Resources; Water Quality; Hydrology; Data Acquisition; Delaware River Basin (US)

19990072344 California Univ., Pacific Earthquake Engineering Research Center, Berkeley, CA USA
Task 3: Characterization of Site Response General Site Categories ***Final Report***
Rodriguez–Marek, A.; Bray, J. D.; Abrahamson, N.; Feb. 1999; 152p; In English
Report No.(s): PB99-157687; PEER-1999/03; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy
Seismic site response and the amplification of ground motions are significantly affected by the combined effect of the dynamic stiffness of the soils and the depth of the soil. This report presents a geotechnically based site classification system that includes a measure of the dynamic stiffness of the site and a measure of the depth of the deposit as primary parameters. This site classification system is used to analyze the ground motion data from the Northridge and Loma Prieta earthquakes. Period-dependent and intensity-dependent spectral amplification factors for site conditions are presented.
NTIS
Sites; Seismology; Characterization

19990074930 Geological Survey, Water Resources Div., Montgomery, AL USA
Water Resources Data for Alabama, Water Year 1998 ***Annual Report, 1 Oct. 1997 - 30 Sep. 1998***
Pearman, J. L.; Stricklin, V. E.; Psinakis, W. L.; Jul. 1999; 462p; In English
Report No.(s): PB99-163925; USGS/WDR/AL-98/1; No Copyright; Avail: CASI; A04, Microfiche; A20, Hardcopy
This report includes records on both surface and ground water in the State. Specifically, it contains: (1) discharge records for 111 streamflow-gaging stations, for 40 partial-record or miscellaneous streamflow stations; (2) stage and content records for 14 lakes and reservoirs and stage or elevation at 32 stations; (3) water-quality records for 11 streamflow-gaging stations, 1 lake station, for 30 ungaged streamsites, and for 1 precipitation station; (4) water temperature and specific conductance at 14 surface-water stations; (5) dissolved oxygen at 9 stations; (6) sediment data at 10 stations; and (7) water-level records at 2 recording

observation wells. Also included are lists of active and discontinued continuous-record surface-water discharge stations, continuous-record surface-water stage stations, continous-record surface-water-quality stations, and partial-record and miscellaneous surface-water-quality stations.
NTIS
Water Resources; Data Bases; Surface Water; Ground Water; Hydrology; Water Quality

19990074936 Geological Survey, Idaho Falls, ID USA
Chlorine-36 in Water, Snow, and Mid-Latitude Glacial Ice of North America: Meteoric and Weapons-Tests Production in the Vicinity of the Idaho National Engineering and Environmental Laboratory, Idaho
Cecil, L. D.; Green, J. R.; Vogt, S.; Frape, S. K.; Davis, S. N.; 1999; 38p; In English
Report No.(s): PB99-162554; USGS/WRI-99-4037; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Most CL-36 produced in the hydrogeologic environment originates from cosmic radiation interacting with atmospheric gases. Additionally, large amounts of CL-36, orders of magnitude larger than naturally-produced inventories, have been released to the environment during nuclear-weapons testing, nuclear-reactor operations, and nuclear-waste processing. Releases of CL-36 representative of disposal practices in the nuclear industry have been documented in the hydrogeologic environment at the INEEL. to better determine the inventories of CL-36 at the INEEL, a total of 64 ground- and surface-water, snow, and glacial-ice and -run-off samples were analyzed to quantify inputs from meteoric sources and fallout from nuclear-weapons tests. These samples were collected at and near the INEEL in southeastern Idaho and western Wyoming.
NTIS
Water Resources; Chlorine; Snow; Ground Water; Nuclear Weapons; Ice; Temperate Regions; Surface Water

19990075051 Forest Service, Radnor, PA USA
Geologic and Tributary Influences on the Chemistry of a Headwater Stream ***Final Report***
Wooten, A. C.; Preer, J.; Edwards, P. J.; Jul. 21, 1999; 18p; In English
Report No.(s): PB99-165094; FSRP-NE-708; NEFES/99-7; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Water samples were collected weekly from June 12 to August 14, 1995, from Big Spring Run (BSR) in West Virginia. BSR originates in Big Spring Cave, where three stream samples were collected. In addition, 18 BSR sites were sampled down-stream from the cave, three from its tributaries, and one above and below the stream's confluence with Elklick Run. Along its length (653 m), the geology is Greebrier limestone in the headwaters, Pocono sandstone in the midsection and Hampshire sandstone and shale in the downstream section. As a result, water chemistry was strongly influenced by biogeochemical and hydrologic processes.
NTIS
Tributaries; Geology; Streams; Water; Biogeochemistry; Hydrology

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.

19990070752 Smith System Engineering Ltd., Guildford, UK
CEOS Analysis Group: A Report to the 1997 CEOS Plenary on the activities of the Analysis Group ***Annual Report, 1996-1997***
October 1997; 78p; In English; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Since its formation in November 1996, the AG has focused on the 6 prototype projects he Strategic Implementation Team (SIT)- The task of the AG is to supply initiated by CEOS Participants and the SIT with an analysis of the extent to which existing and planned missions are meeting the current set of defined user requirements. The AG's work has been integrated with Affiliates' plans for similar analyses. The AG has also provided a useful forum for the projects to take forward their discussions. The AG has adopted an analysis technique that is based upon the content and structure of the CEOS database. In order to "interrogate" the database in an objective manner, the AG has further developed an existing software tool, already adopted by a number of CEOS Affiliates. The tool, which is intended to highlight critical areas for more detailed analysis, takes users' requirements and statements of provision from the database and carries out a comparative, quantitative analysis of the degree to which users' needs for space-based information are met. The AG's report is intended to assist the SIT in developing further and implementing the space

component of an overall IGOS - as well as investigating, with relevant partners, the practical, political, and programmatic mechanisms to act upon recommendations regarding correction of gaps/overlaps in observing programmes.
Author
Quantitative Analysis; Ozone; Chemical Analysis

19990070942 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Map Algebra and Its Application in Remote Sensing and Geoprocessing ***Algebra de Mapas e Suas Aplicacoes em Sensoriamento Remoto e Geoprocessamento***
Barbosa, Claudio Clemente Faria, Instituto Nacional de Pesquisas Espacias, Brazil; 1999; 180p; In Portuguese
Report No.(s): INPE-7115-TDI/667; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The term ”Map Algebra” is used in the Geoprocessing and Remote Sensing literature to denote the set of operators that handle geographic fields (images, thematic maps and numerical terrain models). This work analyzes the different questions involved in the conception, implementation and use of the operators from Map Algebra. In the conceptual analysis, this work presents a consistent theoretical vision of the problem, by analyzing the definition of these operators and by indicating the alternatives of format conversion that are required to implement each operator. The operators were implemented under the environment of the command language of the SPRING system (LEGAL). to test and validate the implemented operators, a concrete, important application was considered (Ecological and Economical Zoning of Legal Amazon). Starting with a methodological plan, which aims to estimate the degree of stability of homogeneous units of scenery, an application in LEGAL was developed to automate such plan, using the operators developed in this work. The great coherency between the results achieved by this technique and those previously produced (with the use of visual interpretation) has shown the potential of Map Algebra as a supporting tool for studies in Remote Sensing and Geoprocessing.
Author
Algebra; Remote Sensing; Mathematical Models; Thematic Mapping

19990071137 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Ice Flow in the North East Greenland Ice Stream
Joughin, Ian, Jet Propulsion Lab., California Inst. of Tech., USA; Kwok, Ron, Jet Propulsion Lab., California Inst. of Tech., USA; Fahnestock, M., Maryland Univ., USA; MacAyeal, Doug, Chicago Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 16-19; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Early observations with ERS-1 SAR image data revealed a large ice stream in North East Greenland (Fahnestock 1993). The ice stream has a number of the characteristics of the more closely studied ice streams in Antarctica, including its large size and gross geometry. The onset of rapid flow close to the ice divide and the evolution of its flow pattern, however, make this ice stream unique. These features can be seen in the balance velocities for the ice stream (Joughin 1997) and its outlets. The ice stream is identifiable for more than 700 km, making it much longer than any other flow feature in Greenland. Our research goals are to gain a greater understanding of the ice flow in the northeast Greenland ice stream and its outlet glaciers in order to assess their impact on the past, present, and future mass balance of the ice sheet. We will accomplish these goals using a combination of remotely sensed data and ice sheet models. We are using satellite radar interferometry data to produce a complete maps of velocity and topography over the entire ice stream. We are in the process of developing methods to use these data in conjunction with existing ice sheet models similar to those that have been used to improve understanding of the mechanics of flow in Antarctic ice streams.
Author
Antarctic Regions; Land Ice; Glaciers; Climatology

19990071139 NASA Wallops Flight Facility, Wallops Island, VA USA
Airborne Resurveys of the Southern Greenland Ice Sheet
Krabill, William B., NASA Wallops Flight Facility, USA; Frederick, Earl, EG and G Services, USA; Manizade, Serdar, EG and G Services, USA; Martin, Chreston, EG and G Services, USA; Sonntag, John, EG and G Services, USA; Swift, Robert, EG and G Services, USA; Thomas, Robert, EG and G Services, USA; Wright, Wayne, EG and G Services, USA; Yungel, Jim, EG and G Services, USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 22-24; In English; See also 19990071134; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Airborne laser-altimeter flight lines from 1993 over southern parts of the ice sheet were resurveyed with almost complete repeat coverage. In 1993 and 1994, NASA surveyed the entire Greenland ice sheet by airborne laser altimeter, obtaining surface-elevation profiles with root mean square (rms) accuracies of 10 cm or better (Krabill 1995) along flight lines that crossed all the major catchment basins. In 1998, the ten flight lines flown in 1993 in the south of Greenland were resurveyed with about 99%

repeat coverage; flight lines in the north will be resurveyed in 1999. Additional flights in 1998 were over glaciers, identified by E. Rignot, where existing SAR data give information on ice motion.
Derived from text
Land Ice; Glaciers; Climatology; Climate Models

19990071140 Kansas Univ., Lawrence, KS USA
Focused SAR Processing of Coherent Depth Sounder Data and Results From 1998 NGRIP Surface Experiment
Legarsky, J., Kansas Univ., USA; Gogineni, S. P., Kansas Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 25-31; In English; See also 19990071134; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

We have been performing airborne ice-thickness measurements using a coherent radar depth sounder [Chuah, 1997a; Chuah, 1997b] as part of the NASA PARCA program. The radar uses complementary Surface Acoustic Wave (SAW) devices for pulse expansion and compression. The system operates as an unfocussed SAR. We have used this system to collect a large volume of data over the last five years, obtaining clear echoes from the bottom as well as from layers to a depth of about 2.5 km over the new European deep drill site and several outlet glaciers.
Author
Land Ice; Glaciers; Ice; Thickness

19990071141 Kansas Univ., Lawrence, KS USA
Airborne Ice-Thickness Measurement: Status Report and Future Work
Akins, Torry, Kansas Univ., USA; Gogineni, Sivaprasad, Kansas Univ., USA; Kanagaratnam, Pannirselvam, Kansas Univ., USA; Legarsky, Justin, Kansas Univ., USA; Wong, Anthony, Kansas Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 32-34; In English; See also 19990071134; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The University of Kansas has been participating in NASA's airborne remote sensing program for performing ice-thickness measurements using a coherent radar depth sounder. This depth sounder is capable of measuring ice thickness up to 4000 m in the colder ice of northern Greenland and lesser thickness in temperate ice. A large volume of data has been collected with this system over the past six years. Many improvements have been made to the depth sounder's transmitter and receiver since its initial operation in 1993. The Next-Generation Coherent Radar Depth Sounder (NG-CORDS) is a compact version of the depth sounder that contains many of these improvements.
Derived from text
Land Ice; Glaciers; Thickness

19990071142 Kansas Univ., Lawrence, KS USA
High-Resolution Monitoring of Internal Layers at NGRIP
Kanagaratnam, Pannirselvam, Kansas Univ., USA; Gogineni, Sivaprasad, Kansas Univ., USA; Legarsky, Justin, Kansas Univ., USA; Akins, Torry, Kansas Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 35-36; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

One of the major goals of NASA's Office of Earth Science Polar Program is to determine the mass balance of the Greenland and Antarctic ice sheets. A key variable in assessing the mass balance of an ice sheet is accumulation rate. Currently, accumulation rate is determined from ice cores and pits. These data are sparse and there are large uncertainties in existing accumulation rate maps derived from sparely distributed ice cores and pits. There is an urgent need for developing remote sensing techniques for determining accumulation rate. We developed an ultra wideband Frequency Modulated-Continuous Wave (FM-CW) radar system for determining the accumulation rate. The radar system operates over the frequency range from 100 to 2000 MHz, for imaging the top 200 to 300 meters of ice with high resolution using both echo amplitude and phase information. We performed shallow radar sounding experiments at the North Greenland Icecore Project (NGRIP) site during June and July of 1998. Preliminary results from our experiments are presented here.
Author
Antarctic Regions; Climatology; Land Ice; Glaciers

19990071143 Ohio State Univ., Byrd Polar Research Center, Columbus, OH USA
Ultra Wide Band Ground-Based Measurements
Baumgartner, Francois, Ohio State Univ., USA; Jezek, Ken, Ohio State Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 37; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Micro-

fiche; Abstract Only; Abstract Only

Radar remote sensing is an important and widely used tool for studying long term changes and seasonal dynamics of the Greenland Ice sheet. Still, there is a limited understanding of the relationship between regionally varying glaciological properties of firn conditions categorized across Greenland as diagenetic glacier facies. We present results from the dry-snow zone which demonstrate the ability to estimate accumulation rate from SAR backscatter. To investigate this relationship we compared co-registered backscatter and mean-annual accumulation rate data over the summit area, where accumulation is well constrained, and also through a large extent of the remaining dry-snow zone where accumulation is poorly constrained. In the summit area the C-band backscatter and mean-annual accumulation rate data for all four transects show that the backscatter increases as the accumulation rate decreases. This relationship extends many hundreds of kilometers throughout the dry snow zone, especially where the accumulation is low. The backscatter is less sensitive and the relationship appears to break-down at the higher accumulation rates. However, the results from the summit area indicate that at least the initial loss of sensitivity may result from the coarse resolution of accumulation data. The most probable mechanisms relating accumulation rate to backscatter in the dry snow zone are 1) volume scatter from the increase in grain size with depth as accumulation rate decreases, and 2) scattering from buried annual layers and depth hoar mechanisms could account for the decreased sensitivity with high accumulation.
Author
Glaciology; Glaciers; Land Ice

19990071144 EG and G Services, Wallops Island, VA USA
Mass Balance of the North and East Side of the Ice Sheet
Csatho, Bea, Ohio State Univ., USA; Thomas, Robert, EG and G Services, USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 38-41; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

The major goal of this work was to estimate the mass balance of the ice sheet lying within the traverse, by comparing total ice discharge with upstream snow accumulation. Last year, we presented results from part of the western side of the ice sheet and, over the past year, we have analyzed data from the north and east portions of the ice sheet, which we present here. Estimates of ice discharge require measurements of ice thickness from the University of Kansas group, and the 1997 measurements were not successful over portions of the stake traverse in the south and southwest which lie over ice that is warm and deep. In 1998, improvements in the U Kansas radar resulted in the first successful measurements of ice thickness over this entire region, but data processing will not be complete in time for us to fill the gaps in our mass-balance calculations for this report.
Derived from text
Land Ice; Glaciers; Mass Distribution; Thickness

19990071149 NASA Goddard Space Flight Center, Greenbelt, MD USA
Interdisciplinary Determination of Ice Sheet Accumulation Patterns: Combined Atmospheric Modeling and Field and Remote Sensing Studies
Shuman, C. A., Maryland Univ., USA; Bindschadler, R. A., NASA Goddard Space Flight Center, USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 60-62; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

This research is focusing on two related areas that are fundamental to the NASA PARCA (Program for Arctic Regional Climate Assessment) program. The primary research area is the determination of the amount, rate, and timing of accumulation at distributed sites in the dry snow zone of Greenland and evaluation of these results in light of accumulation modeling results. The secondary research area is the calibration of the isotope ”thermometer” at these ice sheet sites as well as the determination of long-term temperature trends in Greenland.
Author
Land Ice; Snow; Atmospheric Models; Climate Models; Climate Change; Climatology; Arctic Regions

19990071151 NASA Goddard Space Flight Center, Greenbelt, MD USA
Interpreting Aircraft-Derived Ice Sheet Elevation Change Using Climate Station Data
Abdalati, Waleed, NASA Goddard Space Flight Center, USA; Box, Jason, Colorado Univ., USA; Steffen, Konrad, Colorado Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 71-73; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

This year repeat elevation surveys in the southern half of Greenland were made using the Airborne Topographic Mapper (ATM). The intent of these surveys is to compare present elevations to those measured in 1993 and determine the magnitude and spatial distributions of thickening and thinning rates. In order to effectively interpret any observed changes, it is important to understand the

processes that affect these changes. Moreover, because the surveys are made over a brief period (2-4 weeks) during the spring or summer, it is also important to understand the effects of seasonal and interannual elevation variability, in relation to the timing of these surveys. Toward that end we are examining data from weather stations along the coast of Greenland along with data from GC-Net automatic weather stations (AWS's) on the ice sheet. The objectives are to assess: a) the importance of the timing of the flights in relation to natural processes that affect surface heights, namely accumulation and melt, and b) the temperature characteristics of the region in the five years that separated the two sets of surveys (1993-1998), in relation to the past 19 years.
Derived from text
Land Ice; Glaciers; Glaciology; Topography; Ice Mapping

19990071156 NASA, Washington, DC USA
Remote Sensing Education and Development Countries: Multilateral Efforts through the Committee on Earth Observation Satellites (CEOS)
Charles, Leslie Bermann, NASA, USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 1-7; In English; See also 19990071155; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The Committee on Earth Observation Satellites (CEOS) is an international organization which coordinates space-based Earth observations world wide. Created in 1984, CEOS now comprises 38 national space agencies, regional organizations and international space-related and research groups. The aim of CEOS is to achieve international coordination in the planning of satellite missions for Earth observation and to maximize the utilization of data from these missions world-wide. With regard to developing countries, the fundamental aim of CEOS is to encourage the creation and maintenance of indigenous capability that is integrated into the local decision-making process, thereby enabling developing countries to obtain the maximum benefit from Earth observation. Obtaining adequate access to remote sensing information is difficult for developing countries and students and teachers alike. High unit data prices, the specialized nature of the technology , difficulty in locating specific data, complexities of Copyright provisions, the emphasis on "leading edge" technology and research, and the lack of training materials relating to readily understood application are frequently noted obstacles. CEOS has developed an education CD-ROM which is aimed at increasing the integration of space-based data into school curricula, meeting the heretofore unsatisfied needs of developing countries for information about Earth observation application, data sources and future plans; and raising awareness around the world of the value of Earth observation data from space. The CD-ROM is designed to be used with an Internet web browser, increasing the information available to the user, but it can also be used on a stand-alone machine. It contains suggested lesson plans and additional resources for educators and users in developing countries.
Author
Artificial Satellites; Earth Observations (From Space); Satellite Observation; Remote Sensing; Developing Nations; Technology Transfer

19990071158 NASA, Washington, DC USA
Toward the Development of an Integrated Global Observing Strategy
Charles, Leslie Bermann, NASA, USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 15-17; In English; See also 19990071155; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

In the current environment of stagnant or shrinking budgets for space research and exploration, nations can no longer afford to develop costly systems in a vacuum. Greater coordination of existing and planned systems, both among space agencies and between the space agencies and user communities, will enable the maximization of global investments in all areas of space-related research. In this manner, a group of space agencies has embarked on an initiative to link their activities in Earth observation with complementary observation programs. The goal of this initiative is to develop a comprehensive strategy for enhanced levels of support to scientific, operational and research communities. The space agencies, through the Committee on Earth Observation Satellites (CEOS), have embraced the concept of an Integrated Global Observing Strategy (IGOS), primarily in fulfillment of their own set of objectives and to derive greater benefit from both operating and planned Earth observing systems. Through working together, CEOS agencies are in a position to plan their Earth observation projects with the minimum of unnecessary overlap and to devise joint strategies for addressing serious gaps in their observation capabilities. Ultimately, an IGOS should be the joint product of all groups involved in the collection and analysis of both space-based and in-situ data. CEOS is actively seeking IGOS - related partnerships with the Global Climate, Global Ocean and Global Terrestrial Observing Systems, their intergovernmental Sponsors, the International Group of Funding Agencies for Global Change Research, and other scientific and user organizations including the International Geosphere-Biosphere Programme and the World Climate Research Programme.
Author
Artificial Satellites; Earth Observations (From Space); Earth Observing System (EOS); International Geosphere-Biosphere Program; Biosphere; Lithosphere

19990071168 Stafford Group, Arlington, VA USA

Expanding Global Access to Civilian and Commercial Remote Sensing Systems and Data: Implications and Policy Issues

Tahu, G. J., Stafford Group, USA; Baker, J. C., George Washington Univ., USA; OConnell, K. M., RAND Corp., USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 89-99; In English; See also 19990071155; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

Current and planned developments in the field of civilian and commercial satellite imagery promise a major expansion in international accessibility to remote sensing data and technologies. This paper addresses the implications of the expanding global access to land remote sensing data and their derived products. While atmospheric, meteorological, and oceanographic data is also widely available at cost or free of charge, it is land remote sensing--specifically the Unique systems with high-resolution and frequent revisit time--that are of primary concern for international and regional security issue. Military and intelligence satellites are not addressed in this discussion of expansion due to their inherently controlled access, unless such systems also provide commercially available imagery or products (as is the case with some Russian systems).

Author

Remote Sensing; Satellite Imagery; Image Analysis; Imaging Techniques

19990071651 Minerals Management Service, Washington, DC USA

Minerals Management Service: Annual Performance Plan for Fiscal Year 1999

1999; 21p; In English

Report No.(s): PB99-156341; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The mission is to manage the mineral resources on the Outer Continental Shelf in an environmentally sound and safe manner and to timely collect, verify, and distribute mineral revenues from Federal and Indian lands. The Minerals Management Service (MMS) manages the Nation's natural gas, oil and other mineral resources on the Outer Continental Shelf (OCS), and collects, accounts for, and disburses revenues from offshore federal mineral leases and from onshore mineral leases on federal and Indian lands.

NTIS

Mineral Deposits; Marine Resources; Management Planning

19990071807 NASA Marshall Space Flight Center, Huntsville, AL USA

Environmental and Archaeological Research in the Peten, Guatemala

Sever, Thomas L., NASA Marshall Space Flight Center, USA; 1999; 1p; In English, 3 Mar. 1999, Chicago, IL, USA; Sponsored by Society of American Archaeology; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The Peten, Northern Guatemala, was once inhabited by a population of several million Maya before their collapse in the 9th century A.D.. The seventh and eight centuries were a time of crowning glory four millions of Maya; by 930 A.D. only a few scattered houses remained, testifying to the greatest disaster in human history. What is known is that at the time of their collapse the Maya had cut down most of their trees. After centuries of regeneration the Peten now represent the largest remaining tropical forest in Central America but is experiencing rapid deforestation in the wake of an invasion of settlers. The successful adaptive techniques of the indigenous population are being abandoned in favor of the destructive techniques of monoculture and cattle raising. Remote sensing and Geographic Information System (GIS) analysis are being used to address issues in Maya archeology as well as monitor the effects of increasing deforestation in the area today. One thousand years ago the forests of the Peten were nearly destroyed by the ancient Maya who after centuries of successful adaptation finally overused their resources. Current inhabitants are threatening to do the same thing today in a shorter time period with a lesser population. Through the use of remote sensing/GIS analysis we are attempting to answer questions about the past in order to protect the resources of the future.

Author

Archaeology; Deforestation

19990072353 Smithsonian Astrophysical Observatory, Cambridge, MA USA

AXAF/Chandra Capabilities

Markevitch, M., Smithsonian Astrophysical Observatory, USA; 1999; 1p; In English; 4th; Heating and Acceleration in the Universe, 16-20 Mar. 1999, Tokyo, Japan; Sponsored by ASCA

Contract(s)/Grant(s): NAS-39073; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

I will show some examples of what can be done with AXAF/Chandra, whose mirror has a subarcsecond angular resolution and whose detectors include Charge-Coupled Devices (CCDs) and microchannel plates with available high spectral resolution gratings.
Author
X Ray Telescopes; X Ray Astronomy

19990073343 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
Estimates of Flood-Prone Regions with A Geomorphological Analysis from LANDSAT Images ***Estimasi Daerah Rentan Banjir Dengan Analisis Geomorfologi Dari Citra LANDSAT***
Asriningrum, Wikanti, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; LAPAN Supplementary Issue; July 1998; ISSN 0126-9754; Volume 22, No. 56, pp. 13-22; In Malay-Indonesian; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Flood hazards which cause the biggest damage can be estimated its distribution area. Geomorphology analysis using LANDSAT imageries is supposed to estimate flood susceptibility area in Jakarta-Bogor-Tangerang-Bekasi. For that purpose classification of landform unit is needed. LANDSAT-TM data supported by geology and topography map were used. Landform classification by Voskuil was used to determine landform units, based on geomorphologic aspects. The results show that detail land-form classification can describe flood susceptibility on each landform units. Further study for combining the results and others parameter is also suggested to get better identification.
Author
Satellite Imagery; LANDSAT Satellites; Floods; Geomorphology

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

19990070733 Osaka Univ., Faculty of Engineering, Osaka, Japan
Practical Use of Unutilized Energy on Man-Made Islands
Muraoka, Kohji, Osaka Univ., Japan; Nishimura, Yasuyuki, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2204, pp. 385-400; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Urban unutilized energy resources are arranged and their available energy is estimated on the model man-made islands, Port Island and Rokko Island located off the shore of Kobe City. In addition, monthly net possible supply of two types of energy, heating and cooling energy, is evaluated from the balance between the available energy, and the domestic and commercial heat demand. Consequently the conserved energy is assessed. The result shows that the available energy is much larger than the heat demand and its practical use can contribute to the energy conservation. However, there are some other difficulties that this paper could not discuss such problems as the selection of heat sources, the conveyance system of heat, and the construction of new infrastructure fitting in with the eco-city in future.
Author
Energy Technology; Energy Sources; Residential Energy

19990071163 NASA Glenn Research Center, Cleveland, OH USA
A Space Testbed for Photovoltaics
Landis, Geoffrey A., Ohio Aerospace Inst., USA; Bailey, Sheila G., NASA Glenn Research Center, USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 49-51; In English; See also 19990071155; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Ohio Aerospace Institute and the NASA Lewis Research Center are designing and building a solar-cell calibration facility, the Photovoltaic Engineering Testbed (PET) to fly on the International Space Station to test advanced solar cell types in the space environment. A wide variety of advanced solar cell types have become available in the last decade. Some of these solar cells offer more than twice the power per unit area of the silicon cells used for the space station power system. They also offer the possibilities of lower cost, lighter weight, and longer lifetime. The purpose of the PET facility is to reduce the cost of validating new

technologies and bringing them to spaceflight readiness. The facility will be used for three primary functions: calibration, measurement, and qualification. It is scheduled to be launched in June of 2002.
Author
Photovoltaic Conversion; Solar Cells; Space Station Power Supplies; Cost Reduction; Design Analysis

19990074948 Cratech, Inc., Tahoka, TX USA
Small Scale Biomass Fueled Gas Turbine Power Plant, *Feb. 1992 - Oct. 1997*
Purvis, C. R.; Craig, J. D.; 1998; 10p; In English; Bioenergy 1998, 4-8 Oct. 1998, Madison, WI, USA
Report No.(s): PB99-126450; EPA/600/A-98/143; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

The paper discusses a new-generation, small-scale (is less than 20 Mwe) biomass-fueled power plant that is being developed based on a gas turbine (Brayton cycle) prime mover. Such power plants are expected to increase the efficiency and lower the cost of generating power from fuels such as wood. The new power plants are also expected to economically utilize annual plant growth material (e.g., straw, grass, rice hulls, animal manure, cotton gin trash, and nut shells) that are not normally considered as fuel for power plants. The paper summarizes the new power generation concept with emphasis on the engineering challenges presented by the gas turbine component.
NTIS
Biomass; Gas Turbines; Fuels

19990075980 Los Alamos National Lab., NM USA
Direct methanol fuel cells: Developments for portable power and for potential transportation applications
Ren, X.; Thomas, S. C.; Zelenay, P.; Gottesfeld, S.; Dec. 31, 1998; 4p; In English; 1998 Fuel Cell, 1998, Washington, DC, USA; Sponsored by Department of Energy, USA
Report No.(s): DE99-002550; LA-UR-98-3638; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

The authors describe here results of recent efforts at Los Alamos National Laboratory (LANL), devoted to potential application of Direct Methanol Fuel Cells (DMFCs) as (1) portable power sources at the 50 W level, and (2) primary power sources for electric vehicles. In general, DMFC R and D efforts focus on further improvements in anode catalytic activity, fuel utilization (as related to methanol crossover) and air cathode performance in the presence of the presence of the significant flux of aqueous methanol from anode to cathode. There are significant differences between technical parameters and targets for the two different DMFC applications, which the authors have addressed. They include the lower cell temperature (about 60 C) preferred in portable power vs. operation around 100 C as target temperature for transportation applications, and the much stronger concern for cost of catalyst and any other stack materials in DMFCs developed for potential transportation applications. Most, if not all, recent DMFC work for either portable power or potential transportation applications has strongly focused on cells with polymeric (primarily PFSA) membrane electrolytes. In work at LANL, thin film catalysts bonded to the membrane, e.g., by the decal method, provided best results in terms of catalyst utilization and overall cell performance. In most tests, the single DMFC hardware consisted of uncatalyzed carbon-cloth gas-diffusion similar to hardware employed in work with hydrogen/air PEFCs. However, the machined graphite hardware has recently been replaced by alternative, non- machined flow-field/bipolar plates, which enables effective air and aqueous methanol solution distribution along an active area of 50 cm(sup 2), at a pitch per cell of 2 mm.
NTIS
Fabrication; Fuel Cells; Methyl Alcohol; Portable Equipment; Electric Power Supplies; Electric Motor Vehicles

19990076102 National Renewable Energy Lab., Golden, CO USA
Approach for Designing Thermal Management Systems for Electric and Hybrid Vehicle Battery Packs
Ahmad A. Pesaran,; Matthew Keyser,; Steve Burch,; Jan. 01, 1999; 38p; In English; 4th, 24-27 May 1999, London, UK; Sponsored by Department of Energy, USA
Report No.(s): DE00-003530; NREL/CP-540-25992; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

If battery packs for electric vehicles (EVs) and hybrid electric vehicles (HEVs) are to operate effectively in all climates, thermal management of the packs is essential. In this paper, we review a systematic approach for designing and evaluating battery pack thermal management systems. A thermal management system using air as the heat transfer medium is less complicated than a system using liquid cooling/heating. Generally, for parallel HEVs, an air thermal management system is adequate, whereas for EVs and series HEVs, liquid-based systems may be required for optimum thermal performance.
NTIS
Management Systems; Design Analysis; Electric Batteries; Optimization

45
ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

19990070922 NASA Langley Research Center, Hampton, VA USA
Nonmethane Hydrocarbon Measurements on the North Atlantic Flight Corridor During SONEX
Simpson, I. J., California Univ., USA; Sive, B. C., California Univ., USA; Blake, D. R., California Univ., USA; Blake, N. J., California Univ., USA; Chen, T.–Y., California Univ., USA; Lopez, J. P., California Univ., USA; Sachse, G. W., NASA Langley Research Center, USA; Vay, S. A., NASA Langley Research Center, USA; Fuelberg, H. E., Florida State Univ., USA; Kondo, Y., Nagoya Univ., Japan; [1999]; 27p; In English
Contract(s)/Grant(s): NAG2-1102; No Copyright; Avail: Issuing Activity, Hardcopy

Mixing ratios of nonmethane hydrocarbons (NMHCS) were not enhanced in whole air samples collected within the North Atlantic Flight Corridor (NAFC) during the fall of 1997. The investigation was conducted aboard NASA's DC-8 research aircraft, as part of the Subsonic Assessment-Ozone and Nitrogen Experiment (SONEX). NMHC enhancements were not detected within the general Organized Tracking System (OTS) of the NAFC, nor during two tail-chases of the DC-8's own exhaust. Because positive evidence of aircraft emissions was demonstrated by enhancements in both nitrogen oxides and condensation nuclei during SONEX, the NMHC results suggest that the commercial air traffic fleet operating in the North Atlantic region does not contribute significantly to NMHCs in the NAFC.
Author
Hydrocarbons; Methane; Mixing Ratios; Condensation Nuclei; Augmentation; Air Sampling

19990070927 NASA Goddard Inst. for Space Studies, New York, NY USA
Climatic Implications of the Observed Temperature Dependence of the Liquid Water Path of Low Clouds in the Southern Great Plains
DelGenio, Anthony D., NASA Goddard Inst. for Space Studies, USA; Wolf, Audrey B., Science Systems and Applications, Inc., USA; May 1999; 52p; In English
Report No.(s): GNC-99-41; No Copyright; Avail: Issuing Activity, Hardcopy

Satellite observations of low-level clouds have challenged the assumption that adiabatic liquid water content combined with constant physical thickness will lead to a negative cloud optics feedback in a decadal climate change. We explore the reasons for the satellite results using four years of surface remote sensing data from the Atmospheric Radiation Measurement Program Cloud and Radiation Testbed site in the Southern Great Plains of the USA. We find that low cloud liquid water path is approximately invariant with temperature in winter but decreases strongly with temperature in summer, consistent with the satellite inferences at this latitude. This behavior occurs because liquid water content shows no detectable temperature dependence while cloud physical thickness decreases with warming. Thinning of clouds with warming is observed on seasonal, synoptic, and diurnal time scales; it is most obvious in the warm sectors of baroclinic waves. Although cloud top is observed to slightly descend with warming, the primary cause of thinning is the ascent of cloud base due to the reduction in surface relative humidity and the concomitant increase in the lifting condensation level of surface air. Low cloud liquid water path is not observed to be a continuous function of temperature. Rather, the behavior we observe is best explained as a transition in the frequency of occurrence of different boundary layer types: At cold temperatures, a mixture of stratified and convective boundary layers is observed, leading to a broad distribution of liquid water path values, while at warm temperatures, only convective boundary layers with small liquid water paths, some of them decoupled, are observed. Our results, combined with the earlier satellite inferences, imply that the commonly quoted 1.50 C lower limit for the equilibrium global climate sensitivity to a doubling of CO2, which is based on models with near-adiabatic liquid water behavior and constant physical thickness, should be revised upward.
Author
Climate Change; Temperature Dependence; Liquids; Clouds (Meteorology); Climatology; Humidity; Low Temperature; Moisture Content; Water

19990070929 NASA Goddard Inst. for Space Studies, New York, NY USA
GCM Hindcasts for SST Forced Climate Variability over Agriculturally Intensive Regions
Druyan, Leonard M., NASA Goddard Inst. for Space Studies, USA; Shah, Kathryn P., NASA Goddard Inst. for Space Studies, USA; Chandler, Mark A., NASA Goddard Inst. for Space Studies, USA; Rind, David, NASA Goddard Inst. for Space Studies, USA; November 1998; 37p; In English
Contract(s)/Grant(s): NCC5-117; NSF ATM-97-25142; NSF ATM-96-28843
Report No.(s): GCN-99-46; No Copyright; Avail: Issuing Activity, Hardcopy

The ability to forecast seasonal climate is of great practical interest. One of the most obvious benefits would be agriculture, for which various preparations (planting, machinery, irrigation, manpower) would be enabled. The expectation of being able to make such forecasts far enough in advance (on the order of 9 months) hinges on components of the system with the longest persistence or predictability. The mixed results of El Nino forecasts has raised the hope that tropical Pacific sea surface temperatures (SST) fall into this category. For agriculturally-relevant forecasts to be made, and utilized, requires several conditions. The SST in the regions that affect agricultural areas must be forecast successfully, many months in advance. The climate response to such sea surface temperatures must then be ascertained, either through the use of historical empirical studies or models (e.g., GCMS). For practical applications, the agricultural production must be strongly influenced by climate, and farmers on either the local level or through commercial concerns must be able to adjust to using such forecasts. In a continuing series of papers, we will explore each of these components. This article concerns the question of utilizing SST to forecast the climate in several regions of agricultural production. We optimize the possibility of doing so successfully by using observed SST in a hindcast mode (i.e., a perfect forecast), and we also use the globally observed values (rather than just those from the tropical Pacific, for which predictability has been shown). This then is the ideal situation; in subsequent papers we will explore degrading the results by using only tropical Pacific SSTs, and then using only
Author
Climate; Degradation; Expectation; Forecasting; Predictions; Statistical Analysis

19990071135 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Elevation Change of the Southern Greenland Ice Sheet: Update
Davis, C. H., Missouri Univ., USA; Kluever, C. A., Missouri Univ., USA; Haines, B. J., Jet Propulsion Lab., California Inst. of Tech., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 6-11; In English; See also 19990071134; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The overall focus of our research is to document long-term elevation change of the Greenland ice sheet using satellite altimeter data. In addition, we are investigating seasonal and interannual variations in the ice-sheet elevations to place the long-term measurements in context. Specific objectives of this research include: 1) Developing new techniques to significantly improve the accuracy of elevation-change estimates derived from satellite altimetry. 2) Measuring the elevation change of the Greenland ice sheet over a 10-year time period using Seasat (1978) and Geosat GM (1985-86) and Geosat ERM (1986-88) altimeter data. 3) Quantifying seasonal/interannual variations in the elevation-change estimates using the continuous time series of surface elevations from the Geosat GM and ERM datasets. 4) Extending the long-term elevation change analysis to two decades by incorporating data from the ERS-1/2 missions (1991-99) and, if available, the Geosat-Follow On (GFO) mission (1998-??).
Author
Land Ice; Glaciers; Glaciology; Annual Variations; Arctic Regions; Climatology; Climate Change; Climate Models

19990071136 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Large Ice Discharge From the Greenland Ice Sheet
Rignot, Eric, Jet Propulsion Lab., California Inst. of Tech., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 12-15; In English; See also 19990071134; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The objectives of this work are to measure the ice discharge of the Greenland Ice Sheet close to the grounding line and/or calving front, and compare the results with mass accumulation and ablation in the interior to estimate the ice sheet mass balance.
Author
Land Ice; Glaciers; Ice Environments

19990071138 Washington Univ., Applied Physics Lab., Seattle, WA USA
Satellite Observations of Ice Sheet Climate on Decadal Time Scales
Winebrenner, Dale P., Washington Univ., USA; Arthern, Robert J., Washington Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 20-21; In English; See also 19990071134; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The objective of this work is to map accumulation rates and decadal variations in surface temperature in the dry snow zone in Greenland using spaceborne microwave observations, based on a quantitative understanding of the physics underlying those observations. We anticipate comparison of our results with corresponding estimates from ground observations and atmospheric

modeling, and we will work toward improving accumulation rate parameterizations suitable for coupled ice sheet/atmosphere models.
Author
Land Ice; Glaciers; Climatology; Periodic Variations

19990071148 Ohio State Univ., Dept. of Geography, Columbus, OH USA
Greenland Net Annual Snow Accumulation: Temporal Perspective and Spatial Constraints
Mosley–Thompson, Ellen, Ohio State Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 54-59; In English; See also 19990071134; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The ice core analysis component of the PARCA (Program for Arctic Climate Assessment) Program is a joint effort by The Ohio State University (OSU), the University of Arizona (UA) and the University of Colorado-Boulder (CU). The primary objective is to use the well-preserved seasonal variations of various chemical and physical constituents in ice cores to reconstruct a combination of recent (last few decades) and longer (decades to centuries) histories of net accumulation from a broad spatial distribution of firn and ice cores from above 2000 meters elevation on Greenland. The OSU role in the PARCA Program is closely linked with that of the University of Arizona as both groups are engaged in the high resolution analysis of the chemical and physical properties of Greenland ice cores with the explicit goal of reconstructing annually resolved histories of net accumulation with minimal dating errors. OSU analyses include: (1) the concentrations of insoluble dust which exhibit a marked spring peak and winter minimum and serve as an excellent tool for dating Greenland ice cores; (2) the oxygen isotopic ratio (delta(sup 18)O) also varies annually and in regions with higher accumulation (is greater than or equal to 0.25 m H2O or water equivalent) may be preserved for decades to hundreds of years; and (3) Beta radioactivity which provides critical 'known time stratigraphic horizons' that help verify and (in lower accumulation regions) help constrain the annual dating. The analytical procedures were discussed in the 1997 PARCA report and are not included.
Derived from text
Arctic Regions; Snow; Snow Cover; Ice; Cores; Ice Reporting

19990071150 Colorado Univ., Cooperative Inst. for Research in Environmental Sciences, Boulder, CO USA
Greenland Ice Sheet Climatology: GC-Status and Applications
Steffen, K., Colorado Univ., USA; Box, J. E., Colorado Univ., USA; Weber, J., Colorado Univ., USA; Estupinen, J., Colorado Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 63-70; In English; See also 19990071134; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Climatological observations and surface energy balance studies are the keys to the understanding of the surface processes linked with ice sheet mass balance. Long-term climate records at different sites on the ice sheet are needed for the assessment of the snowpack energy and mass balance of the accumulation zone and to gain more complete information of the spatial variation of climate over the ice sheet. The Greenland Climate Network (GC-Net) was established in spring 1994 with the emphasis on monitoring climatological and glaciological parameters at various location on the ice sheet over a time period of at least 5-10 years. The objectives of the GC-Net automatic weather station (AWS) network are: Assess daily, annual and interannual variability in accumulation rate, surface climatology and surface energy balance at selected locations on the ice sheet where high sensitivity of the ice sheet mass balance to climate anomalies is predicted from modeling results; Assess accurate surface elevation, location, and near-surface density at the AWS location with the option to revisit the locations in order to get temporal information for dynamic ice sheet modeling; and Model the surface energy balance based on atmospheric and cryospheric interactions, using the Greenland climate network of AWS stations as input parameters. In a first attempt, the surface energy balance of the western part of the ice sheet will be modeled, using the current AWS network.
Author
Glaciology; Glaciers; Land Ice; Mass Distribution; Climatology; Climate Models; Climate Change

19990071190 Washington Univ., Center for Air Pollution Impact and Trend Analysis, Saint Louis, MO USA
Local and Regional Contributions of Fine Particulate Mass to Urban Areas in the Mid-Atlantic and Southwestern US, *Nov. 1997 - Sep. 1998*
Schichtel, B. A.; Mar. 29, 1999; 60p; In English
Contract(s)/Grant(s): 7D-0869-NAEX
Report No.(s): PB99-147209; EPA/600/R-99/036; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This work examined the seasonal local and regional contributions of PM2.5 to urban areas in the Mid-Atlantic States: Baltimore, MD, Washington, DC, and Philadelphia, PA and Phoenix, AZ in the Southwest. This was accomplished using two different methods. The first method estimated urban excesses by comparing seasonal PM2.5 trends at the urban monitors to nearby rural

monitors. The second approach used a simple model based on the PM2.5 dependence on wind speed and wind direction to classify a site as being dominated by local or regional source contributions. The method also quantifies the regional contributions during high wind speed conditions. The wind vectors were derived from surface observations and air mass histories. All monitoring sites in the urban centers were dominated by local sources during the cold season.
NTIS
Particulates; Cities; Monitors; Environment Pollution

19990071224 NASA Goddard Space Flight Center, Greenbelt, MD USA
SONEX Airborne Mission and Coordinated POLINAT-2 Activity: Overview and Accomplishments
Singh, Hanwant B., NASA Ames Research Center, USA; Thompson, Anne M., NASA Goddard Space Flight Center, USA; Schlager, H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; [1999]; 11p; In English; No Copyright; Avail: Issuing Activity, Hardcopy

The SASS (Subsonic Assessment) Ozone and NO(x) Experiment (SONEX) was an airborne field campaign conducted in October-November 1997 in the vicinity of the North Atlantic Flight Corridor Lo study the impact of aircraft emissions on NOx and ozone (03). A fully instrumented NASA DC-8 aircraft was used as the primary SONEX platform. SONEX activities were closely coordinated with the European POLINAT-2 (Pollution from Aircraft Emissions in the North Atlantic Flight Corridor) program, which used a Falcon-20 aircraft and an instrumented in-service Swissair B-747. Both campaigns focused on the upper troposphere/"lowermost" stratosphere (UT/LS) as the region of greatest interest. Specific sampling goals were achieved with the aid of a state-of-the art modeling and meteorological support system, which allowed targeted sampling of air parcels with desired characteristics. A substantial impact of aircraft emissions on NO(x) and O3 in the UT/LS of the study region is shown to be present. It is further shown that the NO(x)- HO(x)-O3 relationships are highly nonlinear and must be accurately simulated to make meaningful future predictions with global models. SONEXIPOLINAT-2 results are being published in Special Sections of GRL and JGR. Here we provide a brief overview of SONEX design, implementation, and expected results to provide a context within which these publications can be understood.
Author
Ozone; Nitrogen Oxides; Air Sampling; Samples

19990071252 Kyushu Univ., Faculty of Engineering, Fukuoka, Japan
Development of a Simple Monitoring System of C-14 in Environment by Using a Low Background Liquid-Scintillation Counter
Nishida, Kimihiko, Kyushu Univ., Japan; Wakabayashi, Genichiro, Kyushu Univ., Japan; Nohtomi, Akihiro, Kyushu Univ., Japan; Okai, Tomio, Kyushu Univ., Japan; Matoba, Masaru, Kyushu Univ., Japan; Kawamura, Hidehisa, Kyushu Univ., Japan; Momoshima, Noriyuki, Kyushu Univ., Japan; Technology Reports of Kyushu University; Jun. 1994; ISSN 0023-2718; Volume 67, No. 3, pp. 155-160; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We have been developing a simple monitoring system of C-14 in the atmospheric environment with a low background liquid-scintillation counter. Samples are prepared for the measurement by "the suspension method" which is much simpler than other methods such as the benzene synthesis method or the methanol synthesis method. The Efficiency Tracing Method (ETM) is used in order to compensate the decrease of counting efficiency due to scintillation light quenching. Output signals from the liquid-scintillation counter are analyzed automatically according to the ETM using a newly installed pulse-height analysis system. We investigated the propriety of the system by measuring C-14 radioactivity in a fir tree; the concentration of 14C was analyzed in each five years from 1943 to 1986. The change of C-14 concentration with the passing of the years was properly evaluated.
Author
Fabrication; Control Systems Design; Monitors; Carbon 14

19990071287 Cambridge Research and Instrumentation, Inc., Cambridge, MA USA
Solar Irradiance Variations and Climate
Foukal, Peter, Cambridge Research and Instrumentation, Inc., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 103-111; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

In 1838, the French physicist Claude Pouillet published the first measurement of the Sun's total light and heat input to the Earth. He described his new instrument-the pyrheliometer-and the corrections he made for attenuation of solar light in the Parisian atmosphere. Similar measurements were carried out by the English astronomer Sir John Herschel, working at about the same time at the Cape of Good Hope. Pouillet used the value of 1.76 calories/sq cm min that he obtained for his "solar constant" to calculate that sunlight at the Earth's surface was powerful enough to melt a global ice layer 31 m deep in 1 year. He also pointed out that

this value implied a prodigious solar power output whose source deserved consideration, and he attempted to determine the temperature of the solar surface emitting this vast flux of heat and light. We no longer wonder at the magnitude of the Sun's power output per square meter-sufficient to power half a dozen Atlantic liners at their utmost speed, night and day-as 19th-century astronomers enjoyed pointing out. The source of power in a star like the Sun is also less enigmatic to us than it was to Victorian astronomers, although satisfactory closure of the neutrino problem may yet require modification of our understanding of energy generation, mixing, and convection in the solar interior. The frontier in studies of solar irradiance has gradually moved toward variability of the Sun's total output, and also of its outputs in the infrared, ultraviolet, and extreme ultraviolet spectral regions. The last two wavelength regions are largely inaccessible to ground-based measurement, due to strong absorption in the Earth's atmosphere. The motivation for these studies has progressed beyond the enthusiasm of Pouillet and his contemporaries for applying the newly discovered laws of thermodynamics to a star and to the Earth's atmosphere.
Derived from text
Climate; Solar Radiation; Spectral Bands; Pyroheliometers; Infrared Radiation; Heat Measurement

19990071653 General Motors Research Labs., Warren, MI USA
In-Use Light Duty Gasoline Vehicle Particulate Matter Emissions on the FTP, REP05 and UC Cycles ***Final Report***
Cadle, S. H.; Mulawa, P.; Groblicki, P.; Laroo, C.; Ragazzi, R. A.; Jun. 02, 1999; 70p; In English
Report No.(s): PB99-157224; CRC Proj. E-46; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The study was conducted at the Colorado Department of Public Health and Environment (CDPHE) Aurora Emissions Technical Center, in the eastern Denver metropolitan area starting in May 1998. The program was designed to focus on in-use, late model (1990 or later model year) LDGVs. The goals of the exhaust PM characterization component (added by CRC's participation in this study) were to (1) improve the data base on PM emission rates from in-use vehicles at low temperatures (35 deg F); (2) determine the impact of driving cycle on PM emission rate; (3) determine the impact of an oxygenated fuel on the PM emission rate and (4) determine the impact of fuel and driving cycle on the particle size distribution, number and the PM chemical composition.
NTIS
Gasoline; Particulates; Automobiles; Emission

19990071654 Haskew (Harold) and Associates, Inc., Milford, MI USA
Running Loss Emissions from In-Use Vehicles ***Final Report***
Haskew, H. M.; Eng, K. D.; Liberty, T. F.; Reuter, R. M.; Feb. 1999; 76p; In English
Report No.(s): PB99-157281; CRC-612; CRC Proj. E-35-2; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

In Mesa, Arizona, a total of 150 vehicles were recruited at a local I/M lane and tested for running loss emissions at the Automotive Testing Labs (ATL). Running loss emissions were measured in a Running loss SHED (RL-SHED) for a 25 minute, 7.5 mile trip on a hot summer day (95 F). Vehicles from model years 1971 through 1991 were tested. The program identified 30 vehicles as candidates for repair and retest. The result showed a very high (90 + or -%) effectiveness for the repairs. Repeat tests were run on 10 vehicles to provide an estimate for test-to-test variability.
NTIS
Losses; Emission; Automobiles

19990071655 Automotive Testing Labs., Inc., Mesa, AZ USA
Measurement of Running Loss Emissions from in-Use Vehicles ***Final Report***
McClement, D.; Dueck, J. A.; Hall, B.; Feb. 16, 1998; 94p; In English
Report No.(s): PB99-158024; CRC-611; CRC Proj. E-35; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

A total of one hundred and fifty randomly procured in-use vehicles were tested in Mesa, Arizona during the summer months of 1997. Running loss hydrocarbon emissions were measured using a dynamometer enclosed in an evaporative emissions enclosure (SHED). New vehicle evaporative emission certification test equipment specifications, test procedures, and quality control limits were used, with specified exceptions required to test publicly owned in-use vehicles. A thorough inspection of vehicle components related to evaporative emissions was performed on each vehicle following the initial test with the vehicles in the 'as-received' condition. Thirty vehicles were selected for repairs and were retested following repairs. Ten vehicles were selected for as-received replicate testing.
NTIS
Losses; Exhaust Emission; Combustion Products

19990074931 California Univ., Office of Environmental Science and Engineering, Los Angeles, CA USA
Measurements of Biogenic Hydrocarbons in Ambient Air. Addendum to Biogenic Inventories for California: Generation of Essential Databases ***Final Report***
Winer, A. M.; Karlik, J.; Arey, J.; Chung, Y. J.; Reissell, A.; Dec. 10, 1998; 124p; In English
Contract(s)/Grant(s): ARB 95-309
Report No.(s): PB99-163644; ARB/R 99/678; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

During the 1997 Southern California Ozone Study/North American Research Strategy for Tropospheric Ozone (SCOS97-NARSTO), UC Riverside measured concentrations of isoprene, methacrolein (MACR), and methyl vinyl ketone (MVK) in the northern South Coast Air Basin at Pine Mountain, Mount Baldy, the highlands above Azusa, and the city of Azusa. MACR and MVK are the main oxidation products of isoprene photochemistry. The highest concentrations for isoprene were found at the mountain sites having high leaf biomass, where the ratio of MVK/MACR remained relatively constant throughout the day. This implies that isoprene oxidation is the source of MVK/MACR concentrations in the mountains.
NTIS
Hydrocarbons; Data Bases; Ecology

19990074932 Environmental Protection Agency, Air Pollution Prevention and Control Div., Research Triangle Park, NC USA
Fine Particle Emissions from Residual Fuel Oil Combustion: Characterization and Mechanisms of Formation
Linak, W. P.; Miller, C. A.; Wendt, J. O. L.; 1999; 46p; In English; 5th; Technologies and Combustion for a Clean Environment, 12-15 Jul. 1999, Lisbon, Portugal
Report No.(s): PB99-163131; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

The characteristics of particulate matter (PM) emitted from residual fuel oil combustion in two different types of combustion equipment were compared. A small commercial 732 kW rated fire-tube boiler yielded a weakly bimodal particulate size distribution (PSD) with over 99% of the mass contained in a broad coarse mode, and only a small fraction of the mass in an accumulation mode consistent with ash vaporization. Larger scale utility units firing residual oil were simulated using an 82 kW laboratory refractory-lined furnace. PM emissions from this unit were in good agreement with published data data including published emission factors. These data indicated that the refractory-lined combustor produced lower total but greater fine particulate emissions, as evident from a single unimodal PSD centered approximately around 0.1 micrometers diameter. These results have particular significance in considering the effects of fuel oil combustion equipment type on the characteristic attributes of the fine PM emitted into the atmosphere, and their ensuing health effects.
NTIS
Particle Emission; Fuel Oils; Fuel Combustion

19990074933 Environmental Protection Agency, Air Pollution Prevention and Control Div., Research Triangle Park, NC USA
Analysis of Trace-Level Organic Combustion Process Emissions Using Novel Multidimensional Gas Chromatography-Mass Spectrometry Procedures
Rubey, W. A.; Striebich, R. C.; Ryan, J. V.; 1999; 16p; In English
Report No.(s): PB99-163115; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

This paper outlines the application of the MDGC-MS technique through the analyses of various incinerator effluent and PIC samples using the sequential repetitive heart-cutting method and discusses the improvements that are possible using new MDGC-MS procedures.
NTIS
Combustion Products; Reaction Kinetics; Organic Compounds; Spectroscopic Analysis; Emission

19990074942 California Univ., Center for Environmental Research and Technology, Riverside, CA USA
Measurement and Modeling of PM10 and PM2.5 Emissions from Paved Roads in California ***Final Report***
Venkatram, A.; Fitz, D. R.; Nov. 1998; 134p; In English
Contract(s)/Grant(s): ARB/R 94-336
Report No.(s): PB99-160178; ARB/R 99/679; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

This report describes the results from a two-year study to develop and evaluate a reliable method to estimate PM-10 particulate matter with an aerodynamic diameter or less than 10 micrometers and PM-2.5 emission from paved roads. The study described in this report is designed to reduce the uncertainties associated with estimating particulate emissions from paved roads. This report pertains to results from the following tasks: (1) Examine in detail the studies conducted to date to characterize fugitive emissions from paved roads; (2) Design and implement field experiments to evaluate improved emission measurement methods; (3) Collect

input data to run the AP-42 model at different roadways in southern California; and (4) Evaluate the AP-42 model with data collected at selected sites.
NTIS
Roads; Pavements; Mathematical Models; Emission; Air Pollution

19990075052 University of Central Florida, Dept. of Civil and Environmental Engineering, Orlando, FL USA
COSCREEN98 User's Manual for the FDOT Intersection Air Quality (CO) Screening Model
Cooper, C. D.; Keely, D. K.; Mar. 1999; 20p; In English
Report No.(s): PB99-165060; FL-ER-71B-99; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

As with the original FDOT carbon monoxide (CO) screening test - COSCREEN - this new version, COSCREEN98, attempts to screen major intersections by using a hypothet8ical four-legged intersection. The original COSCREEN is based on CALINE3 analysis of an intersection for a specific set of temperatures. COSCREEN98 requires only a few more input data than the original COSCREEN, but is much more accurate about predicted CO concentrations near the intersection. The user inputs the region, the environment, the traffic volume, the approach speed, the year, and up to ten real receptors. This model then uses MOBILE5a and CAL3QHC2 to evaluate the intersection. CAL3QHC2 is the model accepted by the US Environmental Protection Agency (EPA) for dispersion modeling at intersections. Using MOBILE5a, emission factors are automatically developed for each analysis based on the location of the project, year, and speed. The location of the project impacts the temperatures and MOBILE5a options, which are automatically set by COSCREEN98. The selected environment (urban, suburban or rural) impacts the surface roughness value and the background CO concentrations. The addition of the suburban option provides the user with additional flexibility. The one-hour and eight-hour CO concentrations (including background concentrations) are calculated at each specified receptor.
NTIS
User Manuals (Computer Programs); Air Quality; Environment Models; Computer Programs

19990075849 BFK Solutions, Pacific Palisades, CA USA
Implementation Update: n-Propyl Bromide in Perspective
Kanegsberg, Barbara, BFK Solutions, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 14-19; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Components manufacturers face a dilemma. They must cope with increasing manufacturing requirements. With the increase in technology, comes increasingly stringent performance, requirements. Tolerances decrease, the expectation of a long product lifetime is increasing. A one size fits all process approach is no longer appropriate. This is true for diverse industries including computer hardware inertial navigation systems, complex electronics, semi-conductors, and implantable biomedical devices. At the same time, world-wide competitive pressure is forcing strict cost containment. Strict, confusing, and often conflicting regulatory requirements, from global, national, and local agencies, may encourage use of cleaning and techniques which can be at cross-purposes to performance requirements.
Derived from text
Ozone Depletion; Solvents; Chlorofluorocarbons; Ethane; Cleaning; Cleaners

19990075851 Dewberry and Davis, Fairfax, VA USA
Storm Water Discharges from Industrial Facilities: Achieving Compliance at Kelly Air Force Base
Makowski, Paul, Dewberry and Davis, USA; Goodman, Gary, Universe Technologies, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 38-42; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

Changes to the National Pollutant Discharge Elimination System (NPDES) program require that storm water discharges associated with industrial activity be regulated. How these NPDES regulations apply to Air Force installations and how these installations comply with the terms and conditions of the NPDES storm water permit is discussed. Central to permit compliance is the preparation of the Storm Water Pollution Prevention Plan emphasizing best management practices.
Author
Storms; Water Pollution; Water Sampling; Pollution Control; Pollution Monitoring; Contaminants

19990075852 NASA Marshall Space Flight Center, Huntsville, AL USA
X-33 Environmental Impact Statement: A Fast Track Approach
McCaleb, Rebecca, NASA Marshall Space Flight Center, USA; Holland, Donna L., NASA Marshall Space Flight Center, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 43-53; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The purpose of this presentation is to discuss the developmental approach to the Environmental Impact Statement regarding the X-33 vehicle.
CASI
X-33 Reusable Launch Vehicle; Recoverable Launch Vehicles; Reusable Spacecraft; Environmental Surveys; Environment Effects

19990075853 CH2M/Hill, Inc., Montgomery, AL USA
Title 5 Application Preparation at MSFC: Lessons Learned
Martin, J. P., CH2M/Hill, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 54-58; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The purpose of this paper is to present a summary of the Title V application development process at Marshall Space Flight Center (Marshall or the Center), and to describe the major challenges involved in developing an effective Title V regulatory compliance strategy for this unique NASA facility. As lead environmental contractor at Marshall, CH2M HILL has worked closely with the Center's environmental and management staff to integrate an air emissions compliance plan into their overall environmental program.
Derived from text
Clean Energy; Environment Pollution; Environment Management; Pollution Control; Environmental Monitoring

19990075854 Creative EnterpriZes, Lake Jackson, TX USA
Life Under The NESHAP: Experiences of the Regulators, Industry and Users
Durkee, John B., II, Creative EnterpriZes, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 59-65; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

This paper describes the history, methodology, and impact of the NESHAP for chlorinated solvents past through the compliance date. This rule "broke the mold" because it: spoke against "political correctness" and validated use of solvents; was "user friendly" because the EPA gave users so many ways to comply; and yet was not a complete break from the past because enforcement was based on an old-style punitive approach.
Author
Environmental Monitoring; Environment Protection; Cleaning; Cleaners; Solvents

19990075869 Weston (Roy F.), Inc., San Antonio, TX USA
An Innovative Approach to Meeting Storm Water Discharge Requirements
Cress, Billy B., Weston (Roy F.), Inc., USA; Bost, Richard L., Weston (Roy F.), Inc., USA; Henke, Kim A., Weston (Roy F.), Inc., USA; Goodman, Gary, Department of the Air Force, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 223-231; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Kelly Air Force Base (Kelly) is a large industrial complex that provides "depot" level maintenance for aircraft and approximately 75 percent of the Air Force's engine inventory. The base maintains both an Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) permit and a Texas Natural Resource Conservation Commission (TNRCC) storm water discharge permit. Because of the complexity of the base's two discharge permits and the distance between outfalls, the base installed a system of automated storm water monitoring samplers and flow meters for its eight storm water outfalls. This paper describes the base's approach to storm water monitoring and provides insight into how the base has been able to meet storm water monitoring compliance requirements while reducing the manpower required to implement this program.
Author
Storms; Water; Water Flow; Drainage Patterns

19990075870 Federal Aviation Administration, Fort Worth, TX USA
Asbestos Management in Buildings: FAA Southern Region Asbestos Control Program
Nelson, Ronald R., Federal Aviation Administration, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 232-281; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This presentation addresses asbestos control in various buildings and facilities. Detailed information is given on structures, facilities, and on how to develop an asbestos control program.
CASI
Asbestos; Electrical Insulation; Insulators; Thermal Insulation

19990075871 Florida Dept. of Environmental Protection, Orlando, FL USA

Partnering for a Sustainable Working Relationship

Hobbs, Jennifer H., Florida Dept. of Environmental Protection, USA; Venuto, Charlie, United Space Boosters, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 282-289; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The State of Florida Department of Environmental Protection (FDEP), NASA and USBI Co. have embarked on a unique relationship. Together they have put substance into the term partnering. Traditional relationships between environmental agencies and industry have been based on regulatory requirements. USBI, NASA and the FDEP agreed to take an alternative approach through a partnering effort. A continuous improvement tool, Environment, Health and Safety (EHS) Kaizen was used. Results from the Kaizen event and insights will be discussed.

Author

Health; Safety; Improvement; Public Relations

19990075874 Thiokol Corp., Brigham City, UT USA

Chrysotile Asbestos Behavior During Burning of Waste Solid Rocket Propellant

Dietz, James M., Thiokol Corp., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 308-313; In English; See also 19990075847; Copyright Waived; Avail: CASI; A02, Hardcopy; A06, Microfiche

Washout of solid rocket propellant from missile cases results in some insulation being removed with the propellant. Normal disposal of the propellant waste is done by combustion. Since insulation from the case may contain chrysotile asbestos, some concern exists that these fibers may be liberated during the burning of the propellant. Results of a laboratory study show that heat sufficient to liberate free fibers from the insulation dehydrates the fibers to form non-asbestos magnesium silicates. The study was conducted on fibers heated in the laboratory as well as samples taken from actual burning pits. Microscopic techniques of polarized light and dispersion staining were used to characterize the fibers.

Author

Asbestos; Insulation; Insulators; Waste Disposal; Solid Rocket Propellants

19990075892 Air Force Research Lab., Airbase and Environmental Technology Div., Tyndall AFB, FL USA

Removal of Emulsified Oil and AFFF Using Air-Sparged Hydrocyclone Technology

OSullivan, Dennis, Air Force Research Lab., USA; Yi, Ye, Advanced Processing Technologies, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 527-531; In English; See also 19990075847; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

A range of Air Force (AF) activities generate wastewater containing suspended solids, petroleum, oil, and lubricant (POL) products, emulsion stabilizing agents, and aqueous film forming-foam (AFFF) liquids. These contaminants may pose a nuisance to federal or civilian industrial wastewater treatment plant (IWTP) operations or actually force the effluent stream to be out of compliance with local discharge limits. These concerns have been identified as Environment, Safety, and Occupational Health (ESOH) Needs #912, ”New Treatment Technologies for Removing Low-Level Emulsified Oils in Contaminated Wastewater from Point and Non-Point Sources (High Priority),” #1414, ”Pollution Controls for Aircraft Wash Racks (High Priority),” and #1609, ”Methods to Mitigate Problems Associated with the Release of AFFF From the Flooding of Hangars as a Fire Suppressant (Low Priority)” (HSC/XRE, 1997). Conventional wastewater pre-treatment processes are either ineffective or too costly to treat emulsified oils caused by the use of soaps and detergents and AFFF releases. Gravity oil/water (O/W) separators are not able to separate the chemically stabilized O/W emulsions that exit from aircraft and vehicle wash racks. Other pre-treatment unit operations, such as thermal treatment, chemical demulsification, depth filtration, and combinations thereof, are capital intensive and usually have high operation and maintenance costs. Wastewaters containing AFFF need pre-treatment before being released to federally or privately owned treatment works (FOTW, POTW) due to its persistent foaming and high biochemical oxygen demand (BOD). Biological degradation may be economically successful if containment facilities and aeration equipment are available; otherwise, large capital expenditures are necessary. Also, long residence time, sludge removal, and intermittent flow may be barriers to an effective biodegradation process.

Derived from text

Waste Water; Contaminants; Water Treatment; Biochemical Oxygen Demand; Crude Oil; Lubricants

19990075893 CH2M/Hill, Inc., Montgomery, AL USA

Meeting the 50 Percent Reduction Mandate: Progress at MSFC

Belser, Sharon D., CH2M/Hill, Inc., USA; Martin, J. P., CH2M/Hill, Inc., USA; Woods, Nannette C., CH2M/Hill, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 532-538; In English; See also 19990075847; No Copy-

right; Avail: CASI; A02, Hardcopy; A06, Microfiche

The federal government is the nation's largest consumer of raw materials, power, water, and products (EPA, 1994). This consumption can generate potentially harmful releases (air, water, and soil) and wastes that might adversely affect public health or the environment. In addition, high costs are associated with managing waste at current facilities and cleaning up contaminated facilities. This paper presents the efforts of the George C. Marshall Space Flight Center (MSFC) to comply with Executive Order (EO) 12856, which requires facilities to voluntarily reduce the release and offsite transfer of toxic chemicals by 50 percent by December 31, 1999. MSFC's primary goal is to achieve a 50 percent reduction in total reportable toxic chemical releases and offsite transfers under Section 313 of the Superfund Amendments and Reauthorization Act (SARA), using the 1994 Toxic Chemical Release Inventory (TRI) baseline for comparison (NASA/MSFC, June 1995). In addition, MSFC will apply the reduction goal to new chemical substitutions that may occur (such as trichloroethylene for Freon 113) even though this is not required by EO 12856. MSFC's secondary goals are to reduce significant general toxic chemical releases by 50 percent; to control the use of toxic chemicals in any existing or new processes, to the extent feasible; and to find non-toxic substances for the replacement chemicals. This technical paper has been prepared to document MSFC's progress toward meeting these goals. The focus of this paper is only on reportable and general toxic chemical usage, although EO 12856 addresses other areas, such as solid waste, energy, and water use. The progress toward meeting the 50 percent reduction goal is documented by evaluating the projects completed and by identifying additional pollution prevention projects to help meet the reduction goals. The objectives of this paper include documenting the following: Progress made toward meeting the 50 percent reduction goal for reportable chemicals; Status toward meeting secondary goals for general toxic chemicals; Pollution prevention projects completed to date and those planned for implementation; and Projected status toward meeting the 50 percent reduction goal by December 31, 1999, based on implementation of proposed projects.

Derived from text

Pollution Control; Environmental Cleanup; Wastes; Waste Management; Contaminants

19990075904 Thiokol Propulsion, Brigham City, UT USA

Contamination Control Changes to the Reusable Solid Rocket Motor Program: A Ten Year Review

Bushman, David M., Thiokol Propulsion, USA; Elliott, Robin, Thiokol Propulsion, USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 643-650; In English; See also 19990075847; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

During the post Challenger period, NASA and Thiokol implemented changes to the Reusable Solid Rocket Motor (RSRM) contract to include provisions for contamination control to enhance the production environment. During the ten years since those agreements for contamination controls were made, many changes have taken place in the production facilities at Thiokol, and these changes have led to the production of much higher quality shuttle solid rocket motors, and improved cleanliness and safety of operations in the production facilities. The experience in contamination control over this past decade highlights the value these changes have brought to the RSRM program, and how the system can be improved to meet the challenges the program will face in the next ten years.

Author

Solid Propellant Rocket Engines; Reusable Launch Vehicles; Product Development; Rocket Engine Design

19990075911 Microcraft, Inc., Huntsville, AL USA

Microtox Toxicity Test Compared with The Daphnid, Flathead Minnow Acute Lethality Test for Use in Monitoring Wastewater Effluent at NASA, Marshall Space Flight Center

Obenhuber, Donald C., Microcraft, Inc., USA; Huff, Tim, Microcraft, Inc., USA; Third Aerospace Environmental Technology Conference; April 1999, pp. 700-712; In English; See also 19990075847; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The Microtox Toxicity Test is a new bioanalytical method for determining the toxicity of aqueous samples. Microtox measures the light output of fluorescent bacteria (Vibrio fischeri) before and after exposure to a toxic sample. The Microtox Test was compared with the EPA approved Daphnid, Flathead Minnow Acute Lethality Test for use in monitoring wastewater effluent.

Derived from text

Toxicity; Environmental Monitoring; Water Pollution; Waste Water; Waste Disposal; Effluents

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GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see 93 Space Radiation.

19990070930 NASA Goddard Space Flight Center, Greenbelt, MD USA
Artifacts Introduced in the Point Evaluation of Functions Expanded Into a Degree 360 Spherical Harmonic Series
Rapp, Richard H., Ohio State Univ.; March 1999; 24p; In English
Contract(s)/Grant(s): NAS5-32352
Report No.(s): NASA/CR-1999-209205; NAS 1.26:209205; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An expansion of a function initially given in 1 deg cells was carried out to degree 360 by using 30 min cells whose value was initially assigned to be the value of the 1 deg cell in which it fell. The evaluation of point values of the function from the degree 360 expansion revealed spurious patterns attributed to the coefficients from degree 181 to 360. Expansion of the original function in 1 deg cells to degree 180 showed no problems in the point evaluation. Mean 1 deg values computed from both degree 180 to 360 expansions showed close agreement with the original function. The artifacts could be removed if the 30 min values were interpolated by spline procedures from adjacent 1 deg cells. These results led to an examination of the gravity anomalies and geoid undulations from EGM96 in areas where 1 deg values were 'split up' to form 30 min cells. The area considered was 75 deg S to 85 deg S, 100 deg to 120 deg where the split up cells were basically south of 81 deg S. A small, latitude related, and possibly spurious effect might be detectable in anomaly variations in the region. These results suggest that point values of a function computed from a high degree expansion may have spurious signals unless the cell size is compatible with the maximum degree of expansion. The spurious signals could be eliminated by using a spline interpolation procedure to obtain the 30 min values from the 1 deg values.
Author
Evaluation; Coefficients; Gravity Anomalies; Interpolation

19990070932 Washington Univ., Seattle, WA USA
Wave Dynamics and Transport in the Stratosphere ***Final Report, 1 Jan. 1996 - 30 Jun. 1999***
Holton, James R., Washington Univ., USA; Alexander, M. Joan, Washington Univ., USA; 1999; 6p; In English
Contract(s)/Grant(s): NAG1-1803; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The report discusses: (1) Gravity waves generated by tropical convection: A study in which a two-dimensional cloud-resolving model was used to examine the possible role of gravity waves generated by a simulated tropical squall line in forcing the quasi-biennial oscillation was completed. (2) Gravity wave ray tracing studies:It was developed a linear ray tracing model of gravity wave propagation to extend the nonlinear storm model results into the mesosphere and thermosphere. (3) tracer filamentation: Vertical soundings of stratospheric ozone often exhibit laminated tracer structures characterized by strong vertical tracer gradients. (4) Mesospheric gravity wave modeling studies: Although our emphasis in numerical simulation of gravity waves generated by convection has shifted from simulation of idealized two-dimensional squall lines to the most realistic (and complex) study of wave generation by three-dimensional storms. (5) Gravity wave climatology studies: Mr. Alexander applied a linear gravity wave propagation model together with observations of the background wind and stability fields to compute climatologies of gravity wave activity for comparison to observations. (6) Convective forcing of gravity waves: Theoretical study of gravity wave forcing by convective heat sources has completed. (7) Gravity waves observation from UARS: The objective of this work is to apply ray tracing, and other model technique, in order to determine to what extend the horizontal and vertical variation in satellite observed distribution of small-scale temperature variance can be attributed to gravity waves from particular sources. (8) The annual and interannual variations in temperature and mass flux near the tropical tropopause. and (9) Three dimensional cloud model.
CASI
Wave Propagation; Wave Generation; Stratosphere; Tropical Regions; Gravitational Effects; Climatology; Three Dimensional Models

19990070949 Global Hydrology and Climate Center, Huntsville, AL USA
Variability of Upper-Tropospheric Precipitable from Satellite and Model Reanalysis Datasets
Jedlovec, Gary J., NASA Marshall Space Flight Center, USA; Iwai, Hisaki, Global Hydrology and Climate Center, USA; 1999; 1p; In English; Hydrology, 10-15 Jan. 1999, Dallas, TX, USA; Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

Numerous datasets have been used to quantify water vapor and its variability in the upper-troposphere from satellite and model reanalysis data. These investigations have shown some usefulness in monitoring seasonal and inter-annual variations in

moisture either globally, with polar orbiting satellite data or global model output analysis, or regionally, with the higher spatial and temporal resolution geostationary measurements. The datasets are not without limitations, however, due to coverage or limited temporal sampling, and may also contain bias in their representation of moisture processes. The research presented in this conference paper inter-compares the NVAP, NCEP/NCAR and DAO reanalysis models, and GOES satellite measurements of upper-tropospheric,precipitable water for the period from 1988-1994. This period captures several dramatic swings in climate events associated with ENSO events. The data are evaluated for temporal and spatial continuity, inter-compared to assess reliability and potential bias, and analyzed in light of expected trends due to changes in precipitation and synoptic-scale weather features. This work is the follow-on to previous research which evaluated total precipitable water over the same period. The relationship between total and upper-level precipitable water in the datasets will be discussed as well.
Author
Annual Variations; Satellite Observation; Troposphere; Precipitation (Meteorology); Water Vapor; Climate; Data Processing

19990071118 California Univ., Dept. of Physics and Astronomy, Los Angeles, CA USA
Structure of Alfven Waves of Small Transverse Scale and Relation to Auroral Processes
Morales, G. J., California Univ., USA; Maggs, J. E., California Univ., USA; Penano, J. R., California Univ., USA; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 318-322; In English; See also 19990071067; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

A comprehensive theoretical and experimental study has identified key properties of shear Alfven waves of small transverse scale that shed new insight into spacecraft observations and models of the auroral ionosphere.
Author
Magnetohydrodynamic Waves; Plasma Waves; Plasma Drift; Plasmas (Physics)

19990071119 National Cheng Kung Univ., Dept. of Physics, Tainan, Taiwan, Province of China
Generation of Mirror Waves, Slow-Mode Waves and Ion Cyclotron Waves in the Earth's Magnetosheath
Lee, L. C., National Cheng Kung Univ., Taiwan, Province of China; Wu, B. H., National Cheng Kung Univ., Taiwan, Province of China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 323-328; In English; See also 19990071067
Contract(s)/Grant(s): NSC-87-2119-M006-001; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

As the supersonic solar wind impinges on the earth's magnetosphere, a bow shock is formed in front of the magnetosphere. The region between the bow shock and magnetosphere is called the magnetosheath. Low-frequency fluctuations in the plasma density and magnetic fields are often observed in the magnetosheath. These fluctuations can be identified as mirror waves, ion cyclotron waves and slow-mode waves. In addition, sunward plasma flows are also observed in the region near the bow shock. These fluctuations can be generated by the ion temperature anisotropy associated with bow shock or by the interaction of interplanetary discontinuities with the bow shock. Observations, theoretical models and simulations of these wave phenomena will be discussed in this paper.
Author
Bow Waves; Shock Waves; Magnetosheath; Plasma Sheaths; Solar Wind; Ion Cyclotron Radiation; Plasma Waves

19990071146 Colorado Univ., Dept. of Physics and CIRES, Boulder, CO USA
Absolute Gravity and GPS Measurements in Greenland
Wahr, J., Colorado Univ., USA; vanDam, T., National Oceanic and Atmospheric Administration, USA; Robertson, D., National Oceanic and Atmospheric Administration, USA; Larson, K., Colorado Univ., USA; Francis, O., Belgian Royal Observatory, Belgium; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 45-47; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Our objective is to use GPS (Global Positioning System) and absolute gravity measurements made on bedrock along the edge of the Greenland ice sheet, to help detect ongoing changes in ice thickness. A change in ice load will deform the earth, and so cause vertical motion of the earth's crust. By measuring that motion we can put constraints on the change in ice mass averaged over a few hundred km of the observation point. by combining the GPS and absolute gravity measurements, it should eventually be possible to separate the secular effects of ongoing changes in ice from the earth's visco-elastic response to past ice variability. This project has been a joint effort between the University of Colorado (CIRES, Physics, and Aerospace Engineering), NASA, NOAA, and the Royal Observatory of Belgium.
Author
Global Positioning System; Gravitation; Climate Change; Climate Models; Climatology

19990071153 Ohio State Univ., Bryd Polar Research Center, Columbus, OH USA

Development of Greenland GIS Database System (GGDS)

Csatho, Bea, Ohio State Univ., USA; Kim, Changjoo, Ohio State Univ., USA; Bolzan, John, Ohio State Univ., USA; Thomas, Robert, EG and G Services, USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 80-84; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

An important component of the PARCA (Program for Arctic Regional Climate Assessment) program is the 'traditional' mass-balance investigation (Thomas, in press). to obtain the mass balance the difference between the snow accumulation and the ice discharge is computed for the interior of the ice sheet. The input data of the analysis are the ice velocity and ice thickness measured along the 2000-meter elevation contour, digital accumulation maps, digital flowlines passing through the velocity stations, etc. The large data volume and complexity of the data set necessitated the introduction of a spatial database system. We have started to develop the Greenland GIS (Geographical Information System) Database System (GGDS) in 1998. GGDS contains various geophysical and glaciological data collected on the Greenland ice sheet. Since the errors of the mass balance computations are dominated by the uncertainty in the accumulation rate, different accumulation and precipitation models have been included in GGDS, such as the Bender (1984) and the Ohmura and Reeh accumulation maps (1991). to take advantage of the information from the recent German and PARCA ice cores a new accumulation map has been compiled by using universal kriging (Csatho 1997). Additional enhancements to this depiction are expected with the improved spatial coverage of glaciological observations supplied by the PARCA investigation. The current status of GGDS is reported here.

Derived from text

Mass Distribution; Thickness; Land Ice; Glaciers; Glaciology

19990071187 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Measurement of HO2 and Other Trace Gases in the Stratosphere using a High Resolution Far-Infrared Spectrometer ***Final Report, 1 Apr. 1998 - 31 Mar. 1999***

Traub, Wesley A., Smithsonian Astrophysical Observatory, USA; Chance, Kelly V., Smithsonian Astrophysical Observatory, USA; June 1999; 6p; In English

Contract(s)/Grant(s): NSG5-175; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report is a continuation of the analysis of data from past flights, exploring issues such as radical partitioning, stratospheric transport, and the ozone budget.

CASI

Peroxides; Dioxides; Trace Elements; Gas Analysis; Ozone; Atmospheric Composition; Photochemical Reactions

19990071193 NASA Goddard Space Flight Center, Greenbelt, MD USA

Seasonal and Interannual Variability of the Stratosphere Diagnosed from UKMO TOVS Data

Scaife, A. A., Meteorological Office, UK; Austin, J., Meteorological Office, UK; Butchart, N., Meteorological Office, UK; Pawson, S., NASA Goddard Space Flight Center, USA; Keil, M., Meteorological Office, UK; Nash, J., Meteorological Office, UK; James, I. N., Reading Univ., UK; 1999; In English; Sponsored in part by the TASTE CEC and EuroGRIPS CEC

Contract(s)/Grant(s): NAS5-98181; ENV4-CT-96-0325; ENV4-ST95-0123; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We describe the UK Meteorological Office (UKMO) TOVS analyses of the period since 1979 and show that the record of satellite radiance measurements is now long enough to capture most of the year-to-year variability in the stratosphere. Given this, we construct a statistically stable climatology of the stratosphere. This state shows the seasonal asymmetry in both the extratropical and tropical lower stratosphere. We examine the interannual variability in more detail: in the extratropics, the northern hemisphere shows a pattern of interannual variability that increases monotonically towards the pole whereas the southern winter stratosphere shows the largest interannual variability in a collar of high values surrounding almost no variability over the pole; in the tropics, analyses of TIROS Operational Vertical Sounder (TOVS) data clearly show the quasi-biennial and semi-annual oscillations in zonal wind. by comparing three methods of analysis we conclude that meridional resolution is one of the most important factors for accurate analysis of stratospheric winds over the equator. Finally, temperature trends are calculated directly from the satellite radiance data and these indicate a clear cooling throughout much of the stratosphere. This rate of cooling increases with height above the tropopause and it reaches 2K per decade in the upper stratosphere.

Author

Annual Variations; Climatology; Northern Hemisphere; Satellite Observation; Satellite Sounding; Stratosphere

19990071219 NASA Goddard Space Flight Center, Greenbelt, MD USA

Using a Genetic Algorithm to Model Broadband Regional Waveforms for Crustal Structure in the Western USA

Bhattacharyya, Joydeep, NASA Goddard Space Flight Center, USA; Sheehan, Anne F., NASA Goddard Space Flight Center, USA; Tiampo, Kristy, NASA Goddard Space Flight Center, USA; Rundle, John, NASA Goddard Space Flight Center, USA; Bulletin of the Seismological Society of America; February 1999; Volume 89, No. 1, pp. 202-214; In English; Sponsored in part by the Petroleum Research Fund

Contract(s)/Grant(s): NAG5-3054; NGT5-30025; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this study, we analyze regional seismograms to obtain the crustal structure in the eastern Great Basin and western Colorado plateau. Adopting a for- ward-modeling approach, we develop a genetic algorithm (GA) based parameter search technique to constrain the one-dimensional crustal structure in these regions. The data are broadband three-component seismograms recorded at the 1994-95 IRIS PASSCAL Colorado Plateau to Great Basin experiment (CPGB) stations and supplemented by data from U.S. National Seismic Network (USNSN) stations in Utah and Nevada. We use the southwestern Wyoming mine collapse event (M(sub b) = 5.2) that occurred on 3 February 1995 as the seismic source. We model the regional seismograms using a four-layer crustal model with constant layer parameters. Timing of teleseismic receiver functions at CPGB stations are added as an additional constraint in the modeling. GA allows us to efficiently search the model space. A carefully chosen fitness function and a windowing scheme are added to the algorithm to prevent search stagnation. The technique is tested with synthetic data, both with and without random Gaussian noise added to it. Several separate model searches are carried out to estimate the variability of the model parameters. The average Colorado plateau crustal structure is characterized by a 40-km-thick crust with velocity increases at depths of about 10 and 25 km and a fast lower crust while the Great Basin has approximately 35- km-thick crust and a 2.9-km-thick sedimentary layer.

Author

Mathematical Models; Waveforms; Broadband; Crustal Fractures; Seismograms; Research; Seismic Waves; Genetic Algorithms

19990071220 Colorado Univ., Cooperative Inst. for Research in Environmental Sciences, Boulder, CO USA

Modeling the Volcanic Source at Long Valley, CA, Using a Genetic Algorithm Technique ***Final Report***

Tiampo, Kristy F., Colorado Univ., USA; [1999]; 10p; In English

Contract(s)/Grant(s): NGT5-30025; ESS/96-0139; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this project, we attempted to model the deformation pattern due to the magmatic source at Long Valley caldera using a real-value coded genetic algorithm (GA) inversion similar to that found in Michalewicz, 1992. The project has been both successful and rewarding. The genetic algorithm, coded in the C programming language, performs stable inversions over repeated trials, with varying initial and boundary conditions. The original model used a GA in which the geophysical information was coded into the fitness function through the computation of surface displacements for a Mogi point source in an elastic half-space. The program was designed to invert for a spherical magmatic source - its depth, horizontal location and volume - using the known surface deformations. It also included the capability of inverting for multiple sources.

Author

Models; C (Programming Language); Boundary Conditions; Deformation; Genetic Algorithms; Volcanoes

19990071221 NASA Ames Research Center, Moffett Field, CA USA

Observations of Convective and Dynamical Instabilities in Tropopause Folds and their Contribution to Stratosphere-Troposphere Exchange

Cho, John Y. N., Massachusetts Inst. of Tech., USA; Newell, Reginald E., Massachusetts Inst. of Tech., USA; Bui, T. Paul, NASA Ames Research Center, USA; Browell, Edward V., NASA Langley Research Center, USA; Fenn, Martha A., NASA Langley Research Center, USA; Gary, Bruce L., Jet Propulsion Lab., California Inst. of Tech., USA; Mahoney, Michael J., Jet Propulsion Lab., California Inst. of Tech., USA; Gregory, Gerald L., NASA Langley Research Center, USA; Sachse, Glen W., NASA Langley Research Center, USA; Vay, Stephanie A., NASA Langley Research Center, USA; [1999]; 48p; In English

Contract(s)/Grant(s): NAG2-1105; No Copyright; Avail: Issuing Activity, Hardcopy

With aircraft-mounted in-situ and remote sensing instruments for dynamical, thermal. and chemical measurements, we studied two cases of tropopause folding. In both folds we found Kelvin-Helmholtz billows with horizontal wavelength of about 900 m and thickness of about 120 m. In one case the instability was effectively mixing the bottomside of the fold, leading to the transfer of stratospheric air into the troposphere. Also we discovered in both cases small-scale secondary ozone maxima shortly after the aircraft ascended past the topside of the fold that corresponded to regions of convective instability. We interpreted this phenome-

non as convectively breaking gravity waves. Therefore, we posit that convectively breaking gravity waves acting on tropopause folds must be added to the list of important irreversible mixing mechanisms leading to stratosphere-troposphere exchange.
Author
Observation; Convection; Dynamic Characteristics; Tropopause; Stratosphere; Kelvin-Helmholtz Instability

19990071222 NASA Langley Research Center, Hampton, VA USA
Evidence of Convection as a Dominant Source of Condensation Nuclei in the Northern Midlatitude Upper Troposphere
Wang, Y., Georgia Inst. of Tech., USA; Liu, S. C., Georgia Inst. of Tech., USA; Anderson, B. E., NASA Langley Research Center, USA; Kondo, Y., Nagoya Univ., Japan; Gregory, G. L., NASA Langley Research Center, USA; Sachse, G. W., NASA Langley Research Center, USA; Vay, S. A., NASA Langley Research Center, USA; Blake, D., California Univ., USA; Singh, H. B., NASA Ames Research Center, USA; Thompson, A. M., NASA Goddard Space Flight Center, USA; [1999]; 21p; In English; No Copyright; Avail: Issuing Activity, Hardcopy

We examine concurrent upper tropospheric measurements of CN (diameter greater than 4 nm). NO, and NO(Y) during the SONEX Experiment over the North Atlantic (Oct.-Nov., 1997). Elevated CN and NO(Y) concentrations observed in the upper troposphere are attributed largely to enhancements in convective outflows. We estimate that less than 7% of observed high-CN plumes (greater than 10000 /cc) may be attributed to aircraft emissions. Dilution of high-CN convective and aircraft plumes appears to be much more rapid than losses of NO(X) and CN by oxidation and coagulation, respectively, and accounts for much of observed CN concentrations. When taking into account of different time scales against dilution for observable aircraft and convective high-CN plumes (estimated to be 1:4), the contribution by aircraft emissions to CN concentrations is significant, about 20% of the convective source. We find no evidence that particle formation in convective plumes is limited by OH oxidation of SO2.
Author
Troposphere; Carbon; Nitrogen; Nitrogen Oxides; Sulfur Dioxides; Observation; Condensation Nuclei

19990071231 NASA Marshall Space Flight Center, Huntsville, AL USA
Inner Magnetospheric Superthermal Electron Transport: Photoelectron and Plasma Sheet Electron Sources
Khazanov, G. V., Alaska Univ., USA; Liemohn, M. W., NASA Marshall Space Flight Center, USA; Kozyra, J. U., Michigan Univ., USA; Moore, T. E., NASA Goddard Space Flight Center, USA; Journal of Geophysical Research; Oct. 01, 1998; ISSN 0148-0227; Volume 103, No. A10, pp. 23,485-23,501; In English; Original contains color illustrations
Contract(s)/Grant(s): NSF ATM-97-10326; NSF ATM-98-96049; NSF ATM-98-00830; NAG5-6976; UPN-310-10-16
Report No.(s): Paper-98JA02291; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Two time-dependent kinetic models of superthermal electron transport are combined to conduct global calculations of the nonthermal electron distribution function throughout the inner magnetosphere. It is shown that the energy range of validity for this combined model extends down to the superthermal-thermal intersection at a few eV, allowing for the calculation of the entire distribution function and thus an accurate heating rate to the thermal plasma. Because of the linearity of the formulas, the source terms are separated to calculate the distributions from the various populations, namely photoelectrons (PEs) and plasma sheet electrons (PSEs). These distributions are discussed in detail, examining the processes responsible for their formation in the various regions of the inner magnetosphere. It is shown that convection, corotation, and Coulomb collisions are the dominant processes in the formation of the PE distribution function and that PSEs are dominated by the interplay between the drift terms. of note is that the PEs propagate around the nightside in a narrow channel at the edge of the plasmasphere as Coulomb collisions reduce the fluxes inside of this and convection compresses the flux tubes inward. These distributions are then recombined to show the development of the total superthermal electron distribution function in the inner magnetosphere and their influence on the thermal plasma. PEs usually dominate the dayside heating, with integral energy fluxes to the ionosphere reaching 10(exp 10) eV/sq cm/s in the plasmasphere, while heating from the PSEs typically does not exceed 10(exp 8) eV/sq cm/s. On the nightside, the inner plasmasphere is usually unheated by superthermal electrons. A feature of these combined spectra is that the distribution often has upward slopes with energy, particularly at the crossover from PE to PSE dominance, indicating that instabilities are possible.
Author
Convection; Electron Distribution; Inner Radiation Belt; Photoelectrons; Electron Transfer; Magnetospheric Electron Density; Electron Sources; Ionospheric Electron Density; Corotation; Coulomb Collisions

19990071276 Alaska Univ., Geophysical Inst., Fairbanks, AK USA
Aurora
Akasofu, Syun–Ichi, Alaska Univ., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 1-11; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

The aurora is the luminous emission of atoms and molecules in the polar upper atmosphere that appears as permanent, ring-shaped belts called the auroral oval around the north and south geomagnetic poles. It is associated with a global electrical discharge process that requires about 1 million MW or more. In fact, electric currents of a few million amperes flow along the auroral oval. Except for specialized books for professionals in this field, however, most books describe the aurora as a result of the direct entry of energetic particles from the Sun toward the polar region. This view is too simplistic in terms of the progress we have made in this field since the advent of the satellite age. Indeed, we have begun to understand the generator process that powers the auroral discharge. In this article, the auroral process is described in terms of this latest knowledge. The Sun emits an enormous amount of energy in the form of charged particles in addition to the 6000 K blackbody radiation that is crucial for life on Earth. This particular flow of charged particles is called solar wind. It originates in the corona, the uppermost part of the solar atmosphere, which has a temperature of more than 1,000,000 K. Because of its high temperature, the coronal gas is ionized. An ionized gas is called a plasma. Therefore, the solar wind is a supersonic plasma flow that consists mainly of protons and electrons. At the distance of the Earth, the speed of the solar wind is usually about 400-500 km per second. At the present time, there is no accepted theory on the generation of the solar wind. The Voyager spacecraft is still detecting the solar wind at the distance of Neptune and beyond.
Derived from text
Auroras; Plasmas (Physics); Molecules; Magnetic Poles; High Temperature Gases; Energetic Particles; Electrons; Coronas; Charged Particles

19990071277 Leicester Univ., Dept. of Physics, UK
The Earth's Magnetosphere
Cowley, S. W. H., Leicester Univ., UK; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 13-22; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

The Earth's magnetosphere is composed of two essential ingredients. The first is the Earth's magnetic field, generated by currents flowing in the Earth's core. Outside the Earth this field has the same form as that of a bar magnet, aligned approximately with the Earth's spin axis. The second ingredient is the solar wind, a fully ionized hydrogen/ helium plasma that streams continuously outward from the Sun into the solar system at speeds of approx. 300-800 km/s. This plasma wind is pervaded by a large-scale interplanetary magnetic field (IMF), which plays a crucial role in the Earth's interaction with the solar wind. There is also a third ingredient that plays an important role: The Earth's ionosphere. The upper atmosphere is partially ionized by solar far-ultraviolet and X-rays above altitudes of approx. 100 km. The ionosphere forms a second source of plasma for the magnetosphere, mainly of protons and singly charged helium and oxygen.
Author
Earth Magnetosphere; Solar Wind; Ionized Gases; Interplanetary Magnetic Fields; Hydrogen Plasma

19990071278 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA
Radiation Belts
VanAllen, James A., Iowa Univ., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 23-28; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

In this article, I describe some of the reasons for the existence of radiation belts around the Earth and other planets and some of their basic properties. A radiation belt is an important component of a larger and more complex physical system called a magnetosphere. Elsewhere the similarities and differences among the diverse and dynamic planetary magnetospheres that have been investigated thus far are discussed in a more general context. A magnetosphere is that region surrounding a planet within which the planet's intrinsic magnetic field has an important role in physical phenomena involving electrically charged particles. But even unmagnetized plan- ets, satellites of planets, comets, and (presumably) asteroids exhibit similar rudimentary plasma physical effects. The Earth's magnetosphere extends about 10 planetary radii toward the Sun and hundreds of times that far in the direction away from the Sun. Its outer boundaries and much of its physical dynamics are attributed to the solar wind-the tenuous, ionized, magnetized gas (plasma) that flows outward from the solar corona through interplanetary space. The solar wind does not readily penetrate the geomagnetic field but compresses and confines the field around the Earth. The sunward boundary is located where the external pressure of the flowing solar wind equals the internal pressure of the geomagnetic field. A complex process of interconnection of the solar wind's magnetic field and the geomagnetic field stretches out the magnetic field in the direction away from the Sun, creating the long magnetotail.
Derived from text
Radiation Belts; Charged Particles; Earth Magnetosphere; Geomagnetism; Interplanetary Space; Ionized Gases; Magnetic Fields; Physical Factors; Planetary Magnetic Fields

19990071280 National Center for Atmospheric Research, High Altitude Observatory, Boulder, CO USA

The Ionosphere and Upper Atmosphere

Richmond, A. D., National Center for Atmospheric Research, USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 35-44; In English; See also 19990071275

Contract(s)/Grant(s): NASA Order W-17385; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

Because our society is becoming increasingly dependent on technological systems that can be affected by ionospheric phenomena during geomagnetic storms, the ionosphere, its electrodynamics, and its coupling with the neutral atmosphere and the magnetosphere are being studied as part of a coordinated program of ”space weather” research. This research seeks to characterize the variability of ionospheric density and electric currents during magnetic storms, and to determine to what extent valid predictions of those phenomena and their effects can be made.

Author

Ionospheric Currents; Upper Atmosphere; Magnetic Storms

19990071281 Alaska Univ., Geophysical Inst., Fairbanks, AK USA

Red Sprites and Blue Jets: Transient Electrical Effects of Thunderstorms on the Middle and Upper Atmospheres

Sentman, D. D., Alaska Univ., USA; Wescott, E. M., Alaska Univ., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 45-55; In English; See also 19990071275

Contract(s)/Grant(s): NAG5-5019; NSF ATM 92-17161; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

Four new and diverse classes of energetic electrical effects of thunderstorms have been documented over the past 5 years. Two of these classes, called red sprites and blue jets, are large-scale optical emissions excited by lightning. Together they span the entire distance between tops of some thunderstorms and the ionosphere. Gamma-ray (1 MeV) bursts and extremely intense VHF radio bursts some 10(exp 4) times larger than normally produced by lightning have been observed from low Earth orbit and are also believed to originate in thunderstorms. Taken together, these newly discovered classes of natural electrical phenomena provide evidence that thunderstorms are both more energetic and capable of electrically interacting with the upper atmosphere and ionosphere to a far greater degree than has been appreciated in the past. Here, characteristics of red sprites and blue jets are summarized.

Author

Thunderstorms; Upper Atmosphere; Very High Frequencies; Lightning

19990071282 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Magnetic Storms

Tsurutani, Bruce T., Jet Propulsion Lab., California Inst. of Tech., USA; Gonzalez, Walter D., Instituto Nacional de Pesquisas Espacias, Brazil; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 57-66; In English; See also 19990071275; Original contains color illustrations; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

One of the oldest mysteries in geomagnetism is the linkage between solar and geomagnetic activity. The 11-year cycles of both the numbers of sunspots and Earth geomagnetic storms were first noted by Sabine. A few years later, speculation on a causal relationship between flares and storms arose when Carrington reported that a large magnetic storm followed the great September 1859 solar flare. However, it was not until this century that a well-accepted statistical survey on large solar flares and geomagnetic storms was performed, and a significant correlation between flares and geomagnetic storms was noted. Although the two phenomena, one on the Sun and the other on the Earth, were statistically correlated, the exact physical linkage was still an unknown at this time. Various hypotheses were proposed, but it was not until interplanetary spacecraft measurements were available that a high-speed plasma stream rich in helium was associated with an intense solar flare. The velocity of the solar wind increased just prior to and during the helium passage, identifying the solar ejecta for the first time. Space plasma measurements and Skylab’s coronagraph images of coronal mass elections (CMES) from the Sun firmly established the plasma link between the Sun and the Earth. One phenomenon associated with magnetic storms is brilliant ”blood” red auroras, as shown.

Author

Magnetic Storms; Geomagnetism; Solar Activity; Solar Wind; Cycles; Correlation; Coronagraphs

19990071333 National Oceanic and Atmospheric Administration, Atmospheric Turbulenceand Diffusion Div., Oak Ridge, TN USA

Summary of the Lovanger International Workshop on Turbulence and Diffussion in the Stable Planetary Boundary Layer *Final Report*

Nappo, Carmen J.; Johannson, Per–Erik; Mar. 15, 1999; 43p; In English

Report No.(s): AD-A365202; ARO-37328.1-EV-CF; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Topics addressed included: (1) the very stable boundary layer, (2) gravity wave/turbulence interactions, (3) modeling the stable boundary layer, (4) future observations and new measurement techniques, (5) the role of condensation (fog) and radiative flux divergence, and (6) atmospheric diffusion. Invited papers appear in this special issue. Workshop discussions, informal presentations, and specific recommendations are summarized. Workshop participants and organizers are presented in the Appendix.

DTIC

Atmospheric Physics; Turbulent Diffusion; Turbulence Models; Planetary Boundary Layer; Atmospheric Diffusion

19990076099 Sandia National Labs., Albuquerque, NM USA

Tracer Tests in a Fractured Dolomite: 4. Double Porosity, Multiple-Rate Mass Transfer Processes in Two-Well Convergent Flow Tests; Water Resources Research

Haggerty, R.; McKenna, S. A.; Meigs, L. C.; Mar. 04, 1999; 12p; In English

Report No.(s): DE00-004169; SAND98-2549J; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Two-well convergent-flow tracer tests conducted in the Culebra dolomite (Rustler Formation, New Mexico, USA) are analyzed with both single-and multiple- rate, double-porosity models. Parameter estimation is used to determine the mean and standard deviation of a log-normal distribution of diffusion rate coefficients as well as the advective porosity and longitudinal dispersivity. At two different test sites, both multi-rate and single-rate models are capable of accurately modeling the observed data. Estimated model parameters are tested against breakthrough curves obtained along the same transport pathway at a different pumping rate. Implications of the multirate mass-transfer model at time and length scales greater than those of the tracer tests include the instantaneous saturation of a fraction of the matrix and the possibility of a fraction of the matrix remaining unsaturated at long times.

NTIS

Dolomite (Mineral); Normal Density Functions; Diffusion Coefficient; Fractures (Materials)

47
METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

19990070928 NASA Goddard Space Flight Center, Greenbelt, MD USA

Approximation for Horizontal Photon Transport in Cloud Remote Sensing Problems

Plantnick, Steven, Maryland Univ. Baltimore County, USA; May 18, 1999; 32p; In English

Contract(s)/Grant(s): NAG5-6996; No Copyright; Avail: Issuing Activity, Hardcopy

The effect of horizontal photon transport within real-world clouds can be of consequence to remote sensing problems based on plane-parallel cloud models. An analytic approximation for the root-mean-square horizontal displacement of reflected and transmitted photons relative to the incident cloud-top location is derived from random walk theory. The resulting formula is a function of the average number of photon scatterings, and particle asymmetry parameter and single scattering albedo. In turn, the average number of scatterings can be determined from efficient adding/doubling radiative transfer procedures. The approximation is applied to liquid water clouds for typical remote sensing solar spectral bands, involving both conservative and non-conservative scattering. Results compare well with Monte Carlo calculations. Though the emphasis is on horizontal photon transport in terrestrial clouds, the derived approximation is applicable to any multiple scattering plane-parallel radiative transfer problem. The complete horizontal transport probability distribution can be described with an analytic distribution specified by the root-mean-square and average displacement values. However, it is shown empirically that the average displacement can be reasonably inferred from the root-mean-square value. An estimate for the horizontal transport distribution can then be made from the root-mean-square photon displacement alone.

Author

Photons; Clouds (Meteorology); Remote Sensing; Horizontal Distribution; Radiative Transfer; Approximation

19990070931 NASA Goddard Space Flight Center, Greenbelt, MD USA

Cloud Liquid Water, Mean Droplet Radius and Number Density Measurements Using a Raman Lidar

Whiteman, David N., NASA Goddard Space Flight Center, USA; Melfi, S. Harvey, NASA Goddard Space Flight Center, USA; [1999]; 16p; In English; No Copyright; Avail: Issuing Activity, Hardcopy

A new technique for measuring cloud liquid water, mean droplet radius and droplet number density is outlined. The technique is based on simultaneously measuring Raman and Mie scattering from cloud liquid droplets using a Raman lidar. Laboratory experiments on liquid micro-spheres have shown that the intensity of Raman scattering is proportional to the amount of liquid present in the spheres. This fact is used as a constraint on calculated Mie intensity assuming a gamma function particle size distribution. The resulting retrieval technique is shown to give stable solutions with no false minima. It is tested using Raman lidar data where the liquid water signal was seen as an enhancement to the water vapor signal. The general relationship of retrieved average radius and number density is consistent with traditional cloud physics models. Sensitivity to the assumed maximum cloud liquid water amount and the water vapor mixing ratio calibration are tested. Improvements to the technique are suggested.
Author

Cloud Physics; Drops (Liquids); Water Vapor; Density Measurement; Particle Size Distribution; Procedures

19990070941 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Impact of AVHRR Images for Classifying Cloud Patterns Using ITPP5.0 Model ***Impacto das Imagens AVHRR na Classificacao de Padroes de Nebulosidade Utilizando o Modelo ITPP5.0***

Nogueira, Jorge Luiz Martins, Instituto Nacional de Pesquisas Espacias, Brazil; 1999; 96p; In Portuguese; Original contains color illustrations

Report No.(s): INPE-7118-TDI/670; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The aim of this work is to incorporate data extracted from the Advanced Very High Resolution Radiometer (AVHRR) sensor into International TOVS Processing Package (ITPP5.0) model and then to evaluate its performance for classifying clouds coverage patterns at soundings locations. Also, a brief analysis of the resulting temperature and moisture profiles is presented. The analysis was based on radiance data from the satellite NOAA-14, afternoon passages, for the 14 th _ 16 th October, 1997 period, and covering the Southern region of Brazil and vicinities. The ITPP5.0 model was set up with different processing options involving internal data (regression coefficients), surface temperature data and temperature profile from numerical weather forecasting model. The results obtained show that in general the cloud pattern is better classified with the aid of AVHRR data. It was also observed that the processing of anchoring surface temperature influences the temperature profile up to the equivalent height of 700 hPa. On the other hand the use of temperature and moisture profiles as a first guess affects the behaviour of the resulting ITPP5.0 profiles in all tropospheric levels.
Author

Data Acquisition; Surface Temperature; Radiance; Numerical Weather Forecasting; Moisture

19990070947 NASA Marshall Space Flight Center, Huntsville, AL USA

Time of Arrival Retrievals on an Oblate Spheroidal Earth

Solakiewicz, Richard J., Chicago State Univ., USA; Koshak, William J., Chicago State Univ., USA; 1999; 1p; In English; Atmospheric Electricity, 6-11 Jun. 1999, Guntersville, AL, USA; Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

The current National Lightning Detection Network (NLDN) retrieval algorithm is based on a chi sq minimization. This numerical approach finds the lightning ground strike location on an ellipsoidal Earth that optimally agrees with multiple station time of arrival (TOA) measurements and, if available, magnetic bearing data. In addition, an analytic solution for determining lightning ground strike locations on a spherical Earth using only TOA data has been recently introduced. In the current work, a quasi-analytic approach is suggested for determining lightning ground strike locations on an oblate spheroidal Earth by perturbing the spherical model results proposed by Koshak. Latitude, longitude, time, and the associated perturbed quantities are related through terms in a Taylor series. The correction terms may be considered collectively as a vector which may be calculated by an overconstrained inversion. Expressions for the derivatives contained in the Taylor series are given in terms of elliptic integrals.
Author

Lightning; Detection; Derivation; Earth (Planet); Spheroids

19990070952 NASA Marshall Space Flight Center, Huntsville, AL USA

Observations of Hurricane Georges During the Third Convection and Moisture EXperiment (CAMEX-3)

Guillory, Anthony R., NASA Marshall Space Flight Center, USA; Hood, Robbie E., NASA Marshall Space Flight Center, USA; 1999; 1p; In English; Interdepartmental Hurricane, 8-12 Feb. 1999, Biloxi, MS, USA; Copyright; Avail: Issuing Activity; Abstract

Only, Hardcopy, Microfiche

The third Convection and Moisture EXperiment (CAMEX-3) was conducted from 6 August - 27 September 1998. CAMEX is a series of field experiments sponsored by the Earth Science Enterprise of the National Aeronautics and Space Administration (NASA). The overall goal of CAMEX-3 was to study atmospheric water vapor and precipitation processes using a unique array of aircraft, balloon, and land-based remote sensors for research in tropical cyclone development, tracking, intensification, and landfalling situations using NASA-funded aircraft and surface remote sensing instrumentation. This project collected high spatial and temporal information of hurricane structure, dynamics, and motion. The ER-2 and DC-8 were the primary NASA aircraft used in the deployment flying at altitudes of 65,000 and 35,000 feet, respectively. In addition, coordinated flights with NOAA WP-3 and Air Force Reserve Hurricane Hunters C-130 aircraft were developed so that some missions involved as many as five to six aircraft. This presentation will highlight the CAMEX-3 research. It will focus primarily on the unique observations gained while studying Hurricane Georges during four missions: 1) near St. Croix, 2) over the Domican Republic, 3) over the Florida Keys, and 4) near landfall on the Mississippi coast. In particular, observations obtained through the use of the ER-2 of the orographically forced precipitation as it interacted with Hispaniola on 22 September 1998 will be shown.

Author

Hurricanes; Convection; Atmospheric Moisture; Water Vapor; Earth Sciences; Precipitation (Meteorology); Satellite Observation

19990070954 NASA Marshall Space Flight Center, Huntsville, AL USA

Overview of the Third Convection and Moisture EXperiment (CAMEX-3)

Hood, Robbie, NASA Marshall Space Flight Center, USA; Kakar, Ramesh, NASA, USA; 1999; 1p; In English; Hurricanes and Tropical Metrorology, 9-15 Jan. 1999, Dallas, TX, USA; Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

The Convection and Moisture EXperiment (CAMEX) is a series of field research investigations sponsored by the National Aeronautics and Space Administration (NASA). The third field campaign in the CAMEX series (CAMEX-3) is scheduled for 6 August - 23 September, 1998 to study tropical cyclone development, tracking, intensification, and landfalling impacts using NASA-funded aircraft remote sensing instrumentation. This study will yield high spatial and temporal information of hurricane structure, dynamics, and motion. These data, when analyzed within the context of more traditional aircraft, satellite, and ground-based radar observations, should provide additional insight to hurricane modelers and forecasters who continually strive to improve hurricane predictions. During CAMEX-3, NASA will deploy a high attitude ER-2 and medium altitude DC-8 aircraft from Patrick Air Force Base, Florida. Ground-based instrumentation will also be stationed on Andros Island, Bahamas. Opportunities for coordinated aircraft missions with the National Oceanic and Atmospheric Administration (NOAA) Hurricane Research Division are also being planned. This presentation will provide an overview of the CAMEX-3 missions and key case studies sampled. Data availability and access will also be discussed.

Author

Convection; Tropical Storms; Radar Tracking; Hurricanes; Atmospheric Moisture

19990071152 Ohio State Univ., Byrd Polar Research Center, Columbus, OH USA

Evaluation of Recent Greenland Ice Sheet Precipitation Studies

Bromwich, David H., Ohio State Univ., USA; Chen, Qiu–Shi, Ohio State Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 74-79; In English; See also 19990071134; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Observations of precipitation over Greenland are limited and generally inaccurate. These limitations have given rise to the use of several different atmospheric methods for examining precipitation variability over Greenland. Atmospherically derived precipitation estimates typically rely on atmospheric numerical analyses in order to retrieve values. The high spatial and temporal resolution furnished by these methods provides a valuable climatological record that cannot presently be obtained from other sources. The various atmospheric methods presently available for precipitation retrieval over this Arctic ice sheet are examined in comparison to glaciological data and to each other (material adapted from Bromwich (1998)). In addition, we compare the retrieved annual precipitation using the U.S. Navy 10 arc minute topographic data set with that obtained by using Ekholm (1996)'s topography. The objective of this study is to develop an enhanced dynamic method for retrieving precipitation over Greenland from the atmospheric analyzed fields. Precipitation and accumulation over Greenland from 1979 to 1998 and their seasonal and interannual variations will be estimated by the enhanced method. How the atmospheric general circulation and weather systems control precipitation and accumulation over Greenland will also be studied.

Author

Arctic Regions; Climatology; Climate Change; Land Ice; Glaciers; Glaciology; Topography

19990071223 NASA Goddard Space Flight Center, Greenbelt, MD USA

Cloud 3D Effects Evidenced in LANDSAT Power Spectra and Autocorrelation Functions

Oreopoulos, Lazaros, NASA Goddard Space Flight Center, USA; Marshak, Alexander, NASA Goddard Space Flight Center, USA; Cahalan, Robert F., NASA Goddard Space Flight Center, USA; Wen, Guoyong, NASA Goddard Space Flight Center, USA; Jul. 21, 1999; 36p; In English; No Copyright; Avail: Issuing Activity, Hardcopy

An analysis of nadir reflectivity Fourier spatial power spectra and autocorrelation functions at solar wavelengths and for cloudy conditions has been carried out. The data come from LANDSAT Thematic Mapper (TM) observations, while Monte Carlo (MC) simulations are used to aid the interpretation of the LANDSAT results. We show that radiative processes produce consistent signatures on power spectra and autocorrelation functions. The former take a variety of forms not shown or explained in previous observational studies. We demonstrate that the TM spectra can potentially be affected by both radiative ”roughening” at intermediate scales (approx. 1 -5 km), being more prevalent at large solar zenith angles, and the already documented radiative ”smoothing” at small scales (less than 1 km). These processes are wavelength dependent, as shown by systematic differences between conservative (for cloud droplets) TM band 4 (approx. 0.8 microns) and absorbing band 7 (approx. 2.2 microns): band 7 exhibits more roughening and less smoothing. This is confirmed quantitatively by comparing least-squared fitted power spectral slopes for the two bands. It is also corroborated by a slower decrease with distance of autocorrelation function values for band 4 compared to band 7. The appearance of roughening at large solar zenith angles is a result of side illumination and shadowing and adds an additional complexity to the power spectra. MC spectra are useful in illustrating that scale invariant optical depth fields can produce complex power spectra that take a variety of shapes under different conditions. We show that radiative roughening increases with the decrease of single scattering albedo and with the increase of solar zenith angle (as in the observations). For high Sun there is also a clear shift of the radiative smoothing scale to smaller values as droplet absorption increases. The shape of the power spectrum is sensitive to the magnitude and type of cloud top height variability, with the spectral signatures of decorrelation between reflectance and optical depth at large scales becoming stronger as the magnitude of cloud top variations increase. Finally, the usefulness of power spectral analysis in evaluating the skill of novel optical depth retrieval techniques in removing 3D radiative effects is demonstrated. New techniques using inverse Non-local Independent Pixel Approximation (NIPA) and Normalized Difference of Nadir Reflectivity (NDNR) yield optical depth fields which better match the scale-by-scale variability of the true optical depth field.

Author

Autocorrelation; Cloud Height Indicators; Fourier Analysis; Optical Thickness; Power Spectra; Three Dimensional Models; Scattering; Solar Position; Spectrum Analysis; Thematic Mappers (LANDSAT)

19990071650 National Center for Atmospheric Research, Mesoscale and Microscale Meteorology Div., Boulder, CO USA

User’s Guide to the MM5 Adjoint Modeling System

Zou, X.; Huang, W.; Xiao, Q.; Jul. 1998; 106p; In English

Report No.(s): PB99-155244; NCAR/TN-437-IA; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

Contents include the following: Introduction (Horizontal Grid Specification; Vertical coordinate; Time integration, Lateral boundary condition); Getting Started (File Naming Conventions; Code Testing; Adjoint Modeling System Source Code); MM5 Forecast (Purpose; Forecast Job deck; The Main forecast program: mm5fcst.F); Sensitivity Experiment (Purpose; The main routine of the sensitivity calculation: sens.F; A more general adjoint sensitivity study; The job deck of the sensitivity calculation: sens.deck); 4D-VAR; Conclusion; and References.

NTIS

User Manuals (Computer Programs); Mesometeorology; Micrometeorology

19990071806 NASA Marshall Space Flight Center, Huntsville, AL USA

Temperature Crosstalk Sensitivity of the Kummerow Rainfall Algorithm

Spencer, Roy W., NASA Marshall Space Flight Center, USA; Petrenko, Boris, Universities Space Research Association, USA; 1999; 1p; In English; 6th; Microwave Radiometry, 16-18 Mar. 1999, Florence, Italy; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Even though the signal source for passive microwave retrievals is thermal emission, retrievals of non-temperature geophysical parameters typically do not explicitly take into account the effects of temperature change on the retrievals. For global change research, changes in geophysical parameters (e.g. water vapor, rainfall, etc.) are referenced to the accompanying changes in temperature. If the retrieval of a certain parameter has a cross-talk response from temperature change alone, the retrievals might not be very useful for climate research. We investigated the sensitivity of the Kummerow rainfall retrieval algorithm to changes in

air temperature. It was found that there was little net change in total rainfall with air temperature change. However, there were non-negligible changes within individual rain rate categories.
Author
Temperature Effects; Crosstalk; Sensitivity; Algorithms; Rain

19990072351 NASA Marshall Space Flight Center, Huntsville, AL USA
Comparison of CO2 Lidar Backscatter with Particle Size Distribution and GOES-7 Data in Hurricane Juliette
Jarzembski, Maurice, NASA Marshall Space Flight Center, USA; Pueschel, R. F., NASA Marshall Space Flight Center, USA; Srivastava, Vandana, NASA Marshall Space Flight Center, USA; McCaul, E. W., Jr., NASA Marshall Space Flight Center, USA; Cutten, Dean R., NASA Marshall Space Flight Center, USA; Jedlovec, Gary J., NASA Marshall Space Flight Center, USA; Atkinson, R. J., NASA Marshall Space Flight Center, USA; 1999; 1p; In English; 10th; Coherent Laser Radar Technology and Applications, 28 Jun. 1999, Mt. Hood, OR, USA; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Backscatter measurements using 9.1 and 10.6 micron continuous wave lidars were obtained along with particle size distributions in 1995 Hurricane Juliette at altitude approximately 11.7 km. Agreement between lidar backscatter and cloud particle size distribution was excellent. Measurements also correlated well with concurrent GOES-7 infrared images of cloud top height.
Author
Backscattering; Carbon Dioxide; Particle Size Distribution; GOES 7; Hurricanes; Infrared Radar; Optical Radar

19990072355 NASA Marshall Space Flight Center, Huntsville, AL USA
Real-Time Assimilation of GOES-Derived Products into A Mesoscale Model and It's Impact on Short-Term (06-36hr) Forecasts from 17 October 1998 through the Present
Lapenta, William M., NASA Marshall Space Flight Center, USA; Suggs, Ron, NASA Marshall Space Flight Center, USA; Jedlovec, Gary, NASA Marshall Space Flight Center, USA; McNider, Richard T., Alabama Univ., USA; 1999; 1p; 1st, 29-30 Mar. 1999, Boulder, CO, USA; Sponsored by US Weather Researcy Program; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

As the parameterizations of surface energy budgets in regional models have become more complete physically, models have the potential to be much more realistic in simulations of coupling between surface radiation, hydrology, and surface energy transfer. Realizing the importance of properly specifying the surface energy budget, many institutions are using land-surface models to represent the lower boundary forcing associated with biophysical processes and soil hydrology. However, the added degrees of freedom due to inclusion of such land-surface schemes require the specification of additional parameters within the model system such as vegetative resistances, green vegetation fraction, leaf area index, soil physical and hydraulic characteristics, stream flow, runoff, and the vertical distribution of soil moisture. Spatial heterogeneity of these parameters makes correct specification problematic since measurements are not routinely available. A technique has been developed for assimilating GOES-IR skin temperature tendencies, solar insolation, and surface albedo into the surface energy budget equation of a mesoscale model so that the simulated rate of temperature change closely agrees with the satellite observations. The technique has been successfully employed in a number of mesoscale models in case-study mode. We have taken the next step and developed a study to determine if assimilating these types of data into mesoscale models in real-time can improve short-term (648h) forecasts of temperature, relative humidity, and QPF on a daily basis over relatively large regions. Therefore, an operational modeling/assimilation system has been developed at the GHCC during the past summer that allows us to produce simulations out to 48 hours in a timely manor. The PSU/NCAR MM5 is used in a nested configuration with a 25 km grid covering the southeastern third of the US. The model has been on-line since 1 July 1998 and forecast products are posted on our web site. The satellite algorithms that generate data to be assimilated came on-line 17 October 1998. Quantitative assessment of the forecast quality is performed via traditional verification statistics. In addition, invaluable qualitative information is obtained through close collaboration with several NWSFO's who are using the MM5 products in real-time on a daily basis. The assimilation technique has been applied in an off-line mode since 17 October. Results based on bulk statistical verification of surface meteorology over the entire Southeastern US show that assimilating the GOES-derived land surface tendencies and solar radiation results in a significant reduction of the shelter air temperature and RH bias on a daily basis. In fact, the assimilation technique has produced improved temperature and RH forecasts for 97% of the 100 simulations performed to date. Work is currently underway to determine the sensitivity of the assimilation procedure to the availability of satellite data, length of assimilation period, model initialization, and synoptic-scale meteorological conditions. In addition, results from a detailed energy budget analysis using the Early Eta, our operational MM5, and the assimilation runs will help us to better understand the satellite assimilation the land-surface energy budge. Research during the spring-summer of 1999 will focus on the impact of the assimilation technique during the warm season where it is hypothesized that it can have a positive impact on QPF during conditions of weak synoptic-scale forcing.
Author
Real Time Operation; Assimilation; Mesoscale Phenomena; Forecasting; Meteorology

19990076121 Osaka Electro-Communication Univ., Japan

Characteristic Changes in Cross-Polarization Discrimination due to Lightning Discharges on Satellite-to-Ground Path

Maekawa, Yasuyuki, Osaka Electro-Communication Univ., Japan; Chang, Nion Sock, Osaka Electro-Communication Univ., Japan; Miyazaki, Akira, Osaka Electro-Communication Univ., Japan; Kojima, Toshitaka, Osaka Electro-Communication Univ., Japan; Memoirs of Osaka Electro-Communication University; 1995; ISSN 0386-4987, No. 30, pp. 79-89; In Japanese; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Rapid changes in depolarization of twelve thunderstorm events which have been obtained from the CS-3 beacon signal (19.45 Giga Hertz, right hand circular polarization) for the past four years are compared with time and location of lightning strokes around our site. Nearly half of the rapid changes are, for the first time, found to coincide with the moment of lightning strokes, which occured on the south side of the site at the distance up to about 15 kilometer. The mean canting angle of ice crystals in the thunderclouuds seems to increase clockwise before lightnings seen from the satellite and to return rapidly to horizontal direction with the discharge. The cross-polarization discrimination (XPD) values show both cases of increase (depolarization decrease) and decrease (depolarization increase) at the moment of rapid changes. The increase of XPD is possibly ascribed to random orientations of ice crystals after the electric force is released. On the other hand, the decrease of XPD can be caused by both effects of ice crystals near the lightning and those in other places, because difference between their mean canting angles may rather induce depolarization cancellation and high XPD values before the lightnings.

Author

Circular Polarization; Thunderstorms; Cross Polarization; Lightning

19990076125 Osaka Electro-Communication Univ., Japan

The East Asian Cold Outbreak and Its Effects on the Variation of the Circulation over the Pacific and the Atlantic Areas

Fujii, Morisumi, Osaka Electro-Communication Univ., Japan; Memoirs of Osaka Electro-Communication University; 1995; ISSN 0386-4987, No. 30, pp. 13-33; In Japanese; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The atmospheric circulation and its variation were studied using 850- and 200-hPa grid data compiled by NCAR during winters of Dec. ’81-Feb. ’82 and Dec.’84-Feb. ’85. In case of the cold outbreak over East Asia the development of the jet stream occurs over the area of western to central Pacific in mid-latitudes. Nearly the same time or a little later, cold outbreaks also happen to occur over North-East of Canada and the jet stream strengthens over the area of western Atlantic. The development of the jet stream over the western Pacific accompanies the deepening of the mid-Pacific trough in the upper troposphere. The deepening of the upper trough is also observed over the Atlantic. On the South side of the upper trough, the strong wind over 40 m/sec is sometimes observed in the upper troposphere over the equatorial area. The deviation of the velocity potential x of the 200 hPa wind which was obtained from x - bar-x (bar-x is the relevant winter mean) moves eastward remarkably over the eastern hemisphere, and circulates the whole earth in about two months. The period of the oscillation is about 30-40 days. The anomalies of the 850 hPa temperature and the 200 hPa zonal wind at 30 deg N correspond well to the anomaly of the 200 hPa velocity potential of the equatorial area. This means that the cold outbreaks over East Asia, the development of the convection over the equatorial area and the strengthening of the subtropical jet stream are mutually correlated. Anomalies of the 200 hPa zonal wind and the 200 hPa height changes respectively with the same sign over the Pacific and the Atlantic, and in the trough area of the eastern Pacific they variate with opposite sign to those over the Pacific and the Atlantic. The extremes of the anomaly are near the mid-Pacific and the western Atlantic, and the variations over the western Atlantic are a little retarded to those of the Pacific. The pattern of the anomaly show the multiple structure with latitudes, and changes the sign depending to the behaviors of the arctic cold air and the activities of the convection over the equatorial western Pacific.

Author

Atmospheric Circulation; Anomalies; Troposphere; Jet Streams (Meteorology)

48
OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

19990071145 Ohio State Univ., Byrd Polar Research Center, Columbus, OH USA

Local Rates of Ice Sheet Thickness Change

Hamilton, Gordon, Ohio State Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 42-44; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Local rates of ice thickness change (mass balance) are being measured at several sites on the Greenland Ice Sheet. Results will be used to identify regions of the ice sheet where large changes are occurring, the causes of which can be investigated fully in future studies. The results will also be useful for interpreting elevation changes detected by repeat airborne and spaceborne altimetry.
Author
Land Ice; Glaciers; Mass Distribution; Thickness

19990071147 Arizona Univ., Dept. of Hydrology and Water Resources, Tucson, AZ USA
Accumulation Estimates From Ice Cores
Bales, R. C., Arizona Univ., USA; Burkhart, J. F., Arizona Univ., USA; McConnell, J. R., Arizona Univ., USA; Snider, B., Arizona Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 48-53; In English; See also 19990071134; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The objective of the 1998 SHAllow COring (SHACO) field campaign was to elucidate questions regarding spatial variability of accumulation rates throughout the Greenland ice sheet. In the 1998 field season we were primarily concerned with an accumulation trend along the central-western portion of the ice sheet. In addition, data were needed to fill a large gap of information in the central and southern portions of the ice sheet. In order to achieve a spatially extensive data collection program, depth (temporal variation) was limited to 20-m so that a greater number of cores could be efficiently collected. Cores acquired under PARCA use multi-species chemical analyses of ice cores to develop accurate estimates of annual accumulation at various sites. The ice core data are also analyzed for the interannual variability of snow- accumulation rates, which 'Is a major cause of short-period variability of ice sheet elevation, and must be understood before we can infer long-term trends in ice sheet volume from observed surface elevation changes. This year's results will offer a spatially distributed record for the purposes of developing a high- resolution accumulation map of the Greenland ice sheet.
Author
Land Ice; Glaciers; Glaciology; Climatology; Climate Change

19990071191 National Health and Environmental Effects Research Lab., Western Ecology Div., Corvallis, OR USA
Effects of Habitat Alteration by Estuarine Stressors on Ecological Resources of Pacific Northwest Estuaries. Research Plan
Boese, B.; Cole, F.; DeWitt, T.; Ferraro, S.; Lamberson, J.; Feb. 1999; 286p; In English
Report No.(s): PB99-147191; EPA/600/R-99/043; No Copyright; Avail: CASI; A03, Microfiche; A13, Hardcopy

The Coastal Ecology Branch (CEB), Western Ecology Division of the US Environmental Protection Agency will initiate a research program to evaluate the effects of alterations of estuarine habitats resulting from multiple stressor sources. The research will concentrate on stressor effects on the ecological resources of estuaries of the Pacific Northwest (PNW). The research program is designed to support the general mission of the US EPA which includes the safeguarding of the natural environment upon which the health and well being of the nation's population ultimately depends. The goal of CEB research is to improve the ability to make key policy decisions on coastal environmental issues by defining key ecological processes and by developing models to predict stress-response relationships for ecological resources within Pacific Northwest estuaries at range of spatial and temporal scales. CEB research objectives are to (1) evaluate how specific estuarine habitats respond to a range of potential stressors which may lead to habitat alteration, (2) understand the influences of these stress factors at spatial scales from local to regional, and (3) develop indicators of ecological condition which may be used to evaluate estuarine status across multiple spatial scales.
NTIS
Environment Protection; Habitats; Estuaries; Coastal Ecology

19990073634 Norwegian Defence Research Establishment, Kjeller, Norway
Multidomain Solution of the Internal Wave Model
Lie, Ivar; Mar. 25, 1998; 40p; In English
Report No.(s): PB99-161606; FFI/RAPPORT-98/01714; FFIVM/670/170; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The authors present the details in the multidomain algorithms used in the internal wave model. Interface conditions and subdomain iteration techniques are discussed in detail. The authors also discuss general principles of construction of interface conditions, including the use of Neumann operators and Calderon projectors.
NTIS
Oceanography; Internal Waves; Domains

19990073635 Norwegian Defence Research Establishment, Kjeller, Norway
Some Aspects of a Model for Internal Wave Interaction
Lie, Ivar; Mar. 25, 1998; 30p; In English
Report No.(s): PB99-161598; FFI/RAPPORT-98/01715; FFIVM/670/170; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The authors present the details of some of the capabilities of the internal wave model: Dynamic boundary conditions at the sea surface, the use of Smagorinsky type of turbulent viscosity, and the use of spectral filtering of some of the prognostic variables in the model.
NTIS
Wave Interaction; Internal Waves; Boundary Conditions; Oceanography

51
LIFE SCIENCES (GENERAL)

19990071232 NASA Marshall Space Flight Center, Huntsville, AL USA
Locations of Bromide Ions in Tetragonal Lysozyme Crystals
Lim, Kap, Texas A&M Univ., USA; Nadarajah, Arunan, Toledo Univ., USA; Forsythe, Elizabeth L., Universities Space Research Association, USA; Pusey, Marc L., NASA Marshall Space Flight Center, USA; Acta. Crystallographica; 1998; ISSN 0907-4449, Section D, pp. 899-904; In English; Original contains color illustrations; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Anions have been shown to play a dominant role in the crystallization of chicken egg-white lysozyme from salt solutions. Previous studies employing X-ray crystallography have found one chloride ion binding site in the tetragonal crystal form of the protein and four nitrate ion binding sites in the monoclinic form. In this study the anion positions in the tetragonal form were determined from the difference Fourier map obtained from lysozyme crystals grown in bromide and chloride solutions. Five possible anion-binding sites were found in this manner. Some of these sites were in pockets containing basic residues while others were near neutral, but polar, residues. The sole chloride ion binding site found in previous studies was confirmed, while four further sites were found which corresponded to the four binding sites found for nitrate ions in monoclinic crystals. The study suggests that most of the anion-binding sites in lysozyme remain unchanged even when different anions and different crystal forms of lysozyme are employed.
Author
Anions; Chemical Bonds; Crystal Growth; Crystallization; Eggs; Lysozyme; Bromides; Position (Location)

19990071234 Alabama Univ., Dept. of Biological Sciences, Huntsville, AL USA
Beta-Adrenergic Receptor Gene Expression in Bovine Skeletal Muscle Cells in Culture
Bridge, Kristin Y., Alabama Univ., USA; Smith, Charles K., II, Lilly Research Labs., USA; Young, Ronald B., Alabama Univ., USA; Journal of Animal Science; 1998; Volume 76, pp. 2382-2391; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Beta-adrenergic receptors (Beta AR) are abundant in fetal, neonatal, and adult skeletal muscles of cattle; however, only minimal levels of functional Beta AR were detected in multinucleated muscle cell cultures prepared from 90-d to 150-d fetal bovine skeletal muscle. Two other lines of evidence were consistent with low levels of Beta AR expression in bovine muscle cultures. First, treating the cells with 10(exp -6) M isoproterenol for up to 20 min did not increase intracellular cAMP concentration. Second, neither the quantity of myosin heavy chain (MHC) nor its apparent synthesis rate were changed by treating the cells for 4 d with 10(exp -7) or 10(exp -6) M isoproterenol. Despite these results, the mRNA for the Beta(sub 2)AR could be detected in muscle cultures by PCR and on slot blots. Thus, the Beta(sub 2)AR mRNA was expressed, but significant levels of functional receptors could not be detected. Glucocorticoids are known to activate expression of Beta AR genes in several tissues, and the effect of dexamethasone on Beta AR gene expression in bovine multinucleated muscle cell cultures was evaluated. The intracellular concentration of cAMP following treatment with isoproternol was elevated 10 fold by dexamethasone and the population of functional receptors was elevated by approximately 50 percent. The effect of dexamethasone on muscle protein synthesis and accumulation was analyzed after 24 hours followed by treatment with dexamethasone and 10(exp -6) M isoproternol for an additional 48 hours. The quantity of MHC synthesized and apparent synthesis rate of MHC were stimulated by 10 to 35 percent. These effects seem to be due to posttranscriptional events because the quantity of beta(sub 2)AR receptor mRNA on slot blots was not

increased by treatment with dexamethasone. Results of this study emphasize the importance of verifying that muscle cells contain functional Beta AR when they are used to study the effects of Beta AR agonist on muscle protein metabolism.
Author
Adrenergics; Cattle; Muscles; Protein Synthesis; Cells (Biology); Protein Metabolism

19990071323 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
Synthesis of 9-Deoxycotylenol Derivatives Carrying a Fluorescent Chromophore
Li, Feng, Tohwa Univ., Japan; Kato, Nobuo, Kyushu Univ., Japan; Gorohmaru, Hideki, Kyushu Univ., Japan; Mataka, Shuntaro, Kyushu Univ., Japan; Mori, Akira, Kyushu Univ., Japan; Takeshita, Hitoshi, Tohwa Univ., Japan; The Reports of the Institute of Advanced Material Study, Kyushu University; 1998; ISSN 0914-3793; Volume 12, No. 2, pp. 125-130; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the course of our study on the structure-activity relationships of cotylenol, a plant-growth regulating diterpenoid, 9-deoxycotylenol has been found to retain the biological activities. Here, aiming to create new tools for targeting 14-3-3 proteins which are the biding proteins of this class of molecules and have recently been regarded to be the key regulatory proteins in the intracellular signal transductions, the synthesis of 9-deoxycotylenol derivatives carrying a fluorescent chromophore is reported.
Author
Fluorescence; Chromophores; Vegetation Growth; Leaves

19990071329 Texas A&M Univ., Research Foundation, College Station, TX USA
Coupling of Proton Conduction to Rotation in the Bacterial Flagellar Motor ***Final Report, 1 Apr. 1994 - 31 Mar. 1998***
Manson, Michael D.; Mar. 01, 1999; 8p; In English
Contract(s)/Grant(s): DAAH04-94-G-0056
Report No.(s): AD-A365125; ARO-32533.3-LS; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Rotation of the flagella of Escherichia coli is driven by an inward H(+) current maintained by the transmembrane proton motive force. The first objective of the work was to determine, by genetic suppression analysis, interactions between the two proteins (MotA and MotB) that make up the stator of the flagellar motor. The second objective was to determine how the stator interacts with the rotor. We demonstrated that amino acid substitutions affecting portions of MotB thought to contact or lie adjacent to the peptidoglycan layer of the cell wall and that cause severe motility defects can be suppressed by mutations altering the external face or transmembrane regions of MotA. Some motB mutations can also be suppressed by mutations in the fliG gene, which encodes a component of the rotor. Our overall conclusion is that suppression is achieved by events that affect distant sites within the motor. Thus, a mutation in motB that misaligns the stator with respect to the rotor can be corrected by a compensating change in the stator (a motA mutation) or in the rotor (a fliG mutation). Similar experiments with missense mutations in motA produced different results in that suppressors fell chiefly into a defined region encoding residues 136-138 of MotB. In contrast to the suppressors of motB mutations, we propose that the residues of MotB identified in this suppression analysis may directly contact MotA and help determine correct alignment or tight binding.
DTIC
Protons; Rotation; Escherichia

19990071470 Fourth Military Medical Univ., Xi'an, China
Tail-Suspended Rats with Inguinal Canal Ligation and Their Myocardial Function
Yu, Zhibin, Fourth Military Medical Univ., China; Xie, Xiaoping, Fourth Military Medical Univ., China; Bao, Junxiang, Fourth Military Medical Univ., China; Ma, Jin, Fourth Military Medical Univ., China; Zhang, Lifan, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 172-176; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

To examine the effect of testosterone level on myocardial contractility and to prevent the testis from sliding into abdominal cavity when subjected to tail-suspension, a new tail-suspended model of rat with its inguinal canal ligated was made. Rats suspended for 4 w without inguinal canal ligation (SUS) exhibited significant reduction in weight of testis (CON 1.70 +/- 0.19 g; SUS 0.60 +/- 0.16 g) and in serum testosterone level (CON 99.5 +/- 32.7 ng/dl; SUS 23.0 +/- 13.2 ng/di) (Pis less than 0.01). Unexpectedly, 4 w tail-suspension of rats with inguinal canal ligation (ST) also showed significant changes in testis weight (1.21 +/- 0.30 g) and serum testosterone level (40.7 +/- 32.6 ng/dl). A significant decrease of the devel- oped tension of the papillary muscle of the left cardiac ventricle was observed in SUS and ST group as compared with controls (CON: 3.93 +/- 0.42 g/mm2, SUS: 2.54

+/- 0.85 g/mm2, ST: 2.60 +/- 0.73 g/mm2). There was no relationship between the developed tension and serum testosterone level. It suggests that the decrease of blood supply of the testis may result in an atrophy of the testis in ST group.
Author
Canals; Myocardium; Contraction

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19990071324 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
Noncontact Measurement of Bone Density Distribution Using Ultrasonic Computed Tomography, 1, Numerical Simulation and Experimental Measurement
Fujii, M., Kyushu Univ., Japan; Zhang, Xing, Kyushu Univ., Japan; Kaku, Chiori, Kyushu Univ., Japan; Saeki, Masayuki, Kyushu Univ., Japan; The Reports of the Institute of Advanced Material Study, Kyushu University; 1998; ISSN 0914-3793; Volume 12, No. 2, pp. 115-124; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Numerical simulations and experiments are carried out to apply ultrasonic computed tomography (CT) for a non-invasive measurement of bone density distribution. When an ultrasonic ray passes through such an object as bone, it propagates along refracted and curved paths. In such a case, the reconstruction methods commonly used will lead to inexact or even false results. to overcome this difficulty encountered in ultrasonic CT, the following procedure was developed. First, an approximate distribution of sound velocity is determined with usual reconstruction method on the assumption of straight-line propagation. Subsequently, after the corrected curved ray paths have been computed based on the result, a more exact sound velocity distribution can be reconstructed as the solutions of linear algebraic equations. This procedure is confirmed to be very effective from the present numerical simulation for a cylindrical object with high sound velocity. Through the measurements of the forefingers, the sound velocity distributions corresponding to the above first approximation could be obtained. The results indicate that the shape of the finger is enlarged due to the sound ray refraction. Because the present subjects are all young and healthy persons, there are no remarkable differences with respect to the maximum sound velocity of the finger.
Author
Bones; Bone Mineral Content; Bone Demineralization

19990071462 Institute of Space Medico-Engineering, Beijing, China
Preliminary Experiment on Selection of Oral Hygienic Cleanser
Xie, Qiong, Institute of Space Medico-Engineering, China; Ba, Fusen, Institute of Space Medico-Engineering, China; Zhang, Hong, Institute of Space Medico-Engineering, China; Liu, Guoyin, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 208-210; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The effectiveness of three commercial chewing gums (”Hua Aikang ”, ”Cao Shan-hu”and”Poli”) and brushing with toothpaste on the elimination of dental plaque was observed in 31 healthy males(aged 19 approx. 25 years) Before and after chewing or brushing, evaluation of oral taste and examination of plaque were performed. The result showed that the oral taste after chewing, ” hua aikang” was the best, then ” po li ” and ” cao shanhu” ; plaque indexes were substantially reduced by all four kinds of treatment (Pis less than 0.001) as compared with the pretest values, however” hua aikang” demonstrated a better effectiveness (Pis less than 0.001). It also indicates that plaque index is an important index revealing the hygiene status.
Author
Dental Calculi; Oral Hygiene

19990071463 Air Force General Hospital, Beijing, China
Preliminary Study on Determination Methods of Respiratory Muscle Functions
Ji, Shuguo, Air Force General Hospital, China; Gao, He, Air Force General Hospital, China; Wang, Yuesong, Air Force General Hospital, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 205-207; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy

Attention has been paid to the research of respiratory muscle functions recently. In this paper some lung function indices concerning respiratory muscle functions, such as maximal inspiratory and expiratory pressure at mouth, inspiratory and expiratory tolerance time, transdiaphragmatic pressure and maximal transdiaphragmatic pressure and diaphragmatic electromyogram etc,

were determined in 24 healthy young men and the normal values were obtained. They were important in the study of respiratory muscle functions in hard physical labors, especially in divers, pilots and sportsmen etc. These indices were also useful for evaluating convalescent therapy chronic lung diseases, respiratory muscles training programs or the drug effects on respiratory muscle fatigue, etc.
Author
Muscles; Diseases; Respiration

19990071466 Institute of Space Medico-Engineering, Beijing, China
Theoretical Analysis of Factors Affecting Heat Exchange of Human Body with Environment
Wu, Qingcai, Institute of Space Medico-Engineering, China; Wang, Xianmin, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 194-197; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Life could not be normal without the heat produced by metabolism of human body being transmitted into environment. This paper discussed the ways of heat exchange of human body with the environment, and analyzed their effects on the stability of heat exchange theoretically. In addition, factors that affects the stability of heat exchange were studied. The results indicate that the environmental temperature is the most important factor.
Author
Human Body; Heat Transfer; Man Environment Interactions; Ambient Temperature

19990071469 Institute of Space Medico-Engineering, Beijing, China
Effect of 7 d Head Down Bed Rest on Cardiopulmonary Circulation in Human
Wang, Desheng, Institute of Space Medico-Engineering, China; Xiang, Qiulu, Institute of Space Medico-Engineering, China; Shen, Xianyun, Institute of Space Medico-Engineering, China; Meng, Jingrui, Institute of Space Medico-Engineering, China; Dong, Qi, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 177-180; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Changes of cardiopulmonary circulation in 6 healthy young men during 7 d head down bed rest(-6 deg HDT) Nyere observed with the XXH - 2000 lesser circulation and cardiac function instrument. Decrease of Q - j and Q - J/j - z, increase of hz, hc, and hc/hz were found during the initial 24 h. After 24 h, j - z decreased and Q - j/j - z increased. The results showed that increased pulmonary arterial pressure, increased preload of left and right heart, increased right myocardial contractility and congestion of the lungs appeared during 24 h bed rest, after which right myocardial contractility decreased. It suggests that the lesser ciiculation and cardiac function testing is a sensitive method for evaluating the cardiopulmonary circulation function during HDT.
Author
Bed Rest; Human Beings; Pulmonary Circulation; Head Down Tilt; Myocardium

19990071472 Institute of Space Medico-Engineering, Beijing, China
Temporal and Spatial Features of Slow Positive Potential Related to Visual Selective Response During Head-Down-Tilt
Wei, Jinhe, Institute of Space Medico-Engineering, China; Zhao, Lun, Institute of Space Medico-Engineering, China; Yan, Gongdong, Institute of Space Medico-Engineering, China; Chen, Wenjuan, Institute of Space Medico-Engineering, China; Ren, Wei, Institute of Space Medico-Engineering, China; Duan, Ran, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 157-161; In English
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The temporal and spatial features of visual ERP changes during 2 hour HDT(-10 deg) were compared with that during HUT(+20 deg) in 15 normal subjects. The stimuli consisted of two color LED flashes appeared randomly in left(LVF) or right(RVF) visual field with the same probability. The subjects were asked to make switch response to target signals (T) differentially: switching to left for T in LVF and to right for T in RVF, and making no response to non-target signals(N). Five sets of tests were made during HUT and HDT. ERPs were obtained from 9 locations on the scalp. Mean amplitude of the ERPs in the period 0.30 approx. 0.55 s were taken as the amplitude of slow positive potential(P400). The results obtained were: (1) The mean amplitude of P400 decreased during HDT which was more significant at the 2nd, 3rd and 5th set of tests; (2)spatially, the reduction of mean P400 amplitude during HDT was more significant for signals from RVF and were more significant at posterior and central brain regions than those from frontal locations. These data provide further evidence showing that the higher brain function was affected by the simulated weightlessness and that this effect was not only transient but also with interesting spatial characteristics.
Author
Visual Fields; Head Down Tilt

19990071585 Army Research Inst. of Environmental Medicine, Natick, MA USA

Development of a Comprehensive Thermoregulatory Model for Exercise and Resting Response in Women Exposed to Thermal Stress Wearing Military Clothing ***Final Report***

Gonzalez, Richard R.; Dec. 1998; 78p; In English

Report No.(s): AD-A364250; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Three separate studies were conducted in this project: a resting study on six women; several thermoregulatory modeling projects and an exercise/cold stress study on nine women. Effects of the menstrual cycle on heat loss and heat production (M), core (Tc), and skin temperature responses were studied in six unacclimatized, women nonsmokers (ages 18-29 yr), resting supine. Each women was exposed to a cold ramp (Ta = 20 deg C to -5 deg C, -0.32 deg C/min, rh 50 +/- 2%, V = 1m/s) in the follicular phase (F = days 2-6) and mid luteal phase (L = days 19-23) of her menstrual cycle. It was shown that extensive peripheral vasoconstriction in F during early periods of the ramp generally elevated resting Tes above thermoneutral levels. Shivering thermogenesis was highly correlated with Mean weighted skin temperature), and finger temperature. There was a reduced slope in the M as a function of mean body thermal drive in L experiments when dressed in BDUs (P is less than 0.02) and BDU + BDOs (P is less than 0.01). Heat flux was higher and cold debt was less in the L phases when dressed in BDUs. The modeling study showed that, several cold model equations appear to be applicable for depicting shivering thermogenesis provided the dominant thermal drive is not from decreasing core temperature and cold adrenergic drives and individuals are within a range of body fat between 8% to 30%. In the exercise study, nine healthy women were exposed to a cold challenge as in the resting experiments during their early follicular (F) and mid luteal (ML) phases. The women walked on a treadmill at a work rate of 32% VO2max dressed in BDUs + parka. During submaximal exercise/cold stress, control of ventilation and cardiac output was found to be linked with altered core temperature (Tc) but the sweating and heat exchange requirements are driven by thermoregulatory adjustments appearing during a woman's menstrual cycle.

DTIC

Thermal Stresses; Body Temperature; Models; Physical Exercise

19990071608 Fourth Military Medical Univ., Dept. of Aerospace, Xi'an, China

Plastic Changes of Structure, Function and Perivascular Innervation of Arterial Vasculature during Simulated Weightlessness

Zhang, Lifan, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 215-219; In Chinese

Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

At present, whether structural remodeling and functional adjustment of arterial vasculature might occur during weightlessness has not yet been fully recognized. Hence, a serial work using tail - suspension rat model aimed at elucidating the nature, time course and reversibility of changes in structure, function and perivascular innervation of arterial vasculature in different body parts during and after simulated weightlessness was started several years ago in this laboratory. Our results have demonstrated the differentiated effects of simulated weightlessness on arterial vasculature in different body parts: (1) in the hindquarter arteries and arterioles, it leads to atrophic remodeling changes, diminished vasoconstrictor responsiveness and perivascular hypoinnervation; (2) in the fore body part, it leads to hypertrophic changes, enhanced responsiveness and hyperinnervation in the arteries. The results suggest that microgravity-induced changes in cardiovascular effector apparatus, e. g., the structural remodeling and functional adjustment in vascular smooth muscle, might play an important role in the genesis of postflight orthostatic intolerance.

Author

Weightlessness Simulation; Arteries; Weightlessness

19990071609 Institute of Space Medico-Engineering, Beijing, China

Effects of Extremity Cuffs against Physiological Changes Induced by Head-Down Bedrest

Jiang, Shizhong, Institute of Space Medico-Engineering, China; Jiang, Changlin, Institute of Space Medico-Engineering, China; Li, Jianjun, Institute of Space Medico-Engineering, China; Sun, Xiqing, Institute of Space Medico-Engineering, China; Wu, Xinyu, Institute of Space Medico-Engineering, China; Qiao, Zonglin, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 211-214; In Chinese

Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

-6 deg head down bedrest (HDBR) 10d was used to simulate weightlessness. 12 volunteers were randomed into control group and cuffs group, with 6 in each group. Inflated cuffs on the upper part of thighs and arms were performed 12 h/d in cuffs group during bedrest. No countermeasures were applied in the control group. During head up tilt (HUT) +75 deg 20 min orthostatic toler-

ance test after HDBR, 5 in control group became presyncopal, while only one in cuffs group. The study indicates that the use of inflated cuffs provides a protective effect against the cardiovascular deconditioning after bedrest.
Author
Bed Rest; Physiology; Cardiovascular System; Head Down Tilt; Cuffs

19990071704 Institute of Space Medico-Engineering, Beijing, China
Enzyme Immunoassay for Cuprozinc-Superoxide Dismutase in Whole Blood and Urine During Head Down Bed Rest
Yang, Tangbin, Institute of Space Medico-Engineering, China; Liu, Zhenxiu, Institute of Space Medico-Engineering, China; Wang, Yumin, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 162-166; In English
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A highly sensitive enzyme immunoassay system for the determination of cuprozinc - superoxide dismutase (Cu, Zn - SOD) in whole blood and urine with horseradish peroxidase as a labeling enzyme was reported. It measures Cu, Zn - SOD with good repeatability of 0.05 approx. 5 ng. Coefficients of variation were 1.17% approx. 7.94% for within - a - day assay and 1.94% approx. 10.73% for between days assay. The average recoveries from whole blood and urine were 101.0% approx. 113.8% and 96.0% approx. 116.0%, respectively. Using this enzyme im- munoassay, the normal range of Cu, Zn - SOD concentration in the whole blood was found to be 281.66 +/- 25.45 ng/ml, and it tended to decline 3d after HDBR -6 deg. The normal range in urine Cul Zn - SOD concentration was 0.87 +/- 0.33 microg/g of creatinine, it decreased signifi- cantly on the 3rd day during HDBR -6 deg. Both of them recovered to normal on the 6th day during HDBR -6 deg.
Author
Enzymes; Immunoassay; Blood; Urine; Bed Rest; Enzyme Activity; Assaying; Inorganic Peroxides

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19990071464 Fourth Military Medical Univ., Dept. of Aerospace Physiology, Xi'an, China
Application of Multistage Evaluation Scale in Subjective Assessment of Mental Workload
Dong, Mingqing, Fourth Military Medical Univ., China; Ma, Ruishan, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 202-204; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The efficiency of multistage evaluation scale (MES) based on the fuzzy set theory as used in subjective assessment of mental workload was studied, and the results were compared with those of tracking performance and category scale(CS). It was found that error (ER) significantly increased when task became more difficult (Pis less than 0.01) and the scalings of MES and CS also increased, but that of MES was significantly different in tasks of all the three difficulties (Pis less than 0.01) while those of CS was significant only between tasks 1 and 3 as well as tasks 2 and 3 (Pis less than 0.01), but not between tasks 1 and 2. These show that the result of MES is more agreeable with that of ER. So it might be a better subjective assessment measure of mental workload.
Author
Mental Performance; Workloads (Psychophysiology); Evaluation

19990071471 Institute of Space Medico-Engineering, Beijing, China
Changes of Brain Potentials Related to Selective Mental Arithmetic during Simulated Weightless
Zhao, Lun, Institute of Space Medico-Engineering, China; Wei, Jinhe, Institute of Space Medico-Engineering, China; Yan, Gong-dong, Institute of Space Medico-Engineering, China; Chen, Wenjuan, Institute of Space Medico-Engineering, China; Duan, Ran, Institute of Space Medico-Engineering, China; Ren, Wei, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 167-171; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

To study the effect of simulated weightlessness on brain function state, the brain event -related potentials (ERPs) during a selective mental arithmetic task were compared between head down tilt (HDT) and head up tilt (HUT) in 15 normal subjects. The results were: target (T) flash signals induced significant slow positive potentials and they decreased significantly in amplitude

especially during HDT as compared with that during HUT. The data provide new evidence indicating that the ability of brain response declined during simulated weightlessness.
Author
Arithmetic; Brain; Weightlessness Simulation; Weightlessness; Mental Performance

19990075032 Electrotechnical Lab., Ibaraki, Japan
Role of Cerebellum in Ocular Following Response
Shidara, Munetaka, Electrotechnical Lab., Japan; Kawano, Kenji, Electrotechnical Lab., Japan; Gomi, Hiroaki, Electrotechnical Lab., Japan; Kawato, Mitsuo, Electrotechnical Lab., Japan; Bulletin of the Electrotechnical Laboratory; 1994; ISSN 0366-9092; Volume 58, No. 1, pp. 1-8; In Japanese; Original contains color illustrations; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We recorded simple spike activities of Purkinje cells (P-cells) and visual-mossy-fiber activities in the ventral paraflocculus (VPFL) during short-latency ocular following responses. Using a linear time-series regression method, we quantitatively analyzed the relationship between the firing frequency of the P-cells (or mossy fibers) and the simultaneously recorded eye movements. In most of the P-cells, the determination coefficient of the regression was higher than 0.7. The mean delay was 7.1 ms, which was near the latency of the eye movements evoked by electrical stimulation. The mean ratio of acceleration coefficient to velocity coefficient of the P-cells was close to that of motoneurons, whereas the mean ratio of acceleration coefficient to position coefficient of the P-cells was different from, and had reversed sign to, that of motoneurons, suggesting that these P-cells contribute to the dynamic (velocity and acceleration) rather than the static (position) control of eye movements. On the other hand, analysis on the firing frequencies of mossy fibers in the VPFL suggested that they do not encode the appropriate dynamic signals. Thus, the input to the cerebellum does not have the proper dynamic signamic signal for ocular following, while the output does. This suggests that the cerebellum is the main area where responsible for sensory-to-motor conversion for ocular following responses.
Author
Cerebellum; Cerebral Cortex; Cells (Biology)

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19990071326 Anacapa Sciences, Inc., Santa Barbara, CA USA
Development of a Flight Simulator and an Intelligent Symbology Management System for Helmet Mounted Displays in Rotorcraft ***Final Report, 21 Jun. 1996 - 9 Feb. 1999***
Rogers, Stepven P.; Asbury, Charles N.; Feb. 09, 1999; 191p; In English
Contract(s)/Grant(s): DAAJ02-96-C-0042
Report No.(s): AD-A365110; AS-FR-1184; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

The overall objective of this project was to develop and evaluate an innovative and intelligent information presentation system for helmet-mounted displays (HMDs) in military helicopters. The subordinate objectives included: (a) defining specific information elements that should be presented via the HMD, (b) developing a powerful, portable, flight simulator to permit rapid identification and evaluation of candidate symbols and their management, and (Copyright) developing and testing innovative flight and mission information symbology management concepts, realistically demonstrating the most promising candidates on the portable simulator. The report describes the symbology management issues of mode switching and information organization and the heavy burden of Army mission management tasks, and presents HMD solutions to the current shortcomings, focusing on ”augmented reality” as the key to workload reduction and situation awareness enhancement. The report also describes the design and development of the PRISMS virtual reality flight simulator, and how it was used to conduct a formal experiment with 14 Apache pilots. The experiment demonstrated the overwhelming advantages of new earth-fixed HMD symbols such as way point and engagement area markers. A wealth of pilot comments and subjective ratings on these and other symbols and their intelligent management is also presented.
DTIC
Flight Simulators; Management Systems; Helmet Mounted Displays; Rotary Wing Aircraft; Military Helicopters; Information Management

19990071467 Institute of Space Medico-Engineering, Beijing, China

Pressure Control System for the Hermetically Sealed Cabin of the Recoverable Satellite

Sun, Jinbiao, Institute of Space Medico-Engineering, China; Yao, Shaojian, Institute of Space Medico-Engineering, China; Zhang, Xiuhua, Institute of Space Medico-Engineering, China; Zhang, Fengwu, Institute of Space Medico-Engineering, China; Zheng, Chuanxian, Institute of Space Medico-Engineering, China; Fu, Lan, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 189-193; In Chinese

Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

There are many precision instruments and equipment for scientific researches and experiments in the hermetically sealed cabin of satellite. Appropriate pressure must be con- trolled in the cabin in order to ensure the instruments and equipment from the adverse space environment. This paper describes a pressure control system for the hermetically sealed cabin in the recoverable scientific detect and experimental satellite. The cabin pressure is regulated automatically into the specific levels by venting or supplying the air from or to the cabin during launch, on orbit and before reentry of the satellite. The system has low mass, low power consumption and high reliability. It was used successfully in the recoverable satellite first in September 1987 and had been used many times since then. It is the first active pressure control system for the hermetically sealed cabin of the satellite in China. Author

Active Control; Pressure; Scientific Satellites; Recoverable Spacecraft; Aerospace Environments; Spacecraft Cabins

19990071468 Institute of Space Medico-Engineering, Beijing, China

Energy Metabolism of Men in Full Pressure Suit with Additional Pressure

Peng, Yuankai, Institute of Space Medico-Engineering, China; Xu, Guoling, Institute of Space Medico-Engineering, China; Liu, Gang, Institute of Space Medico-Engineering, China; He, Shui, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Jun. 1998; ISSN 1002-0837; Volume 11, No. 3, pp. 181-184; In Chinese

Report No.(s): CN-11-2774/R; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The energy metabolism of men in full pressure suit with Additional pressure and without additional pressure were measured during rest and exercise. Results show that the rates of energy metabolism of men in full pressure suit with additional 28 kPa pressure and without additional pressure increased as the exercise load increased. The rates of energy metabolism of men in full pressure suit with additional 28 kPa pressure had no significant difference during rest and 0.9 W exercise, but signicantly increased during 8.5 W exercise, as compared with that without additional pressure. It suggested that full pressure suit with 28 kPa did not affect human energy metabolism during rest, but affected during exerise.

Author

Metabolism; Pressure Suits; Physical Exercise; Loads (Forces)

55
SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

19990071162 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands

ESA Exobiology Activities

Kminek, Gerhard, European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 41-48; In English; See also 19990071155; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The Microgravity and Manned Spaceflight Directorate of the European Space Agency (ESA) has initiated two studies, one in 1996 and one in 1997, in order to assess the interest and the capabilities for a European effort in exobiology research. Both science teams were composed of senior scientists in the fields of microbiology, geology, cosmochemistry and related disciplines. The first report focused on reviewing the places in our solar system where life or pre-biotic evolution might have occurred sometime in the past or at present. The second report focused on an exobiology package for a Mars lander. The scientific objectives to achieve were to identify and characterize the oxidants, to find morphological and chemical signatures of extinct life, and to determine the chirality of organic compounds if present. In order to minimize ambiguities, an assembly of instruments was proposed to carry out the in-situ investigation. Forward contamination and sterilization issues shall be addressed from the very first

stage of the program (Phase A). The whole exobiology system, including the sample acquisition, preparation and handling system has a mass of about 26 kg. The science team report is the baseline for a nine month phase A study with industry and universities that will start mid- to third quarter 1998. In addition, exobiology will be a major cornerstone of the next microgravity program of ESA.
Author
Exobiology; Aerospace Environments; Spacecraft Environments; Spacelab; Spaceborne Experiments; European Space Agency; Spacecraft Contamination; Spacecraft Sterilization

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL

19990073632 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Oscillation and Multilinear Stieltjes Integral
Halilovic, A.; May 1998; ISSN 1401-2278; 20p; In English
Report No.(s): PB99-161697; TRITA-MAT-1998-26; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
In this note the authors consider oscillation of regulated functions. The authors improve and simplify the proof of the existence theorem for multilinear Stieltjes integral in the Riemann-Stieltjes and Moore-Pollard sense and introduce multilinear Henstock-Kurzwell- Stieljes integral.
NTIS
Oscillations; Stieltjes Integral

19990073633 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Discrete Spectrum in the Spectral Gaps of Semibounded Operators with Non-Signdefinite Perturbations
Safronov, O. L.; Apr. 1998; ISSN 1401-2278; 18p; In English
Report No.(s): PB99-161689; TRITA-MAT-1998-24; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Given two selfadjoint operators A and V = (sub +) - V(sub -), the authors study the motion of the eigenvalues of the operator A(t) = A - tV as t increases. Let alpha = 0 and let lambda be a regular point for A. The authors consider the quantities N(sub +)(V; lambda, alpha), N(sub -)(V; lambda, alpha), N(sub 0)(V; lambda, alpha) defined as the number of the eigenvalues of the operator A(t) that pass point lambda from the right to the left, from the left to the right, or change the direction of their motion exactly at point lambda, respectively, as t increases from 0 to alpha is greater than 0. The authors asymptotic characteristics of these quantities as alpha increases toward infinity. In this paper, the authors extend the results obtained previously and give new applications to different operations.
NTIS
Spectra; Perturbation; Linear Operators

19990074940 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Quasi-Stationarity and the Verhulst Model
Nasell, I.; Apr. 1998; ISSN 1401-2278; 60p; In English
Report No.(s): PB99-161739; TRITA-MAT-1998-23; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
A deterministic model for density dependent growth of a single population was established by Verhulst in 1838. A stochastic version of this model is formulated as a finite-state birth-death process with all absorbing state at the origin. Three parameter regions with qualitively different behaviours are identified. Explicit approximations of the quasi-stationary distribution and of the time to extinction are presented in each of these regions. The quasi-stationary distribution is approximately normal, and the time to extinction is long, in one of these regions. Another region has a short time to extinction and a quasi-stationary distribution that is approximated by a geometric distribution. A third region is a transition region between these two. Here the time to extinction is moderately long and the quasi-stationary distribution has a more complicated behavior. Numerical illustrations are given.
NTIS
Mathematical Models; Stochastic Processes

19990074941 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
B(sub h)[g]-Sequences from B(sub h)-Sequences
Lindstroem, B.; Apr. 1998; ISSN 1401-2278; 10p; In English
Report No.(s): PB99-161663; TRITA-MAT-98-MA-22; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

A sequence A of positive integers is call a Bh(g)-sequence of every integer n has as most g representation n=1(sub 1)+a(sub 2)+...+a(sub h) with all a(sub i) in A and a(sub 1) is less than or = a(sub 2) is less than or = ... is less than or = a(su h). A bh(1)-sequence is also called a B(sub h)-sequence or Sidon sequence.
NTIS
Sequencing; Applications of Mathematics

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing. For components see 33 Electronics and Electrical Engineering.

19990071795 High Energy Accelerator Research Organization, Tsukuba, Japan
Computing at KEK
Morita, Y., High Energy Accelerator Research Organization, Japan; June 1997; 10p; In English; Computing in High Energy Physics '97, 7-11 Apr. 1997, Berlin, Germany
Report No.(s): KEK-Preprint-97-85; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In 1996 and in 1997, KEK Computing Research Center installed two large UNIX workgroup cluster systems. Computing and data storage resources are partitioned and allocated to each research group with independent DCE cell administration. Data transfer between different workgroup clusters are established with inter-cell communication. These systems are the largest installation of DCE and DFS which are being used in production, in combination with the hierarchical storage management software on 20-TB and 160- TB tape library mass storage systems.
Author
Computer Systems Programs; Data Storage; Installing

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

19990070756 Kochi Univ., Faculty of Science, Akebono, Japan
A Computer Program for the Frobenius Conjecture
Yamaki, Hiroyoshi, Tsukuba Univ., Japan; Memoirs of the Faculty of Science, Kochi University. Series A: Mathematics; Mar. 1994; ISSN 0389-0252; Volume 15, pp. 15-29; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The purpose of this note is to give a computer program which verifies the well known conjecture by Frobenius for the sporadic simple groups.
Derived from text
Computer Programs; Pascal (Programming Language)

19990071154 Ohio State Univ., Dept. of Civil Engineering and Geodetic Sciences, Columbus, OH USA
Software Development for Visualization and Analysis of Scanning Laser Altimeter Data
Filin, Sagi, Ohio State Univ., USA; Csatho, Beata, Ohio State Univ., USA; Program for Arctic Regional Climate Assessment (PARCA); April 1999, pp. 85-87; In English; See also 19990071134; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Ice sheet elevation changes have been measured by repeat airborne laser altimetry in Greenland since 1991. The system, which has been mounted on a NASA P-3 aircraft, includes a scanning laser altimeter, Inertial Navigation System INS and differential GPS. During the postprocessing the measured data are converted into measurements of ice sheet elevation relative to the Earth ellipsoid (Krabill 1995). Since laser scanner data sets are composed of a huge amount of points, obtaining the swath contour and locating overlapping areas between different swaths in an efficient way is not a simple task. to make this task more feasible NASA has developed an online database called GReenland Airborne Precision Elevation Survey (GRAPES). So far only data acquired prior to 1994 are included in GRAPES and the database system contains only the thinned version of the original data files. Our major goal is to develop software to access, display, and manipulate the individual laser swaths, to determine the overlap between several surveys, compute elevation changes, and to create DEMs and contour maps. Using the original binary data file as an input

the user will be able to perform most of these tasks by using a single application. Until now we were focusing on the first part of the job, namely to provide tools for locating the laser swaths and their overlapping areas.
Derived from text
Computer Programming; Software Engineering; Software Development Tools; Computer Programs; Land Ice; Glaciers

19990071575 Technische Univ., Inst. fuer Informatik, Munich Germany
RTSE 1997 - Workshop on "Requirements Targeting Software and Systems Engineering" ***Final Report***
Broy, Manfred; Rumpe, Bernhard; Apr. 1998; 322p; In English
Contract(s)/Grant(s): DAAG55-97-1-0289
Report No.(s): AD-A365079; TUM-I9807; ARO-37363.1-MA-CF; No Copyright; Avail: CASI; A03, Microfiche; A14, Hardcopy

The intended focus of the workshop was on unified sets of formal models and associated methods suitable for automation for many aspects of software development, in particular those that address change and those that apply on a large scale. Some of the intended aspects of software evolution are (1) modifiable software architectures, (2) resource changes, (3) context changes, (4) requirements changes, (5) changes to decomposition structures, and (6) changes in plans. These issues are related to formal representations of the version history, and formal representations of the activities that produced existing versions or have been proposed to produce future versions.
DTIC
Computer Programming; Software Engineering

19990071582 Michigan Univ., Dept. of Electrical and Computer Engineering, Ann Arbor, MI USA
Improving Processor Performance by Dynamically Pre-Processing the Instruction Stream
Dundas, James D.; Apr. 1999; 266p; In English
Contract(s)/Grant(s): DAAH04-94-G-0327
Report No.(s): AD-A365210; CSE-TR-389-99; ARO-33790.72-EL; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The exponentially increasing gap between processors and off-chip memory, as measured in processor cycles, is rapidly turning memory latency into a major processor performance bottleneck. Traditional solutions, such as employing multiple levels of caches, are expensive and do not work well with some applications. We evaluate a technique, called run ahead pre-processing, that can significantly improve processor performance. The instruction and data stream prefetches generated during run ahead episodes led to a significant performance improvement for all of the benchmarks we examined. We found that run ahead typically led to about a 30% reduction in CPI for the four Spec95 integer benchmarks that we simulated, while run ahead was able to reduce CPI by 77% for the STREAM benchmark. This is for a five stage pipeline with two levels of split instruction and data caches: 8KB each of L1, and 1MB each of L2. A significant result is that when the latency to off-chip memory increases, or if the caching performance for a particular benchmark is poor, run ahead is especially effective as the processor has more opportunities in which to pre-process instructions. Finally, run ahead appears particularly well suited for use with high clock-rate in-order processors that employ relatively inexpensive memory hierarchies.
DTIC
Preprocessing; Computer Programming; Data Flow Analysis

19990071584 California Inst. of Tech., Pasadena, CA USA
Towards HPC++: A Unified Approach to Parallel Programming in C++ ***Final Report, 31 Oct. 1995 - 31 Oct. 1998***
Kesselman, Carl; Oct. 30, 1998; 37p; In English
Contract(s)/Grant(s): DABT63-95-C-0108
Report No.(s): AD-A365479; No Copyright; Avail: Defense Technical Information Center (DTIC), Hardcopy

Compositional C++ or CC++, is a general purpose parallel programming language designed to support a wide range of parallel programming styles. By adding six new keywords to C++, CC++ enables programmer to express many different types of parallelism. CC++ is designed to be a natural extension to C++, appropriate for parallelizing the range of applications that one would write in C++. CC++ supports the integration of different parallel programming styles in a single application. It was designed to provide efficient execution on a range of parallel computing platforms, including both shared and distributed memory computers.
DTIC
C++ (Programming Language); Parallel Processing (Computers); Parallel Programming; Programming Languages; Object-Oriented Programming

19990071605 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan
Development of a BBS Host Program
Ishikawa, Osamu, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 21-28; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

According to the presumption that personal computer communications would grow up remarkably as electronic social field, we have opened a BBS host system experimentally and examined the possibilities in collaboration with citizen. One of our themes was developed of a multi-channel BBS host program. This report describes the three fundamental gists of our program, that is to say: (1) corresponding with multi-channel; (2) high speed processing of transmission and reception; and (3) efficiency utilization of limited memories. Our program is up loaded to NIFTY Serve, therefore anybody can down-load it and open a high function BBS host easily.
Author
Interprocessor Communication; Computer Programs

19990071648 Maryland Univ., Computer Science Dept., College Park, MD USA
Distributed Multimedia Reasoning ***Final Report, Jun. 1995 - Nov. 1998***
Subrahmanian, V. S.; Dec. 31, 1998; 7p; In English
Contract(s)/Grant(s): DAAH04-95-I-0174
Report No.(s): AD-A364738; ARO-34061.2-MA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The research performed under this grant led to the development of abstract models of multimedia data, concrete ways of representing and indexing such multimedia data on a computer, querying such multimedia data using a single unified query language, assembling presentations comprised of a variety of multimedia objects, and delivering such presentations across a distributed network. In effect, the work developed a firm theoretical foundation for reasoning about multimedia databases.
DTIC
Multimedia; Data Bases

19990072348 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Year 2000 Computing Crisis: A Testing Guide
Nov. 1999; 44p; In English
Report No.(s): PB99-156473; GAO/AIMD-10.1.21; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This guide presents a step-by-step framework for managing all testing activities related to the Year 2000 problem. It describes five phases of Year 2000 testing activities, beginning with establishing an organizational infrastructure, followed by designing, conducting, and reporting on four incremental levels of system-related testing (software unit testing, software integration testing, system acceptance testing, and end-to-end testing). To support these five phases, the guide also describes test oversight and control activities. The guide recommends the structure and discipline in testing that characterize mature software and system development/acquisition and maintenance processes.
NTIS
Systems Engineering; Computer Programming; Software Engineering

19990072790 Communications Research Lab., Tokyo, Japan
Efficient Calculation Techniques for Correlation Function and Distance of Run-Length Coded Images
Yoshiya, Kiyosumi, Communications Research Lab., Japan; Kato, Syuko, Communications Research Lab., Japan; Matsumoto, Fumiko, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Dec. 1994; ISSN 0914-9279; Volume 40, No. 4, pp. 343-346; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The techniques proposed here are used to calculate the correlation function and distance of run-length coded images by using corresponding run-length values. Computer simulation shows that these techniques require about 1/30 and 1/50 of the CPU time respectively that direct calculation requires for the correlation function and distance of run-length coded images with 720 x 1200 pixels.
Author
Computerized Simulation; Computation; Procedures

19990073230 Aarhus Univ., Computer Science Dept., Denmark
Principles of Program Analysis
Nielson, Flemming; Nielson, Hanne R.; Hankin, Chris; Jan. 1999; 410p; In English
Contract(s)/Grant(s): F61775-99-W-F003

Report No.(s): AD-A366071; EOARD-CSP-99-5003; No Copyright; Avail: CASI; A04, Microfiche; A18, Hardcopy

In this book we shall introduce four of the main approaches to program analysis: Data Flow Analysis, Control Flow Analysis, Abstract Interpretation, and Type and Effect Systems. Each of Chapters 2 to 5 deals with one of these approaches to some length and generally treats the more advanced material in later sections. Throughout the book we aim at stressing the many similarities between what may at a first glance appear to be very unrelated approaches. To help getting this idea across, and to serve as a gentle introduction, this chapter treats all of-the approaches at the level of examples. The technical details are worked-out but it may be difficult to apply the techniques to related examples until some of the material of later chapters have been studied.

DTIC

Data Flow Analysis; Software Engineering

19990073636 Central Lab. of the Research Councils, Computational Science and Engineering Dept., Warrington, UK

CLIPS: The CLRC Library of Parallel Subroutines: Parallel Application Software on High Performance Computers

Allan, R. J.; Hu, Y. F.; Jul. 21, 1999; 28p; In English

Report No.(s): PB99-161572; DL-TR-99-003; Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

Over the past four years a number of parallel algorithms have been written at Central Lab. of Reseach Council (CLRC) Daresbury Laboratory in order to otpmize parallel applications in various areas of computational science and engineering. With a view of making these more widely available and to promote better software reusability and modularity a parallel library is being created named CLIPS. This brief report summarizes the Library structure and functionality. The Library is written mainly in FORTRAN 90 (with a little C) and uses MPI for communication. It should therefore be portable to most, if not all, contemporary serial and parallel computing platforms including clusters of PCs and workstations.

NTIS

Parallel Processing (Computers); Applications Programs (Computers); Subroutine Libraries (Computers)

19990074938 Research Inst. of National Defence, Avdelningen foer Styrning, Material och Undervattenssensorer, Stockholm, Sweden

Aggregation and Disaggregation in the Concept of HLA. Development of a Test Federation ***Aggregering och Disaggregering inom Ramen foer HLA. Utveckling av en Provfederation***

Homn, G.; Mojtahed, V.; Moradi, F.; Skoeld, S.; Mar. 1998; 40p; In Swedish

Report No.(s): PB99-161895; FOA-R-98-00745-202-SE; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

Modeling and simulation are of increasing importance for the military. Cooperation of models in joint distributed interactive simulations for training and analysis has been given much attention during the last years. That requires the models to be adopted to a common framework like HLA (High Level Architecture). The occurring problems are mainly of two kinds, first there were difficulties in getting access to a suitable air defense model on the operational level, second the very process of adopting existing models to HLA was more time consuming than expected. Now the models ARTEVA (on a technical level) and FBSIM (on a tactical level) have been adopted while the work on TYR (on an operational level) only just has started. As the result of a literature survey on aggregation and disaggregation, the problems that have to be solved are described, for instance how to avoid unintentional spreading of disaggregation and how to maintain the consistency of the low level units after repeated aggregations and disaggregations.

NTIS

High Level Languages; Aggregates

19990075828 Materials Phases Data System, Viznau, Switzerland

Development of a New Technique for Discovering Systematically Hidden Patterns ***Final Report, 15 Mar. 1998 - 14 Mar. 1999***

Villars, Pierre; Mar. 14, 1999; 16p; In English

Contract(s)/Grant(s): F61775-98-W-E013

Report No.(s): AD-A366111; EOARD-SPC-98-4028; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Materials design is still mainly based on the in materials science known concepts and intuition of the experimentalists. Analyzing the conditions that make it possible to search for the in materials science known concepts shows that it was not a new technique, a unique experimental observation, or an abstruse theory which formed the take-off point. It was rather the amassing of a critical volume of experimentally determined data in the literature that permitted an individual with deep insight to perceive an underlying pattern not previously apparent. Extending these facts to a new area of materials design leads to the following four key-points: I) The creation and the use of huge, critically evaluated materials databases which comprehensively covers the pub-

lished world literature (materials databases). II) Computer-aided reduction of the elemental property parameters and systematic combinations of them to find the relevant 3D-feature sets which qualitatively can link materials properties with the chemical species present (semi-empirical approaches). III) Refinement and optimization of the qualitatively obtained results under II) with the help of neuro-computing leading to quantitative results (neuro-computing). IV) Focusing on predicted, most promising materials systems with the aim to reduce the experimental work for its verification, as well as trying to create a theoretical based explanation for such quantitative results (first principle calculations).
DTIC
Computer Techniques; Exploration; Computer Aided Design

19990075955 Department of the Navy, Washington, DC USA
Programmable Stand-Alone Drive Apparatus for Interfacing a Host Computer With PCMCIA Memory Cards Having Multiple Formats.
Houlberg, Christian L., Inventor; Borgen, Gary S., Inventor; Busse, Richard J., Inventor; Mar. 23, 1999; 11p; In English; Supersedes US-Patent-Appl-SN-838476
Patent Info.: Filed 27 Apr. 97,; US-Patent-Appl-SN-838,476; US-Patent-5,887,198
Report No.(s): AD-D019408; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A memory card drive which is compatible with MS-DOS computer systems as well as other computers which do not use MS-DOS as the operating system. The memory card drive comprises an embedded server which is a bridge between a client computer and a pair of memory cards allowing for communication and data transfer between the client computer and the memory cards. The server includes an ethernet interface which connects the server to ethernet bus which is connected to the client computer. The server has a memory card interface module which allows the client computer to communicate with the memory cards and thereby transfer data to the memory cards and retrieve data from the memory cards. The server also includes an embedded computer which enables and controls the functions and operation of the memory card interface and ethernet interface using a computer software program. The embedded computer has a two megabyte hard drive which has the computer software program stored therein.
DTIC
Information Transfer; Memory (Computers); Computer Networks; Computer Programs; Data Storage

19990076122 Osaka Electro-Communication Univ., Japan
A Parallel Algorithm of the MRAC for Transputer
Li, Yu, Osaka Electro-Communication Univ., Japan; Horii, Semmatsu, Osaka Electro-Communication Univ., Japan; Memoirs of Osaka Electro-Communication University; Jan. 01, 1995; ISSN 0386-4987, No. 30, pp. 67-78; In Japanese; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this study, we introduce an approach to the realization of a parallel implementation of the Square Root algorithm for a single input, single input model reference adaptive control system on the transputers.The performance is evaluated in terms of execution time, relative speed and efficiency corresponding to the model sizes.
Author
Algorithms; Transputers; Parallel Processing (Computers); Roots

62
COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

19990075846 Department of the Navy, Washington, DC USA
Interactive Video Delivery System
Preston, Marrill G., Inventor; Mystic, Cameron Johnson, Inventor; Mar. 23, 1999; 8p; In English; Supersedes US-Patent-Appl-SN-581824
Patent Info.: Filed 12 Sep. 90,; US-Patent-Appl-SN-581,824; US-Patent-5,885,086
Report No.(s): AD-D019364; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An interactive video delivery system (IVDS) is used in conjunction with software for training purposes. The IVDS emulates a tactical display system sonar console by using software to provide its input information. The tactical display system sonar console uses actual sonar signals detected by sonar array systems. The IVDS training aid comprises an emulated AN/UYQ-21 console

having a computer and an interactive videodisc system. The computer provides the necessary graphics processing for emulation of the tactical displays.
DTIC
Computer Aided Design; Human-Computer Interface; Graphical User Interface; Computer Assisted Instruction; Language Programming; Computer Graphics

63
CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also 54 Man/System Technology and Life Support.

19990071066 Osaka City Univ., Dept. of Information and Computer Engineering, Japan
An Appropriate Number of Hidden Units for Three Layered Neural Networks to Parity Discrimination
Okamoto, Jiro, Osaka City Univ., Japan; Nakajima, Shigeyoshi, Osaka City Univ., Japan; Asai, Masato, Osaka City Univ., Japan; Hosokawa, Shoichi, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 1998; Volume 39, pp. 95-98; In English; See also 19990071060; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

When we are going to design a neural network(NN) to discriminate input parity, it is always a difficult problem how many numbers of hidden units to be chosen. There are scarcel@, certain methods to decide them. They are tiowada@,s selected b3, ones experience arid intuition. In this paper. we describe the invested result about the suitable number of hidden units when the paritv of N bit signal is discriminated. The reason why we choose the parity discrimination problem as our research subject is that this problem is a fundamental one and is one of the most difficult problem for binary signals. We conclude that, in the case of the forward type three layered NN's, there exists the most appropriate number of hidden units for discriminating binary signals.
Author
Neural Nets; Procedures; Discriminant Analysis (Statistics); Binary Data

19990071167 National Aerospace Lab., Amsterdam, Netherlands
Mission Preparation and Training Equipment (MPTE) for the European Robotic Arm (ERA)
Schoonmade, Marcel, National Aerospace Lab., Netherlands; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 77-88; In English; See also 19990071155; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The content of the presentation include Mission Preparation and Training Equipment (MPTE) project overview, European Robotic Arm (ERA) introduction, MPTE functions, ISS/ERA pictures, MPTE figures, and current status and planning.
CASI
Mission Planning; Project Management; Robot Arms; Robotics; Robot Dynamics; Robot Control; Telerobotics; Remote Control

19990071571 Cornell Univ., Center for Foundations of Intelligent Systems, Ithaca, NY USA
On Hybrid Systems and the Modal Mu-Calculus
Davoren, J. M.; Nov. 1998; 35p; In English
Contract(s)/Grant(s): DAAH04-96-1-0341
Report No.(s): AD-A364783; CFIS-98-14; ARO-35873.99-MA-MUR; No Copyright; Avail: Defense Technical Information Center (DTIC), Hardcopy

Much of the contemporary work in logics for the formal verification of hybrid systems (notably the work of Henzinger at UC Berkeley and Manna at Stanford) builds directly on the framework of temporal logic verification of discrete systems. The core computational model is that of a hybrid automaton, which is represented formally as a transition system over a hybrid state space X subset contained in Q x IR(n), where Q is a finite set of discrete modes. While the temporal logic framework is adequate to formally express many qualitative dynamic properties of such systems, it fails to capture the "continuity" of continuous dynamics, or to reflect the topological and metric structure of Euclidean space. In addressing this deficiency, we look to the modal mu-calculus, a richly expressive formal logic over transition system models, into which virtually all temporal and modal logics can be translated. The key move in this paper is to view the transition system models of hybrid automata not merely as some form of "discrete abstraction", but rather as a skeleton which can be fleshed out by imbuing the state space with topological, metric tolerance or

other structure. Drawing on the resources of modal logics, we give explicit symbolic representation to such structure in polymodal logics extending the modal mu-calculus.
DTIC
Automata Theory; Temporal Logic; Mathematical Logic; Logic Programming; Systems Analysis

19990074954 Electrotechnical Lab., Ibaraki, Japan
Three-Layer Structure Optoelectronic Neural Network
Mori, Masahiko, Electrotechnical Lab., Japan; Ishihara, Satoshi, Electrotechnical Lab., Japan; Bulletin of the Electrotechnical Laboratory; 1994; ISSN 0366-9092; Volume 58, No. 1, pp. 39-46; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We constructed a three layer optoelectronic neural network. On this system, the learning with exclusive OR operation were demonstrated using the back-propagation learning algorithm. We estimated the influence of the contrast and uniformity of the input and matrix display devices by computer simulations and optical experiments.
Author
Neural Nets; Electric Networks

19990075964 Osaka Electro-Communication Univ., Japan
Development of Mold Assembling Robot and Design Education
Mizuno, Kaneo, Osaka Electro-Communication Univ., Japan; Jing, Liao Fei, Osaka Electro-Communication Univ., Japan; Komamura, Hiroshi, Osaka Electro-Communication Univ., Japan; Furutani, Shigeo, Osaka Electro-Communication Univ., Japan; Hirano, Shigeo, Osaka Electro-Communication Univ., Japan; Yokota, Shigeaki, Osaka Electro-Communication Univ., Japan; Memoirs of Osaka Electro-Communication University; 1996; ISSN 0386-4987, No. 31, pp. 67-78; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The purpose of this project involving university and industry is to develop an easy-to-operate assembly robot which assembles components into a complete mold. Mold components are a top part, core part, and a bottom part (shell mold components), made from sand and resin treated with carbon dioxide. The robot will assemble these three parts into a mold. The assembly process involves the following four steps. (1) Deburring the top part, the bottom part, the core and sprue part (edges around the gas vent hole), and sprue. (2) Lift and carry, both the top part and core part at the same time. (3) Set the core part into the bottom part, and at the same time apply adhesive to the top part. (4) Install the top part onto the bottom part.
Author
Robots; Assembling; Artificial Intelligence; Robot Arms

64
NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

19990073338 Illinois Univ., Dept. of Mathematics, Statistics, and Computer Sciences, Chicago, IL USA
PDE, Differential Geometric, Wavelet and Algebraic Methods in Nonlinear Filtering ***Final Report***
Yau, Stephen S.; Mar. 23, 1999; 15p; In English
Contract(s)/Grant(s): DAAH04-95-1-0530
Report No.(s): AD-A365262; ARO-33422.8-MA; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We have found the best solution to Duncan-Mortensen-Zakai (DMZ) equation for Yau filtering system, which is the most general filtering system and includes both linear filtering and exact filtering systems. We show that this equation can be solved explicitly with an arbitrary initial condition by solving a system of ordinary differential equations and a Kolmogorov type equation. Let n be the dimension of the state space. We show that we need only n sufficient statistics in order to solve DMZ equation. In the other direction, we prove that if the estimation algebra is finite dimensional of maximal rank, then the Wang's matrix has constant structures. this theorem plays a fundamental role in the classification of finite dimensional estimation algebra of maximal rank in fact we have classified all these Lie algebras for statespace dimension less than or equal to 6.
DTIC
Wavelet Analysis; Linear Filters; Partial Differential Equations

19990076050 Defence Science and Technology Organisation, Salisbury, Australia
Algorithms for Representing Similarity Data
Lee, Michael D., Defence Science and Technology Organisation, Australia; May 1999; 71p; In English
Report No.(s): AD-A365940; DSTO-RR-0152; DODA-AR-010-971; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report develops and demonstrates algorithms for representing and displaying similarity data using three established cognitive models. The first representational model, multidimensional scaling, represents objects as points in a coordinate space so that similar objects lie near each other. The second representational model, the additive tree, represents objects as terminal nodes in a tree so that the similarity of two objects is modelled by length of the path between them. The third representational model, additive clustering, specifies a number of clusters with associated weights, so that the similarity of two objects is modelled by the sum of the weights of their common clusters. As well as listing and demonstrating MATLAB algorithms for finding these representations, a survey is presented of ways in which similarity and proximity data may be generated, and a principled Bayesian method of controlling the complexity of each representational model is presented. Finally, a number of suggestions are made regarding the use of the three representational models, and the relative strengths and weaknesses of the algorithms in relation to previously developed alternative algorithms are discussed.
DTIC
Algorithms; Cognition; Analogies

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing: Monte Carlo method; and stochastic processes.

19990071331 California Univ., Berkeley, CA USA
Optimal Controller Switching for Stochastic Systems
Skafidas, E.; Evans, R. J.; Mareels, I. M.; Nerode, A.; Mar. 01, 1999; 17p; In English
Contract(s)/Grant(s): DAAH04-96-1-0341
Report No.(s): AD-A365166; TR-98-07; ARO-35873.136-MA-MU; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This paper presents a solution to certain problems in switched controller design for stochastic dynamical systems with a quadratic cost. The main result is a separation theorem for partial information systems. This result is then used to convert the partial information stochastic control problem to a complete information stochastic control problem. We also show that certainty equivalence does not hold. The optimal sequence of controllers can be determined via an appropriate solution to a dynamic programming problem.
DTIC
Switching; Controllers; Stochastic Processes; Optimization

19990071572 Pennsylvania State Univ., Dept. of Statistics, University Park, PA USA
Second Order Corrections of the Poisson Bootstrap
Babu, G. Jogesh; Pathak, P. K.; Rao, C. R.; Apr. 1999; 26p; In English
Contract(s)/Grant(s): DAAH04-96-1-0082
Report No.(s): AD-A365072; TR-99-03; ARO-35518.50-M; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Rao, Pathak and Koltchinskii (1997) have recently studied a sequential approach to resampling in which resampling is carried out sequentially one by one (with replacement each time) until the bootstrap sample contains m approximately (1-e(-1)n approximately .632n distinct observations from the original sample. In our previous work, we have established that the main empirical characteristics of the sequential bootstrap go through, in the sense of being within a distance of order O(n(-3/4)) from those of the usual bootstrap. However, the theoretical justification of the second order correctness of the sequential bootstrap is somewhat difficult. It is the main topic of this investigation. Among other things, we accomplish it by approximating our sequential scheme by a resampling scheme based on the Poisson distribution with mean u=1 and censored at X=0.
DTIC
Correction; Poisson Density Functions

19990071649 Pennsylvania State Univ., Center for Multivariate Analysis, University Park, PA USA

Mu-Estimating and Smoothing

Liu, Z. J.; Rao, C. R.; Mar. 1999; 23p; In English

Contract(s)/Grant(s): DAAH04-96-1-0082

Report No.(s): AD-A364737; TR-99-01; ARO-35518.49-MA; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In the traditional M-estimation theory developed by Huber (1964), the parameter under estimation is the value of theta which minimizes the expectation of what is called a discrepancy measure (DISM) delta (x, theta) which is a function of theta and the underlying random variable X. Such a setting does not cover the estimation of parameters such as multivariate median defined by Oja (1983) and Liu (1990), as the value of theta which minimizes the expectation of a DISM of the type delta (X1,... , Xm, theta) where X1,... , Xm are independent copies of the underlying random variable X. Arcones et al (1994) studied the estimation of such parameters. We call the associated M-estimation MU-estimation (or mu-estimation for convenience). When a DISM is not a differentiable function of theta, some complexities arise in studying the properties of estimations as well as in their computation. In such a case we introduce a new method of smoothing the DISM with a kernel function and using it in estimation. It is seen that smoothing allows up to develop an elegant approach to the study of asymptotic properties and computation of estimations.

DTIC

Estimating; Data Smoothing

19990073349 California Univ., Dept. of Statistics, Berkeley, CA USA

Markov Dependence in Statistics and Information Theory and Statistical Problems in Physical Mapping ***Final Report, 1 Jun. 1994 - 31 May 1998***

Yu, Bin; May 31, 1998; 4p; In English

Contract(s)/Grant(s): DAAH04-94-G-0232

Report No.(s): AD-A366138; ARO-32320.8-MA; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

Investigations were carried out on Markov dependence in statistics and information theory, and statistical problems in physical mapping. Results were obtained on the Minimum Description Length Principle and statistical inference, adaptive quantization in image compression, Markov chain Monte Carlo methods, and statistical problems in the Human Genome Project. These results shed light on the connections between information theory and statistics, on the role of parametric models in quantization and image compression, on understanding the convergence behaviors of Markov chain Monte Carlo samplers, and on the information needed for a clone map of chromosomes. Furthermore, a wavelet image coder is designed as part of the investigation and it gives an excellent performance on test images.

DTIC

Markov Chains; Information Theory

19990075038 Magdeburg Univ., Otto-von-Guericke, Magdeburg, Germany

Possibilities and limitations of statistical process assessment and process control in small and middle-sized batch fabrication with CAQ-software

Wisweh, Lutz, Magdeburg Univ., Germany; Schmidt, Hans–Dieter, Magdeburg Univ., Germany; Ichimiya, Ryoichi, Niigata Univ., Japan; Sakamoto, Shuichi, Niigata Univ., Japan; Research Report of Faculty of Engineering Niigata University; 1996; ISSN 0374-4345, No. 45, pp. 19-32; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper concentrates on using statistical analysis as a basis for proper process control. Specifically, sections of this paper addresses: Statistical data as a source of process information; Statistical evaluation modules as standard software; Determination of quality requirements for Statistical Process Control (SPC)-software; Examination of quality conditions for statistical and SPC user software; Test series as a main tool for objective software testing; Procedures for user oriented software testing; Results of the software assessment; and Total appraisal and shortages.

Derived from text

Statistical Analysis; Quality Control; Computer Systems Performance; Software Reliability

67
THEORETICAL MATHEMATICS

Includes topology and number theory.

19990070754 Kochi Univ., Faculty of Science, Akebono, Japan
Associated Topologies of Generalized Alpha-Closed Sets and Alpha-Generalized Closed Sets
Maki, H., Saga Univ., Japan; Devi, R., Bharathiar Univ., India; Balachandran, K., Bharathiar Univ., India; Memoirs of the Faculty of Science, Kochi University. Series A: Mathematics; Mar. 1994; ISSN 0389-0252; Volume 15, pp. 51-63; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The purpose of this paper is to introduce alternative generalization of alpha-closed sets, that is alpha-generalized closed sets and investigate basic properties. Moreover, we define some topologies associated with their generalized closed sets and characterize the separation axioms.
Derived from text
Topology; Set Theory

19990070755 Kochi Univ., Faculty of Science, Akebono, Japan
On the Modular Embeddings for Basic p-Extensions
Naganuma, Hidehisa, Kochi Univ., Japan; Memoirs of the Faculty of Science, Kochi University. Series A: Mathematics; Mar. 1994; ISSN 0389-0252; Volume 15, pp. 31-40; In English
Contract(s)/Grant(s): MOE-C05640122; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper will construct a modular embedding for the basic p-field F for each p explicitly. Sections of this paper includes: Arithmetic of basic p-extension; Ideal with self dual basis; and Modular embedding for basic p-extension.
CASI
Embedding; Group Theory

19990070757 Kochi Univ., Faculty of Science, Akebono, Japan
Stable Homotopy Types of Stunted Lens Spaces Mod p(sup r)
Kobayashi, Teiichi, Kochi Univ., Japan; Memoirs of the Faculty of Science, Kochi University. Series A: Mathematics; Mar. 1994; ISSN 0389-0252; Volume 15, pp. 9-14; In English
Contract(s)/Grant(s): MOE-C05640122; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The purpose of this note is to study the condition that the stunted lens spaces L(sup n + j, sub j)(p(sup r)) and L(sup n + k, sub k)(p(sup r)) have the same stable homotopy type in case p, is an odd prime.
Derived from text
Homotopy Theory; Projective Geometry

19990071251 Kochi Univ., Faculty of Science, Akebono, Japan
A Certain Bioperation on Topological Spaces
Ummehara, Jun–iti, Kochi Univ., Japan; Memoirs of the Faculty of Science, Kochi University. Series A: Mathematics; Mar. 1994; ISSN 0389-0252; Volume 15, pp. 41-49; In English
Contract(s)/Grant(s): MOE-C05640122; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In this note, for two operations gamma and gamma', we introduce a new bioperation-open set which will be named gamma logical and gamma'-open set, we also investigate relations among some bioperation-open sets. Moreover we study some topological properties under the assumption that gamma logical or gamma' is biregular.
Derived from text
Topology; Set Theory

19990071328 California Univ., Sponsored Projects Office, Berkeley, CA USA
Explicit Modal Logic
Artemov, Sergei N.; Dec. 1998; 12p; In English
Contract(s)/Grant(s): DAAH04-96-1-0341
Report No.(s): AD-A365120; ARO-35873.138-MA-MUR; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In 1933 Godel introduced a modal logic of provability (S4) and left open the problem of a formal provability semantics for this logic. Since then numerous attempts have been made to give an adequate provability semantics to Godel's provability logic with only partial success. In this paper we give the complete solution to this problem in the Logic of Proofs.
DTIC
Mathematical Logic; Proving

70
PHYSICS (GENERAL)

For precision time and time interval (PTTI) see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

19990070383 Commonwealth Scientific and Industrial Research Organization, Collingwood, Australia
Australian Journal of Physics, Volume 51
Robertson, R. P., Editor, Commonwealth Scientific and Industrial Research Organization, Australia; 1998; ISSN 0004-9506; In English; See also 19990070384 through 19990070389; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

Contents include the following: Tunneling of molecule; Stability of shear kinetic Alfven waves in a hot relativistic plasma; Effect of non-thermal electrons on the shock wave in a magnetized plasma; Elastic properties of Cs2HgBr4 and Cs2CdBr4 crystals; Quasi-dipole magnetic fields; A VLA survey of rich clusters of galaxies; An analysis of the results.
CASI
Magnetic Fields; Plasmas (Physics); Very Large Array (VLA); Galactic Clusters

19990070384 Tasmania Univ., Dept. of Physics, Hobart, Australia
Tunnelling of a Molecule
Jarvis, P. D., Tasmania Univ., Australia; Bulte, D. P., Tasmania Univ., Australia; Australian Journal of Physics; 1998; Volume 51, No. 6, pp. 891-902; In English; See also 19990070383; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

A quantum-mechanical description of tunnelling is presented for a one-dimensional system with internal oscillator degrees of freedom. The 'charged diatomic molecule' is frustrated on encountering a barrier potential by its centre of charge not being coincident with its centre of mass, resulting in transitions amongst internal states. In an adiabatic limit, the tunnelling of semiclassical coherent-like oscillator states is shown to exhibit the Hartman and Buttiker Landauer times t(sub H) and t(sub BL), with the time dependence of the coherent state parameter for the tunnelled state given by alpha(t) = (alpha)e(sup -(i(omega)(t+ (delta)t)), (Delta)t = t(sub H) - it(sub BL). A perturbation formalism is developed, whereby the exact transfer matrix can be expanded to any desired accuracy in a suitable limit. An 'intrinsic' time, based on the oscillator transition rate during tunnelling, transmission or reflection, is introduced. In simple situations the resulting intrinsic tunnelling time is shown to vanish to lowest order. In the general case a particular (nonzero) parametrization is inferred, and its properties discussed in comparison with the literature on tunnelling times for both wavepackets and internal clocks.
Author
Diatomic Molecules; Matrices (Mathematics); Tunnel Junctions; Molecules

19990071265 Commonwealth Scientific and Industrial Research Organization, Collingwood, Australia
Australian Journal of Physics, Volume 51
1998; ISSN 0004-9506; In English; See also 19990071266 through 19990071274; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

This journal publishes articles representing original research from all branches of physics. This issue contained articles about general physics, elementary particles and fields, atomic and molecular physics, condensed matter, and astronomy and astrophysics.
CASI
Astrophysics; Atomic Physics; Condensed Matter Physics; Elementary Particles; Physics; Relativity

19990073350 Delaware Univ., Dept. of Physics and Astronomy, Newark, DE USA
Magnetic Hardening Studies and Novel Techniques for Preparation of High Performance Magnets ***Final Report, 1 Dec. 1992 - 31 Mar. 1995***
Hadjipanayis, George C.; Dec. 18, 1998; 7p; In English

Contract(s)/Grant(s): DAAL03-92-G-0086
Report No.(s): AD-A366135; 3-321-2570-11; 3-3-21-2570-13; ARO-29713.1-MS; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

This study was focused on the research, fabrication and characterization of novel hard magnetic materials with large magnetization and anisotropy and high Curie temperature, which can be used for the development of less expensive and stronger permanent magnets.
DTIC
Magnetic Materials; Curie Temperature; Hardening (Materials)

19990075836 Department of the Navy, Washington, DC USA
Method of Controlling a Super Conductor
Osofsky, Michael, Inventor; Soulen, Robert J., Jr., Inventor; Auyeung, Raymond, Inventor; Horwitz, James S., Inventor; Chrisey, Doug B., Inventor; Feb. 16, 1999; 12p; In English; Supersedes US-Patent-Appl-SN-565487, AD-D017871.
Patent Info.: Filed 30 Nov. 95,; US-Patent-Appl-SN-565,487; US-Patent-5,872,368
Report No.(s): AD-D019402; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The order parameter of a superconductor is reduced by Injecting spin-polarized carriers into the superconductor. The reduction in the order parameter is used to modulate the critical current of the superconductor In a typical embodiment a current is caused to flow through a superconductor. Spin polarized electrons are then injected into the path of the current in the superconductor by biasing a magnetic metal with respect to a terminal of the superconduction the bias current may be varied to modulate the injection and thus the flow of current through the superconduction
DTIC
Conductors; Magnetic Materials; Superconductors (Materials); Automatic Control

19990075950 Department of the Navy, Washington, DC USA
Method and System for Measuring Surface Roughness Using Fractal Dimension Values
Holland, Orgal T., Inventor; Poston, Wendy L., Inventor; Jan. 12, 1999; 9p; In English
Patent Info.: Filed 12 Aug. 96,; US-Patent-Appl-SN-695,912; US-Patent-5,859-919
Report No.(s): AD-D019392; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method of measuring surface roughness is provided in which a video image of a surface area is formed and partitioned into a set of regions that cover the video image. Each region is of equal size. A fractal dimension value is calculated for each region.
DTIC
Surface Roughness; Procedures; Dimensional Measurement

71
ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see 45 Environmental Pollution.

19990073227 Institute of Ocean Sciences, Sidney, British Columbia Canada
Analysis of Acoustic Propagation, Bubble Field and Environmental Data from the Scripps Inshore Bubble Field Experiment *Final Report, 1 Nov. 1997 - 31 Oct. 1998*
Farmer, David M.; Jun. 01, 1999; 20p; In English
Contract(s)/Grant(s): N00014-98-1-0115
Report No.(s): AD-A366104; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This experiment was designed to assess the role of bubbles in modifying the high frequency acoustic properties of the near surf environment. The observations included measurement of bubble size distributions in the surf zone and also on a frame deployed offshore by NRL, together with turbulence, wave elevation, 100 kHz propagation, acoustic Doppler, bubble imaging and related environmental measurements. This extensive data set has provided a basis for detailed modeling of the bubble advection by currents, redistribution by bottom generated turbulence, dissolution and modification by buoyancy effects. The results are compared with measured bubble populations at the NRL site and provide a means for deriving acoustical properties of the water column. In particular, the acoustical attenuation associated with bubbles is derived at two different frequencies.
DTIC
Bubbles; Acoustic Properties; Wave Propagation

19990075954 Department of the Navy, Washington, DC USA
Self Powered Underwater Acoustic Array
Sullivan, Michael J., Inventor; Dussault, Douglas G., Inventor; Smith, Timothy P., Inventor; Stottlemyer, Thomas R., Inventor; Jan. 21, 1999; 6p; In English; Supersedes US-Patent-Appl-SN-953786, AD-D018865.
Patent Info.: Filed 14 Oct. 97,; US-Patent-Appl-SN-953,786; US-Patent-5,859,812
Report No.(s): AD-D019407; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A self-powered towed underwater sensor is provided. The sensor has a shielded CASIng which encloses an electric generator. The generator is connected to an impeller that is located at the midpoint of the easing. The impeller is covered by a shroud which minimizes the disturbance of the water by the impeller.
DTIC
Arrays; Underwater Acoustics; Remote Sensors

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

19990070490 Osaka Univ., Faculty of Engineering, Osaka, Japan
WKB Solution to Neutron Diffusion Equation, 2, System of Coupled Equations
NIshigori, Takeo, Osaka Univ., Japan; Rokhmadi, Osaka Univ., Japan; Takeda, Toshikazu, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2183, pp. 189-195; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The WKB approach proposed in a previous paper is extended so as to be applicable to a system of coupled Schrodinger-type equations. The diffusion of multi-energy neutrons is treated to evaluate higher-mode eigenvalues and eigenfunctions in a very efficient and accurate way. In a model consisting of two energy groups and two material-regions for a critical assembly, it is found that the eigenvalues can be determined within 1% error for the second and higher modes, and that the eigenfunctions are determined also very accurately except for the thermal energy group in the reflector region. It is thus confirmed that the present method is particularly suited for higher mode analysis. Lower modes are, however, less accurate, as is known in the general WKB approach, and an improvement by higher-order corrections is necessary.
Author
Wentzel-Kramer-Brillouin Method; Thermal Energy; Particle Diffusion; Neutrons; Diffusion Theory

19990070745 Osaka Univ., Faculty of Engineering, Osaka, Japan
On the Matrix Elements in the Discrete-Type Linear Response Theory for Multiphoton Resonance Ionization Spectroscopy
Inoue, Masahiko, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2186, pp. 217-221; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The quantization procedure of formulas in the linear response theory for velocity distribution measurement of sputtered neutrals by multiphoton resonance ionization spectroscopy is described in detail. This leads to the exact definition for elements of matrixes appeared in the discrete-type theory, and a concrete procedure for the numerical calculation.
Author
Concretes; Multiphoton Absorption

19990071062 Osaka City Univ., Dept. of Electrical Engineering, Japan
Conical Pinched Electron Beam Diode for an Intense Pulsed X-Ray Source
Nakagawa, Yoshiro, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 1998; Volume 39; 8p; In English; See also 19990071060; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

A conical pinched electron beam diode operated by Marx generator reliably produced an intense pulsed X- rays up to 6OmR/shot at 25cm. The diode consisted from a cylindrical cathode, an anode of a conical shaped plastic with a central metal pin. A triple junction around the edge of the central pin allowed to make a large gap distance(25 approx. 30 mm, for about 100 KV), compared with the gap distance(3.5 mm) of an ordinary vacuum spark diode made of all metal electrodes and consequently stable X-ray emission from the diode. An intense pulsed X-ray in a single shot increased sharply; V(sup 4)c approx. V(sup 5)c as the voltage increase of the capacitor of the Marx generator. The diode was operated by two Marx generator with different stored energy(10

kJ and 0.1 kJ). The X-ray emitting efficiency was higher for the diode operated by the smaller Marx generator. The spectrum of X-ray was studied by the absorption method.
Author
Conical Scanning; Electron Beams; Diodes; X Ray Sources; Radar Beams; Electrodes

19990071103 Toyama Univ., Lab. for Plasma Astrophysics and Fusion Science, Japan
Quantum Effects on the Motion of Charged Particles near Neutral Surface of a Magnetic Field
Bulanov, Sergei, Toyama Univ., Japan; Lazzaro, Enzo, Consiglio Nazionale delle Ricerche, Italy; Sakai, Jun–Ichi, Toyama Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 217-224; In English; See also 19990071067
Contract(s)/Grant(s): JSPS-L96556; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

We present results of the classical and quantum descriptions of the charged particle motion near a neutral surface of the magnetic field, where the magnetic field vanishes. Far from the neutral surface the drift approximation is valid in the classical limit meanwhile the Landau description of th charged particle in the magnetic field can be used in the quantum case. In the vicinity of the neural surface, at the distance in the classical regime less then the Larmor radius, the particle motion is described by the Schrodinger equation with the potential that corresponds to that corresponds to that of the harmonic oscillator with the frequency that depends on the particle momentum along the neutral surface.
Author
Charged Particles; Particle Motion; Neutral Sheets; Plasma Physics; Larmor Radius

19990071108 Nagoya Univ., Dept. of Physics, Nagoya, Japan
Production of High-Energy Electrons by Oblique Magnetosonic Shocks
Bessho, Naoki, Nagoya Univ., Japan; Ohsawa, Yukiharu, Nagoya Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 248-253; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Electron motions in magnetosonic shock waves propagating obliquely to a magnetic field are studied by means of a one-dimensional (one spatial coordinate and three velocity components), fully relativistic particle simulation code with full ion and electron dynamics. It is found that highly relativistic electrons can be produced by oblique shock waves. This occurs when non-stationary electric fields in oblique shocks reflect some fraction of electrons. These electrons then oscillate in the shock region; the observed maximum energies of these particles were gamma approximately 100, where gamma is the Lorentz factor. This takes place when the propagation angle is approximately 45 deg and when the magnetic field is rather strong, omega(sub ce) approximately is greater than = omega(sub pe), where omega(sub ce) and omega(sub pe) are the cyclotron and plasma frequencies, respectively, in the upstream region.
Author
High Energy Electrons; Magnetic Fields; Magnetoacoustic Waves; Magnetoacoustics; Oblique Shock Waves; Shock Wave Propagation

19990071109 Nagoya Univ., Dept. of Physics, Nagoya, Japan
Acceleration of Energetic Ions by Magnetosonic Shocks
Maruyama, Kentaro, Nagoya Univ., Japan; Ohsawa, Yukiharu, Nagoya Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 254-258; In English; See also 19990071067; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Wave-particle interactions in nonlinear magnetosonic waves are studied with a one-dimensional (one spatial coordinate and three velocity components), fully relativistic particle simulation code with full ion and electron dynamics. Particular attention is given to th acceleration energetic ions whose initial speed are comparable to or greater than the Alfven speed. Simulations show that some of th energetic ions can be accelerated by the transverse electric field in a magnetosonic wave, The change in energy increases with increasing initial particle energy. The present results suggest that, if particles encounter with magnetosonic pulses many times, then high-energy ions with speeds much greater than the Alfven speed could be produced.
Author
Magnetoacoustic Waves; Magnetoacoustics; Magnetohydrodynamic Waves; Oblique Shock Waves; Wave-Particle Interactions

19990071110 National Inst. for Fusion Science, Toki, Japan
Simulation Study of Radical Electric Field Enhancement by ECRH in Heliotrons
Murakami, S., National Inst. for Fusion Science, Japan; Nakajima, N., National Inst. for Fusion Science, Japan; Gasparino, U.,

Max-Planck-Inst. fuer Plasmaphysik, Germany; Okamoto, M., National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 259-264; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The effect of ECRH (electron cyclotron resonance heating) generated suprathermal electrons on the radial electric field is studied in relation to the transition phenomena of the radial electric field observed in CHS (Compact Helical System). A new Monte Carlo simulation code in 5D phase space is used to evaluate the suprathermal electron distribution and the enhanced electron flux by ECRH. It is found that in low density discharges (n(sub e) is less than or equal to 1 x 10(exp 19) /cubic m, T(sub e) is greater than = 400eV) the positive radial electric field can be enhanced by applying off-axis ECRH with significant heating power (is greater than or equal to l50kW). The simulated profile of the radial electric field is found to be in good agreement with the experimental one.

Author

Heliotrons; Plasma Control; Stellarators; Plasma Diffusion; Plasmas (Physics); Electron Cyclotron Resonance; Electron Cyclotron Heating

19990071188 Michigan Technological Univ., Dept. of Physics, Houghton, MI USA

Computer Simulation of the far Infrared Collision Induced Absorption Spectra of Gaseous CO2

Gruszka, Marcin, Michigan Technological Univ., USA; Borysow, Aleksandra, Michigan Technological Univ., USA; Molecular Physics; 1998; ISSN 0026-8976; Volume 93, No. 6, pp. 1007-1016; In English; Sponsored in part by Forskerakademiet Contract(s)/Grant(s): NAG5-4534; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Far infrared collision induced absorption spectra of gaseous CO2 were computed using molecular dynamics simulations. The quadrupole and hexadecapole multipolar induction, through the trace, and the anisotropy of the molecular polarizability were found to be insufficient to represent properly the dipole induction mechanism. For a detailed analysis of the induction process the spectra obtained were decomposed into components resulting from different terms of the induced dipole. Based on this decomposition, all additional overlap contribution for each term was proposed. When spectra were recomputed including such overlap, good agreement between experiment and simulation was achieved over the temperature range at which measurements exist (233-400 K). The use of an anisotropic intermolecular potential was found to be of critical importance for obtaining the right shape of the far wings of the spectra.

Author

Computerized Simulation; Far Infrared Radiation; Collisions; Absorption Spectra; Carbon Dioxide; Intermolecular Forces; Molecular Dynamics; Infrared Spectra

19990071267 Defence Science and Technology Organisation, Maritime Operations Div., Salisbury, Australia

The Physics of Tachyons, Paper 4, Tachyon Electrodynamics

Dawe, Ross L., Defence Science and Technology Organisation, Australia; Hines, Kenneth C., Melbourne Univ., Australia; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 477-507; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

A new formulation of the of tachyons using the same two postulates as in special relativity is applied to the electrodynamic of material media. A discussion of Lagrange's equation and Hamilton's equations for classical charged tachyons shows such a formalism is a viable approach. An is essay is included on why tachyons can be considered to be localized particles for the purpose of calculations. tachyonic transformations of the electromagnetic fields D, P, H, and M are shown to be the same for the bradyonic transformations. Examples discussed include the electric dipole moment of a tachyonic current loop, constitutive equations, polarization in tachyonic dielectric materials and the velocity of light in tachyonic dielectric media. This is followed by discussion of the collision energy loss for charged tachyons interacting with a material medium and a mathematical proof that tachyons cannot emit Cherenkov radiation when passing through a bradyonic dielectric medium.

Author

Constitutive Equations; Dielectrics; Tachyons; Electrodynamics

19990071268 Flinders Univ., Dept. of Physics, Adelaide, Australia

The Pion Mass Formula

Cahill, Reginald T., Flinders Univ., Australia; Gunner, Susan M., Flinders Univ., Australia; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 509-525; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

The often used Gell-Mann-Oakes-Renner (GMOR) mass formula for Nambu-Golstone(NG) bosons in QCD such as the pions, involves the condensates (q-bar q) f(sub pi) and the quark current masses. Within the context of the Global Color Model (GCM) for QCD a manifestly different formula was recently found. Remarkably, Langfield and Kettner have shown the two formulae to be equivalent. Here we note that the above recent analysis refer to the constituent pion and not the exact pion. Here we note that the above recent analyses refer tothe constituent pion identity to include the full response of the quark correlators to the presence of a non-zero (and momentrum dependent) quark current mass. Results are reproted using an effective gluon correlator from meson data fitting.
Author
Pions; Quantum Chromodynamics; Particle Mass

19990071269 Delhi Univ., Dept. of Physics and Astrophysics, India
Excitation Dynamics of an Atom due to Heavy Ion Impact in a Laser Field
Prasad, Vinod, Delhi Univ., India; Sharma, Rinku, Delhi Univ., India; Mohan, Man, Delhi Univ., India; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 527-537; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

Laser assisted inelastic scattering of heavy ions by alkali atoms is studied theoretically. The non-perturbative quasi-energy method, generalised for many states, is used to describe the laser-atom interaction, and the close coupling method using the impact parameter method is used for scattering calculations. We have calculated the transition probabilities and total cross section for the excitation of alkali atoms, due to simultaneous photon-photon collisions. We show the effect of laser and collision parameters e.g. laser intensity, impact parameter laser frequency, on the excitation process.
Author
Alkalies; Collision Parameters; Collisions; Electromagnetic Interactions; Excitation; Heavy Ions; Laser Outputs; Photons

19990071320 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan
Photoelectrons Ejected from a Zirconium Surface by One-Photon or Two-Photon Laser Ionization in Air
Tsuji, M., Kyushu Univ., Japan; Oota, Hidefumi, Kyushu Univ., Japan; Nishimura, Yukio, Kyushu Univ., Japan; The Reports of the Institute of Advanced Material Study, Kyushu University; 1998; ISSN 0914-3793; Volume 12, No. 2, pp. 141-143; In English; Sponsored in part by Mitsubishi Foundation
Contract(s)/Grant(s): MOE-09440201; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In order to study interactions between photons and a metal surface, a new laser photoionization apparatus was constructed and applied to photoionization of a Zr surface by one-photon or two-photon laser ionization in air. The time profile of photocurrents consisted of two components. One short component was attributed to photoelectrons from the Zr surface and the other long one was explained as due to O2(-) anions formed by an electron attachment to O2. The dependence of the peak voltage and the recovery time on the applied voltage between the Zr rod and a charged particle collector was measured.
Author
Photoelectrons; Photoionization; Electric Current; Electric Potential; Electron Attachment

19990072791 Communications Research Lab., Tokyo, Japan
A New Ring Trap for Frequency Standard Application
Kajita, Masatoshi, Communications Research Lab., Japan; Zvyagin, Andrei V., All-Union Research Inst. for Physical and Radiotechnical Measurements, USSR; Review of the Communications Research Laboratory; Dec. 1994; ISSN 0914-9279; Volume 40, No. 4, pp. 247-352; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We propose a new ring ion trapping system, that is advantageous for use in frequency standard applications. The ring trap can store a large number of ions with low susceptibility to the second-order Dopler effect. The ring trap electrodes also form a wide-band microwave cavity, which increases S/N ratio because the first-order Doppler effect is reduced. This paper presents an analytical model of the ring trap system and estimates of the main parameters of the ring trap.
Author
Trapping; Ring Discharge; Ions; Doppler Effect; Frequency Standards

19990074956 Electrotechnical Lab., Ibaraki, Japan
Ab Initio Excitation Energy of Double K-Shell Hole States of CO and N2
Sekine, Shigeyuki, Electrotechnical Lab., Japan; Bulletin of the Electrotechnical Laboratory; 1994; ISSN 0366-9092; Volume 58, No. 1, pp. 21-25; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Excitation energy of double K-shell excited states of molecular CO and N2 was calculated by an ab initio SCF-MRCI method at their estimated equilibrium internuclear distances. The calculated energies of the (O1 sO 1 s yields 2 (pi) 2 (pi)) (sup 1)(Sigma)(sup +) (repulsive), (O 1 sC 1 s yields 2 (pi) 2 (pi) (sup 1)(Sigma)(sup +) and (C 1 sC 1 s yields 2 (pi) 2 (pi)) (sup 1)(Sigma)(sup +) states of CO were 1159, 823 and 635 eV, respectively, and those of the (N 1 s(sub g)N 1 S(sub g) yields 1(pi)(sub g) 1(pi)(sub g)) (sup 1)Sigma(sup g, sup +) and (N 1 s(sub g)N 1 S(sub u) yields 1 (pi)(sub g) 1 (pi)(sub g)) (sup 1)(Sigma)(sup u, sup +) states of N2 were 873 and 802 eV, respectively.
Author
Nitrogen; Molecules; Holes (Electron Deficiencies); Molecular Excitation

19990075981 Department of the Navy, Washington, DC USA
Apparatus and Method for Performing NMR Spectroscopy on Solid Sample by Rotation
Yeslnowski, James P., Inventor; Hill, Edward A., Inventor; Mar. 23, 1999; 18p; In English; Supersedes US-Patent-Appl-SN-822138, AD-D018582
Patent Info.: Filed 17 Mar. 97,; US-Patent-Appl-SN-822,138; US-Patent-5,886,525
Report No.(s): AD-D019366; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Nuclear magnetic resonance analysis of powdery or other randomly oriented solid samples is improved by slowly rotating the sample with a period exceeding the nuclear spin relaxation time of nuclei in the sample. As a result, a relatively large proportion of the crystallites in the sample are brought into resonance, thereby improving the signal to noise ratio of the NMR reacting. In addition, information about the width of the entire spectrum can be obtained from analysis of measurements of only a portion of it.
DTIC
Nuclear Magnetic Resonance; Spin-Lattice Relaxation; Spin Resonance; Nuclear Spin; Relaxation Time

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NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory. For space radiation see 93 Space Radiation.

19990070747 Osaka Univ., Faculty of Engineering, Osaka, Japan
Analysis of BWR Power Oscillation Using Spatial Higher Harmonics
Takaya, Hiroki, Osaka Univ., Japan; Miyaji, Takamasa, Osaka Univ., Japan; Takeda, Toshikazu, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2184, pp. 197-203; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The regional power oscillation observed in some BWR plants is analyzed using the higher-harmonic mode. Based on the lambda and the omega-mode eigenfunction expansion methods modified point-kinetics equations are derived. These equations include the mode interference effect. It is seen that the fundamental mode is excited by higher harmonics and vice versa. Combining these equations with the thermal-hydraulic model, and performing Laplace transformation we derive frequency domain equations. From these equations, the power decay ratios for the fundamental and the first-order modes are calculated, and the physical meaning is discussed.
Author
Boiling Water Reactors; Oscillations; Harmonics; Nuclear Power Reactors

19990071477 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA
Transverse Feedback Systems for the PEP-2 B Factory
Corlett, J. N., California Univ., Lawrence Berkeley Lab., USA; Barry, W., California Univ., Lawrence Berkeley Lab., USA; Byrd, J. M., California Univ., Lawrence Berkeley Lab., USA; Lambertson, G., California Univ., Lawrence Berkeley Lab., USA; Johnson, J., California Univ., Lawrence Berkeley Lab., USA; Fahmie, M., California Univ., Lawrence Berkeley Lab., USA; Fox, J. D., Stanford Linear Accelerator Center, USA; Teytelman, D., Stanford Linear Accelerator Center, USA; A Supplement to Proceedings of the International Workshop on Collective Effects and Impedance for B-Factories (CEIBA 1995); Nov. 1996, pp. 550-555; In English; Collective Effects and Impedance for B-Factories, 12-17 Jun. 1995, Tsukuba, Japan
Contract(s)/Grant(s): DE-AC03-76SF-00098; No Copyright; Avail: Issuing Activity (National Lab. for High Energy Physics, 1 - 1 Oho, Tsukuba-shi, Ibaraki-ken 305, Japan), Hardcopy, Microfiche

Growth rates of coherent beam oscillations are faster than the natural damping mechanisms for the parameters of the PEP-11 B-factory storage rings at nominal currents, even with damping of cavity Higher Order Modes (HOM's). With 1658 bunches separated by 4.2 ns, and a large current of up to 3A (2.14 A nominal in the low energy ring), many coupled-bunch modes are excited

by the resistive wall impedance and cavity higher order mode impedance. Fastest growth times of transverse rigid-bunch modes of approximately 300 microsecond are expected, two orders of magnitude faster than the radiation damping time. We will provide broadband, bunch-by-bunch feedback to suppress this coherent motion of the beam. Experience gained with a prototype system, installed and successfully operating at the LBNL Advanced Light Source (ALS), has been used extensively in developing the design of the PEP-11 systems.
Author
Coherent Radiation; Feedback; Coupled Modes; Oscillations

19990071478 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA
Coaxial Wire Impedance Measurements of BPM Buttons for the PEP-2 B Factory
Corlett, J. N., California Univ., Lawrence Berkeley Lab., USA; A Supplement to Proceedings of the International Workshop on Collective Effects and Impedance for B-Factories (CEIBA 1995); Nov. 1996, pp. 546-549; In English; Collective Effects and Impedance for B-Factories, 12-17 Jun. 1995, Tsukuba, Japan
Contract(s)/Grant(s): DE-AC03-76SF-00098; No Copyright; Avail: Issuing Activity (National Lab. for High Energy Physics, 1 - 1 Oho, Tsukuba-shi, Ibaraki-ken 305, Japan), Hardcopy, Microfiche

The coaxial wire impedance measurement uses a conducting rod placed along the beam axis in the vacuum chamber, forming the center conductor in a coaxial line system. Tapers at either end of this section allow for smooth impedance transformation from the 50 Ohm lines used in common microwave measurement equipment, to the characteristic impedance of the vacuum chamber and center conductor, typically around 200 Ohm. RF and microwave absorptive material placed in the ends of the vacuum chamber and in the impedance matching tapers minimizes reflections which cause trapped modes within the apparatus, allowing measurements to be made above the traveling- wave cut-off frequency of the vacuum vessel (typically 2.5 - 3.0 GHz for PEP-11). A smooth vessel of the same cross-section as that containing the device under test is used in a reference measurement. Resonances within the apparatus are difficult to avoid completely and require careful placing of absorptive material, manufacture of test and reference chambers, and assembly of apparatus.
Author
Wire; Coaxial Cables; Impedance Measurement; Electrical Impedance

19990071479 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA
Collective Effects in the PEP-2 B-Factory
Corlett, J. N., California Univ., Lawrence Berkeley Lab., USA; A Supplement to Proceedings of the International Workshop on Collective Effects and Impedance for B-Factories (CEIBA 1995); Nov. 1996, pp. 516-526; In English; Collective Effects and Impedance for B-Factories, 12-17, Tsukuba, Japan
Contract(s)/Grant(s): DE-AC03-76SF-00098; No Copyright; Avail: Issuing Activity (National Lab. for High Energy Physics, 1 - 1 Oho, Tsukuba-shi, Ibaraki-ken 305, Japan), Hardcopy, Microfiche

The expected major collective effects in the PEP-II B-factory are discussed and thresholds presented. Broadband and narrow band impedance values are reviewed. Instabilities not related to impedance are discussed.
Author
Broadband; Impedance; Charged Particles; Particle Beams

19990076100 Oak Ridge National Lab., TN USA
X-Ray Scattering Applications Using Pulsed X-Ray Sources
Larson, B. C.; May 23, 1999; 12p; In English; Time Structure of X-Ray Sources and Its Applications, 19-24 Jul. 1998, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA
Report No.(s): DE00-003610; ORNL/CP-98897; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

Pulsed x-ray sources have been used in transient structural phenomena investigations for over fifty years; however, until the advent of synchrotron sources and the development of table-top picosecond lasers, general access to light temporal resolution x-ray diffraction was relatively limited. Advances in diffraction techniques, sample excitation schemes, and detector systems, in addition to increased access to pulsed sources, have led to what is now a diverse and growing array of pulsed-source measurement applications. A survey of time-resolved investigations using pulsed x-ray sources is presented and research opportunities using both present and planned pulsed x-ray sources are discussed.
NTIS
Scattering; X Ray Scattering; Research; Detection

19990076120 Osaka Electro-Communication Univ., Japan
Reflection Spectra of Thallous Halides in 5d Core Exciton Region
Kiyama, Yukihisa, Osaka Electro-Communication Univ., Japan; Ohno, Nobuhito, Osaka Electro-Communication Univ., Japan; Memoirs of Osaka Electro-Communication University; 1995; ISSN 0386-4987, No. 30, pp. 91-102; In Japanese; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Reflection spectra of cubic TlCl, Tlbr and orthorhombic TlI have been measured in 2-20 electron Volts region by using synchrotron radiation. At about 16 electron Volts, two sharp peaks due to Tl(+) 5d core-exciton transition have been observed with several fine structures. The results are analyzed in terms of a localized excitation model including a crystal-field interaction.
Author
Halides; Spectra; Excitons; Spectral Emission; Synchrotron Radiation

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OPTICS

Includes light phenomena; and optical devices. For lasers see 36 Lasers and Masers.

19990070737 Osaka Univ., Faculty of Engineering, Osaka, Japan
Optical Intensity-Polarization Modulation/Self-Homodyne Detection System
Takeda, Shinichi, Osaka Univ., Japan; Tsukamoto, Katsutoshi, Osaka Univ., Japan; Morinaga, Norihiko, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2194, pp. 277-285; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

An optical intensity-polarization modulation (IPM)/self-homodyne detection system is proposed. In this system, the intensity and the state of polarization of laser light are modulated simultaneously to make the distance between symbols larger than the optical polarization modulation(PLM)/self-homodyne detection system. This paper clarifies the principle of IPM/self-homodyne detection system and investigates its receiver performance, theoretically. First, the immunity from laser phase noise and the optimal signal constellation by which minimum symbol error rate is realized, are shown. Next, the symbol error rates are derived, and it is clarified that the proposed system has excellent performance over the PLM/self-homodyne detection system.
Author
Optical Polarization; Polarization Modulation; Polarized Light; Homodyne Reception; Light Beams; Detection

19990070742 Osaka Univ., Faculty of Engineering, Osaka, Japan
Automatic Design of a Lens System for Multiple Imaging and for Optical Fourier Transformation
Renero–Carrillo, Franciso–Javier, Osaka Univ., Japan; Ichioka, Yoshiki, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2189, pp. 235-242; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

An automatic design of a multiple imaging (MI) lens system, which is capable of achieving both multiple Fourier transform and multiple imaging in a single plane, is presented. The MI lens system is composed of a doublet lens designed for Fourier transform and a graded-index (GRIN) lens array. Applying ALSIE (Automatic Lens design by Solving InEqualities), lens parameters of the off-axis lens systems, which feature the MI lens system, are optimized for resolving 22 lp/mm, with MTF of 0.7, in 3.0 mm-square object plane.
Author
Fourier Transformation; Imaging Techniques; Lens Design; Lenses; Images

19990070744 Osaka Univ., Faculty of Engineering, Osaka, Japan
New Parallel Observation System for LEED-AES with CCD Detector
Ebisu, Nobuhiko, Osaka Univ., Japan; Kimura, Yoshihide, Osaka Univ., Japan; Shimizu, Ryuichi, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2187, pp. 223-227; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We have developed a new low-energy electron diffraction (LEED) optics with a charge-coupled device (CCD) detector for analyzing the crystallographic structure. A specific software for identifying diffraction patterns has also been developed. The construction of this optics for the LEED is very simple, which is composed of a flat mesh, three micro channel plates (MCPs), a fluorescent screen, an optical lens and a CCD element. The advantages of this system are so compact as being set inside of a

cylindrical mirror analyzer (CMA). The observed LEED pattern is converted to the 8-bit digital data of 512 X 492 pixels, enabling the identification of crystallographic orientation in parallel with AES. Some preliminary results are also presented.
Author
Charge Coupled Devices; Electron Diffraction; Crystal Structure; Microstructure; Diffractive Optics; Crystallography; Auger Spectroscopy

19990070926 NASA Goddard Space Flight Center, Greenbelt, MD USA
Thermal Analysis and Design Considerations of NASA's Passively Cooled 35K Next Generation Space Telescope (NGST)
Parrish, Keith, NASA Goddard Space Flight Center, USA; Stanley, Diane, NASA Goddard Space Flight Center, USA; Jul. 12, 1999; 11p; In English; 29th; Environmental Systems, 12-15 Jul. 1999, Denver, CO, USA; No Copyright; Avail: Issuing Activity, Hardcopy

The configuration and thermal analyses of NASA's Next Generation Space Telescope (NGST) Yardstick concept utilizing a novel sunshield approach for passive cooling is described. The NGST mission concept of a large aperture optical telescope passively cooled to less than 40 K and instrument detectors passively cooled to below 30 K is unique from any other mission flown to date. Achieving such a low operational temperature requires reducing by a factor of several thousand the internal heat dissipation and environmental heating of the telescope. The techniques for achieving these requirements, i.e. orbit selection, configuration, etc., along with the supporting thermal analyses are described.
Author
Thermal Analysis; Design Analysis; Hubble Space Telescope; Cooling

19990070943 Electrotechnical Lab., Tsukuba, Japan
Optical Frequency Domain Reflectometry with Step-Like Frequency Controlled Laser Diode for Optical Waveguide Characterization
Yoshizawa, Akio, Electrotechnical Lab., Japan; March 1997; ISSN 0366-9106; 42p; In Japanese
Report No.(s): Rept-981; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Optical reflectometry is of prime importance for characterization of laser diodes, optical waveguides and optical fibers which are all indispensable components used in optical communication systems. Optical time domain reflectometry (OTDR) with a pulsed laser is widely used as a long-distance fiber fault locator, and the distance resolution is usually around several meter determined by the pulse duration. This technique is efficient for long fibers, but laser diodes and optical waveguides are so small that we need to realize optical reflectometry with a distance resolution of the order of millimeter or submillimeter. In this thesis, we propose a novel optical frequency domain reflectometry (OFDR) by means of step- like frequency control of a laser diode for characterization of such small optical components. Also, the reflectometer with a resolution of better than 0.586mm is constructed and experiments on reflection measurement are carried out in order to confirm the usefulness of the proposed OFDR. Chapter 1 is the introduction of this thesis, in which the background, purpose and outline of this research are described. to clarify the purpose, histories of optical reflectometry including low coherence time domain reflectometry, frequency modulation-continuous wave method, optical coherence domain reflectometry, etc. are briefly reviewed. In Chapter 2, OFDR based on Michelson interferometry is described. The interference signal between the reference light and the backscattered (reflected) light from the component under test is detected by changing the optical frequency of a laser diode used as the light source. The location of reflection and reflection intensity are determined by Fourier transform of the interference signal. Noise in the reflectometer and the minimum detectable intensity of the reflected light are also estimated. In Chapter 3, we propose and demonstrate a step-like optical frequency sweep generator which has been developed as a light source in the proposed OFDR. A step-like optical frequency sweep is realized by linearly increasing the laser temperature with respect to time, and the resulting frequency step is equal to the free spectral range of the Fabry-Perot resonator (FPR) that is employed as a frequency discriminator. This technique is based on electrical negative feedback control. 'nerefore, the FPR transmitted light signal or its derivative signal is fed back into the injection current to control the laser current against the shift of the laser frequency caused by the temperature change. In Chapter 4, a new reflection measurement method for the OFDR is proposed in which the distance resolution is improved by the minimum entropy method while the intensity of reflection is determined by the Fourier transform. We compare this method with the one described in Chapter 2 in which only the Fourier transform is used. In chapter 5, we describe a simple method to etermine the effective group refractive index of an optical waveguide using the step-like optical frequency sweep generator. In chapter 6, we summarize the significant results obtained in this research and discuss future research topics.
Author
Reflectometers; Optical Equipment; Laser Outputs; Diodes; Feedback Control; Frequency Modulation; Michelson Interferometers; Semiconductor Lasers; Telecommunication

19990070956 Office National d'Etudes et de Recherches Aerospatiales, Paris, France

Modal and Predictive Control for Adaptive Optics ***Commande Modale et Predictive en Optique Adaptative***

Dessenne, Caroline, Office National d'Etudes et de Recherches Aerospatiales, France; 1999; ISSN 0078-3780; 308p; In French
Report No.(s): ONERA-Publ-1999-1; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

Adaptive optics is a technique for real-time correction of atmospheric turbulent effects to obtain high-resolution astronomical images close to diffraction limit at the focus of telescopes. However, the correction is often partial because the fine bandwidth of adaptive optics systems is reduced by the time delay in the control loop and because turbulent phase measurements used to control the correcting device are noisy. The aim of this study is a spatio-temporal control of adaptive optics systems which is adapted to the atmospheric turbulent conditions and to the level of noise, and which reduces the effect of time delay. a modal and linear predictive control which minimizes the phase residual mean square error of corrected images is synthesized. The minimization is achieved by a modified least square recursive algorithm and leads to a predictor whose transfer function is a s close as possible to the spectral signal to noise ratio of the turbulent signal to correct. by means of numerical simulation,. I show that it is particularly interesting to use such a predictor when the wind speed in the turbulent layers, and the turbulent phase measurement signal-to-noise ratio are high. I show that the predictor can also filter out vibration affecting large telescopes. Theoretical results are confirmed with a high precision by experiments carried out in the laboratory and at Observatoire de Haute-provence with the Onera adaptive optics system. To check that calibration errors, due to measurement noise or optical shiftings, do not reduce the expected performance of the system, I study the tolerance of each of them.
Author

Adaptive Optics; Algorithms; Astronomy; Atmospheric Turbulence; Signal to Noise Ratios; Imaging Techniques; Feedback Control; Linear Systems; Signal Processing; Instrument Compensation

19990071061 Minolta Co. Ltd., Osaka, Japan

Measuring Method for Large Aspherical Surfaces with Holographic Optical Elements

Ueda, Hiroaki, Minolta Co. Ltd., Japan; Shimizu, Eiji, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 1998; Volume 39, pp. 1-6; In English; See also 19990071060; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Measuring method for the shape of large aspherical surfaces is reported. The method is an interferometry using holographic optical elements. The standard plate is made by recording the interference fringe pattern between the parallel reference beam and the reconstructed wave front from the master zone plate which is drawn by all electron beam drawing machine with off-axis optical arrangement. The standard plate is reconstructed by the conjugate beam and creates the standard wave front in a modified Twyman-Green interferometer. Insufficient parallelism of commercial hologram plates can be compensated by a new optical layout. It is also easy to duplicate the standard plate. Some experimental results are also presented.
Author

X Ray Sources; Radar Beams; Conjugates; Conical Scanning; Electron Beams

19990071225 Swales Aerospace, Greenbelt, MD USA

Electron Induced Scintillation Testing of Commercially Available Optical Fibers for Space Flight

Ott, Melanie N., Swales Aerospace, USA; 1999; 4p; In English; Poster Session, 15 Jul. 1999, Norfolk, VA, USA; Sponsored by Institute for Electrical and Electronic Engineers; No Copyright; Avail: Issuing Activity, Hardcopy

A test to verify the performance of several commercial and military optical fibers available on the market today was conducted, via usage of an electron accelerator, to monitor radiation induced scintillation or luminescence. The test results showed that no significant effects could be detected with the PMT system used, above a noise floor of 50 photons/sec that were due to optical fiber scintillation. Although some data appeared to show events taking place, noise scan results have correlated these events to arcing inside the electron accelerator facility. This test was to simply characterize for space flight, which optical fiber candidates were the largest scintillators among the eighteen optical fiber candidates tested.
Author

Scintillation; Optical Fibers; Electron Energy; Electron Flux Density

19990071397 NASA Goddard Space Flight Center, Greenbelt, MD USA

IEEE 1393 Spaceborne Fiber Optic Data Bus: A Standard Approach to On-Board Payload Data Handling Networks for the AIAA Space Technology Conference and Exposition "Partnering in the 21th Century"

Andrucyk, Dennis J., NASA Goddard Space Flight Center, USA; Orlando, Fred J., Ohio Aerospace Inst., USA; Chalfant, Charles H., SPI, USA; 1999; 8p; In English
Report No.(s): Rept-99-4507; No Copyright; Avail: Issuing Activity, Hardcopy

The Spaceborne Fiber Optic Data Bus (SFODB) is the next generation in on-board data handling networks. It will do for high speed payloads what SAE 1773 has done for on-board command and telemetry systems. That is, it will significantly reduce the cost of payload development, integration and test through interface standardization. As defined in IEEE 1393, SFODB is a 1 Gb/s, fiber optic network specifically designed to support the real-time, on-board data handling requirements of remote sensing spacecraft. The network is highly reliable, fault tolerant, and capable of withstanding the rigors of launch and the harsh space environment. SFODB achieves this operational and environmental performance while maintaining the small size, light weight, and low power necessary for spaceborne applications. SFODB was developed jointly by DoD and NASA GSFC to meet the on-board data handling needs of Remote Sensing satellites. This jointly funded project produced a complete set of flight transmitters, receivers and protocol ASICS; a complete Development & Evaluation System; and, the IEEE 1393 standard.
Author
Spaceborne Experiments; Fiber Optics; Channels (Data Transmission); Payload Integration; Real Time Operation; Remote Sensing

19990071583 International Society for Optical Engineering, Bellingham, WA USA
Proceedings of SPIE (The International Society for Optical Engineering) Nonlinear and Coherent Optics
Sherstobitov, Vladimir E.; Jun. 26, 1998; 145p; In English, 22-26 Jun. 1998, Saint Petersburg, Russia
Contract(s)/Grant(s): F61775-98-W-E027
Report No.(s): AD-A365219; EOARD-CSP-98-1028; No Copyright; Avail: Defense Technical Information Center (DTIC), Hardcopy
The purpose of the symposium was to bring together scientists and engineers in optics and lasers in order to report the most recent results and to simulate new disciplinary activity. One of highlights of the symposium this year was a series of papers on such topic as Nonlinear and Coherent Optics.
DTIC
Conferences; Nonlinear Optics; Four-Wave Mixing; Coherent Light; Lasers

19990074962 Electrotechnical Lab., Ibaraki, Japan
Analysis of Axial Gradient-Index Planar-Sandwiched Sphere and Semi-Sphere Lens System
Kikuchi, Keisuke, Electrotechnical Lab., Japan; Bulletin of the Electrotechnical Laboratory; 1994; ISSN 0366-9092; Volume 58, No. 1, pp. 47-54; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche
Complexed lens system of axial gradient index plates, sphere and semi-sphere is analyzed by triangular, cosine formulas and ray tracing method. Optimized axial gradient-index profile of the plates are given for spherical aberration free, sine condition and field curvature correction. Distortion for analyzer, f theta and photo lens are corrected by adjusting semi-sphere refractive index. In addition fiber bundles coupling lens is analyzed by same way for high efficiency.
Author
Gradients; Spheres; Lenses; Planar Structures; Sandwich Structures; Plates (Structural Members)

19990075968 Communications Research Lab., Tokyo, Japan
Research and Development Project for Lightwave Frequency Resources
Araki, Kenichi, Communications Research Lab., Japan; Akiba, Makoto, Communications Research Lab., Japan; Hiromoto, Norihisa, Communications Research Lab., Japan; Hori, Toshihiro, Communications Research Lab., Japan; Review of the Communications Research Laboratory; Sep. 1995; ISSN 0914-9279; Volume 41, No. 3, pp. 239-243; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche
It will be crucial to develop new techniques which will make effective use of the lightwave frequency region and efficient use of radio frequency resources for communication systems in the 21st century. At present, the focus of our research efforts is on technologies for utilizing the features of both optical and radio waves, down-sizing infrared optical communication equipment, and increasing the speed and capacity of free-space optical communication systems. This paper presents an overview of research and development plan for these technologies.
Author
Research and Development; Communication Equipment; Frequencies; Product Development; Procedures

19990076123 Osaka Electro-Communication Univ., Japan
A Simple Method of Determining the Diffusion Parameters in the Electric-Field Assisted Ion-Diffused Optical Waveguide
Kishioka, Kiyoshi, Osaka Electro-Communication Univ., Japan; Iwase, Etsuko, Osaka Electro-Communication Univ., Japan; Memoirs of Osaka Electro-Communication University; Jan. 01, 1995; ISSN 0386-4987, No. 30, pp. 49-66; In Japanese; No Copy-

right; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a simple method for determining the diffusion parameters in the electric-field assisted potassium ion-exchange waveguide in the soda-lime glass. The two major parameter values governing the diffusion-time dependence of the depth are quickly determined based on the measured ion-current in the glass substrate during the diffusion and the effective indices of the guided light propagating along the diffused layer. Both of the two diffusion procedures, i.e., the procedures with the constant applied voltage and constant induced-current, are used for determining the parameter values, and interest properties of the diffusion in the constant current condition are also discussed, which have been partially reported only in a few papers.
Author
Electric Fields; Diffusion; Ion Exchanging; Optical Waveguides; Electric Potential; Ion Currents

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see90 Astrophysics.

19990070385 Jadavpur Univ., High Energy Physics Div., Calcutta, India
Stability of Shear Kinetic Alfven Waves in a Hot Relativistic Plasma
Mukherjee, J., Jadavpur Univ., India; Chowdhury, A. Roy, Jadavpur Univ., India; Australian Journal of Physics; 1998; Volume 51, No. 6, pp. 921-934; In English; See also 19990070383; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

We have analysed the stability of a solitary shear kinetic wave in a hot relativistic plasma for oblique long wavelength perturbation following the method of Zakharov and Rubenchik. The Zakharov Kuznetsov equation describing the wave propagation is deduced and the growth rate of instabilities due to large amplitude magnetic field perturbations is obtained as a function of the angle theta between the direction of propagation of the solitary wave and magnetic field, the streaming parameter v(sub o)/c and the electron temperature sigma.
Author
Research; High Temperature Plasmas; Perturbation Theory

19990070386 Jadavpur Univ., Dept. of Physics, Calcutta, India
Effect of Non-Thermal Electrons on the Shock Wave in a Magnetized Plasma
Chowdhury, K. Roy, Jadavpur Univ., India; Chowdhury, A. Roy, Jadavpur Univ., India; Australian Journal of Physics; 1998; Volume 51, No. 6, pp. 935-941; In English; See also 19990070383; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

We have studied the effect of non-thermal electrons on the structure of a shock wave in a magnetized plasma. Using the reductive perturbation technique we have derived the Zakharov-Kuznetsov equation, and also the modified version of it in the critical limit. The structure of the shock wave is then analysed as a function of the parameter , which measures the deviation from the thermalized state. The corresponding behaviour of the maxima of the shock wave and its velocities are depicted graphically. Both comprehensive and refractive shocks are seen to be generated.
Author
Electrons; Refractivity; Magnetic Fields

19990070746 Osaka Univ., Faculty of Engineering, Osaka, Japan
Observation of Raman Light in Expanding Plasmas from Two-Layered Spherical Targets Irradiated with 527 nm Laser
Tsukamoto, Masahiro, Osaka Univ., Japan; Tanaka, Kazuo A., Osaka Univ., Japan; Kado, Masataka, Osaka Univ., Japan; Nighiguchi, Akio, Osaka Inst. of Tech., Japan; Miyamoto, Seiji, Osaka Univ., Japan; Nakai, Mitsuo, Osaka Univ., Japan; Norimatsu, Takayoshi, Osaka Univ., Japan; Takagi, Masaru, Osaka Univ., Japan; Mima, Kunioki, Osaka Univ., Japan; Nishihara, Katsunobu, Osaka Univ., Japan; Yamanaka, Tatsuhiko, Osaka Univ., Japan; Yamanaka, Tatsuhiko, Osaka Univ., Japan; Nakai, Sadao, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1994; ISSN 0030-6177; Volume 44, No. 2185, pp. 205-216; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Spectrally shifted Raman light with time was observed from two-layered spherical targets irradiated with 527 nm random phased laser light. The target is composed of a foam shell and an outer thin plastic layer. The Raman spectrum rapidly shifted to the short wavelength side during the laser pulse. The start timing was earlier than the one of the usually-observed Raman light

at the experiment with the single-layered plastic shell target. A plasma shoulder moving outward was inferred with a long scale length on the expanding plasma, which could explain the observed Raman fight consistently.
Author
Raman Spectra; Light Beams; Irradiation; Pulsed Lasers; Plasmas (Physics); Plastic Shells

19990071064 Osaka City Univ., Dept. of Applied Physics, Japan
Spatial Distribution of He I 5876 A and He II 4686 A Line Radiation of TPD-S Plasma and its Computer Simulation
Tsuji, Hiroshi, Osaka City Univ., Japan; Mita, Masatoshi, Osaka City Univ., Japan; Mimura, Mikio, Osaka City Univ., Japan; Kobuchi, Takashi, National Inst. for Fusion Science, Japan; Sato, Kuninori, National Inst. for Fusion Science, Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 1998; Volume 39, pp. 77-87; In English; See also 19990071060; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The plasma created by the TPD-S machine of National Institute for Fusion Science changes its shape depending on the discharge current and the density in the experimental region. We measured the spatial distribution of the intensity of He atomic line (5876 A) and ionic line (4686 A) emitted by the plasma. In order to explain the distribution, we carried out a numerical simulation by integrating the rate equations. A suitable electron temperature distribution may explain the measured spatial distribution of the line intensity.
Author
Spatial Distribution; Helium Isotopes; Plasmas (Physics); Liquid Helium; Computerized Simulation

19990071067 National Inst. for Fusion Science, Nagoya, Japan
Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997)
Tomita, Yukihiro, Editor, National Inst. for Fusion Science, Japan; Nakamura, Yuji, Editor, National Inst. for Fusion Science, Japan; Hayashi, Takaya, Editor, National Inst. for Fusion Science, Japan; Aug. 1998; ISSN 0915-6348; 396p; In English; 2nd; Plasma Theory, 24-26 Sep. 1997, Toki, Japan; Sponsored by Japan Society of Plasma Science and Nuclear Fusion Research, Japan; See also 19990071068 through 19990071126
Report No.(s): NIFS-PROC-38; No Copyright; Avail: CASI; A17, Hardcopy; A04, Microfiche

This issue is the proceedings of the second Asian Pacific Plasma Theory Conference (APPTC ’97), which was held on September 24-26, 1997 at National Institute for Fusion Science (Toki, Japan) under the auspices of the Japan Society of Plasma Science and Nuclear Fusion Research and the National Institute for Fusion Science. A part of APPTC ’97 was a Joint session with Japan-Australia fusion theory workshop and US-Japan JIFT workshop on Theoretical Study for Helical Plasmas. The conference covers all plasma theory areas including magnetic confinement, inertial fusion, space plasmas, astrophysical plasmas, industrial processing plasmas, and dusty plasmas, etc.
Author
Conferences; Controlled Fusion; Plasma Physics

19990071068 National Inst. for Fusion Science, Toki, Japan
Confinement Theory of LHD
Okamoto, Masao, National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 1-9; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Physics considerations are presented on the plasmas of the Large Helical Device (LHD). Characteristics of LHD configurations are also reviewed. The flexibility of LHD as an experimental device is emphasized. The nonlinear poloidal viscosity is calculated for the LHD plasma and the possibility of L-H transition is considered.
Author
Plasma Control; Heliotrons; Stellarators; Plasmas (Physics)

19990071069 Korea Basic Science Inst., Taejeon, Korea, Republic of
Current Status of the KSTAR Project
Choi, Duk–In, Korea Basic Science Inst., Korea, Republic of; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 10-14; In English; See also 19990071067; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The project mission of the KSTAR (Korea Superconducting Tokamak Advanced Research) project is to develop a steady-state-capable advanced superconducting tokamak to establish the scientific and technological bases for an attractive fusion reactor as a future energy source. The KSTAR Tokamak Research Objectives are 1) to extend present stability and performance bound-

aries of tokamak operation through active control of profiles and transport, 2) to explore methods to achieve steady state operation for tokamak fusion reactors using non-inductive current drive, and 3) to integrate optimized plasma performance and continuous operation as a step toward an attractive tokamak fusion reactor. The design features of the KSTAR tokamak are 1) Fully superconducting magnets, 2) Long pulse operation capability, 3) Flexible pressure and current profile control, 4) Flexible plasma shape and position control, and 5) Advanced profile and control diagnostics.
Derived from text
Superconductivity; Tokamak Devices; Plasma Control; Plasmas (Physics); Fusion Reactors

19990071070 California Univ., Dept. of Physics and Astronomy, Irvine, CA USA
Nonlinear Dynamics of Alfven Eigenmodes in Toroidal Plasmas
Zonca, F., Associazione EURATOM-ENEA Sulla Fusione, Italy; Chen, L., California Univ., USA; Hu, G., California Univ., USA; Santoro, R. A., Naval Research Lab., USA; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 15-20; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The non-linear saturation of Toroidal Alfven Eigenmodes (TAE) due to mode-mode coupling is investigated both analytically and numerically. It is demonstrated that, as the mode amplitude increases, a fine structure density modulation associated with the short scales excited in the nonlinear TAE mode structure causes enhanced energy dissipation which eventually leads to mode saturation. The nonlinear equations for the time evolution of TAE modes are derived and an analytical estimate of the saturated mode amplitude is given. The magnitude of the numerically obtained saturated fluctuation levels assuming finite dissipation is shown to be systematically smaller than that predicted analytically for a non-dissipative system. The relevance of the above discussed mechanism for non-linear saturation of TAE modes is discussed and comparisons are made with models proposed in other recent non-linear studies.
Derived from text
Magnetohydrodynamic Waves; Magnetohydrodynamics; Toroidal Plasmas; Plasma Control; Plasmas (Physics)

19990071071 Flinders Univ., Dept. of Physics, Adelaide, Australia
Toroidal Plasma Response to External Fields
Storer, R. G., Flinders Univ., Australia; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 21-26; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Toroidal plasmas respond to external driving fields in a way which is determined by the coupling of these fields to the spectrum of the plasma. We have extended the toroidal resistive magnetohydrodynamic spectral code, SPECTOR, to include the effects of external fields on tokamak-like plasmas. The code is capable of determining both the stable and unstable modes and also the response to helical applied fields with arbitrary mode structure. Resistivity changes the continuous regions of the ideal MHD spectrum into a set of discrete eigenvalues lying along lines in the complex frequency plane with a spacing which is related to the inverse of the square root of the magnetic Reynolds number. Results are presented which relate the spectral distribution to the plasma response as a function of frequency.
Author
Magnetohydrodynamics; Tokamak Devices; Toroidal Plasmas; Plasmas (Physics)

19990071072 Academia Sinica, Inst. of Plasma Physics, Hefei, China
Double Tearing Reconnection and the Off-Axis Sawteeth Crash
Li, Ding, Academia Sinica, China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 27-32; In English; See also 19990071067
Contract(s)/Grant(s): NSFC-19515513; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A theoretical model is developed for the onset of the off-axis sawteeth crash observed in TFTR (Tokamak Fusion Test Reactor) reversed magnetic shear experiments. The dispersion relation of the double tearing mode is obtained from the solution structure of the ideal external kink equation. The onset of ”annular crash” is due to the fast reconnection of the hot and cold islands, triggered by the interaction of both branches of the double tearing mode. The onset of ”core crash” is mainly due to the coalescence between the hot islands, triggered by the explosive growth of the inner branch and the rapid expansion of the hot islands.
Author
Tokamak Devices; Fusion Reactors; Plasma Control; Magnetohydrodynamics; Plasmas (Physics)

19990071073 Fudan Univ., Dept. of Physics, Shanghai, China
Collective Scattering of Electromagnetic Waves from a Relativistic Magnetized Plasma
Lu, Quan–Kang, Fudan Univ., China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug.

1998, pp. 33-42; In English; See also 19990071067; Sponsored in part by Association for Plasma Studies of China, Asia-African Association for Plasma Training and ICF; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Recently, laser and microwave scattering has become one of the important diagnostic means for plasmas. Laser and microwave correlative scattering spectrum is determined by particle-density fluctuations in a weak turbulent plasma. In a relativistic plasma, on the basis of complete electromagnetic-interaction between particles, a general expression for particle density fluctuations and spectrums of laser and microwave scattering from a magnetized plasma are derived. The laser and microwave scattering spectrums provide information on electron density and temperature, ion temperature, resonance and nonresonance effects.
Author

Plasmas (Physics); Relativistic Plasmas; Wave Scattering; Electromagnetic Radiation; Plasma Radiation

19990071074 National Inst. for Fusion Science, Theory and Computer Simulation Center, Toki, Japan

Recent Progress of Nonlinear Simulation of the Toroidal Alfven Eigenmode

Todo, Yasushi, National Inst. for Fusion Science, Japan; Sato, Tetsuya, National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 43-47; In English; See also 19990071067
Contract(s)/Grant(s): MOE-07832024; MOE-07858057; MOE-09878090; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Linear and nonlinear particle-magnetohydrodynamic (MHD) simulation codes are developed to study interactions between energetic ions and MHD modes. Energetic alpha particles with a slowing-down distribution are considered and the behavior of n = 2 toroidal Alfven eigenmodes (TAE modes) is investigated with the parameters pertinent to the present large tokamaks. The linear simulation reveals the resonance condition between alpha particles and TAE mode. In the nonlinear simulation two n = 2 TAE modes are destabilized and alpha particle losses induced by these TAE modes take place. Counter-passing particles are lost when they cross the passing-trapped boundary as a result of the interaction with the TAE modes. They are the major part of lost particles, but trapped particles are also lost appreciably.
Author

Energetic Particles; Alpha Particles; Magnetohydrodynamic Waves; Magnetohydrodynamics

19990071075 Southwestern Inst. of Physics, Chengdu, China

Effects of the Safety Factor Profile on the Ion Temperature Gradient Mode in Tokamak Plasmas

Peng, Xiao–Dong, Southwestern Inst. of Physics, China; Zhang, Jing–Hua, Southwestern Inst. of Physics, China; Gao, Qing–Di, Southwestern Inst. of Physics, China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 48-51; In English; See also 19990071067
Contract(s)/Grant(s): NSFC-J94c03031; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Recently, it has been discovered that the profile of safety factor plays an important role in plasmas confinement in tokamak. One characteristic of the enhanced confinement with reversed magnetic shear (ERS mode) is that the profile of safety factor is a nonmonotonic function. Usually, the safety factor is only approximated by a linear function in dealing with plasma instabilities. So, it is necessary that we investigate the instability in the presence of nonmonotonic safety factor. The drift-like instability driven by the ion temperature gradient (ITG) is currently the most plausible candidate for explaining the anomalous ion energy transport in tokamak plasmas. Numerous studies on this mode have been carried out theoretically and experimentally in the last decade. But most of these investigations have been confined to plasmas with monotonic safety factor. In this paper, we will study the effects of safety factor profile on ITG mode. On DIII-D tokamak, the high toroidal velocity shear was observed in the region where the confinement is improved. So, the effects of the toroidal velocity must be taken into account.
Derived from text

Magnetohydrodynamic Stability; Plasma Diffusion; Plasmas (Physics); Tokamak Devices; Plasma Control

19990071076 Tsukuba Univ., Plasma Research Center, Ibaraki, Japan

The Plug Potential Formation and Ion Axial Transport in a Tandem Mirror

Katanuma, I., Tsukuba Univ., Japan; Minai, R., Tsukuba Univ., Japan; Kiwamoto, Y., Tsukuba Univ., Japan; Tatematsu, Y., Tsukuba Univ., Japan; Ishii, K., Tsukuba Univ., Japan; Saito, T., Tsukuba Univ., Japan; Tamano, T., Tsukuba Univ., Japan; Yatsu, K., Tsukuba Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 52-56; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The plug potential is formed experimentally even without high energy, sloshing ion population in the end-mirror cells of a tandem mirror. It is shown theoretically that the plug potential can be formed in the present experimental conditions by using the plausible distribution functions of ion and electron and a little of ionization source. In this paper the required ionization source is estimated for the continuous potential profile around the plug as a first topic. The axial transport is investigated by Monte-Carlo

simulation as a second topic. The ion end-loss spectrum is used to estimate the heights of plug potential and ion temperature in the tandem mirror experiments. The Monte-Carlo simulation reveals that the ion temperature measure from ion end-loss spectrum deviates from the field ion temperature.
Author
Plugs; Potential Energy; Ion Temperature; Tandem Mirrors; Mirror Fusion

19990071077 Kyushu Univ., Research Inst. for Applied Mechanics, Kasuga, Japan
Nonlinear Simulation of Electromagnetic Current Diffusive Interchange Mode Turbulence
Yagi, M., Kyushu Univ., Japan; Itoh, S.–I., Kyushu Univ., Japan; Itoh, K., National Inst. for Fusion Science, Japan; Fukuyama, A., Okayama Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 57-62; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

In this paper, the model equation for the electrostatic CDIM (current diffusive interchange mode) turbulence is extended for both electrostatic and electromagnetic turbulence. (1) Not only E x B convective nonlinearity but also the electromagnetic nonlinearity which is related to the parallel flow are incorporated into the model equation. (2) The electron and ion pressure evolution equations are solved separately, making it possible to distinguish the electron and ion thermal diffusivities. The two dimensional nonlinear simulation of the electromagnetic CDIM is performed based on the extended fluid model. This paper is organized as follows. The model equation is explained in section II. The result of simulation is shown in section III. The conclusion and discussion are given in section IV.
Derived from text
Electrostatics; Electromagnetic Interactions; Turbulence; Magnetic Fields

19990071078 Kurchatov (I. V.) Inst. of Atomic Energy, Moscow, USSR
Two-Dimensional Model of Conventional Stellarator
Pustovitov, V. D., Kurchatov (I. V.) Inst. of Atomic Energy, USSR; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 63-68; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

MHD theory of conventional stellarators was originally founded on the basis of so-called stellarator expansion. Later in the early 80's several groups developed new methods and extended the theory to the wider scope of problems. But the expansion which was used to reduce the equilibrium equations remained the same in all approaches. There were other common features: expansion was always used from the very beginning; four (or even more) parameters were assumed to be small. All this made the derivations rather complicated, all expressions approximate. In addition, it was impossible to restore known exact results in the limit of axial symmetry.
Derived from text
Magnetohydrodynamics; Stellarators; Toroidal Plasmas; Poloidal Flux; Plasma Pressure; Plasma Density; Current Density

19990071079 Pohang Univ. of Science and Technology, Dept. of Physics, Pohang, Korea, Republic of
A Universal Parameterization of Chaos in Various Beam-Wave Interactions
Lee, Jae Koo, Pohang Univ. of Science and Technology, Korea, Republic of; Lee, Hae June, Pohang Univ. of Science and Technology, Korea, Republic of; Hur, Min Sup, Pohang Univ. of Science and Technology, Korea, Republic of; Bae, InDeog, Pohang Univ. of Science and Technology, Korea, Republic of; Yang, Yi, Pohang Univ. of Science and Technology, Korea, Republic of; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 69-73; In English; See also 19990071067
Contract(s)/Grant(s): BSRI-96-2439; BSRI-97-2439; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The comprehensive parameter space of self-oscillation and its period-doubling route to chaos are shown for a bounded collisionless beam plasma system. In this parameterization, it is helpful to use a potentially universal parameter in close analogy with free-electron-laser chaos. A common parameter, which is related to the velocity slippage and the ratio of bounce to oscillation frequencies, is shown to have similar significance for different physical systems. This single parameter replaces the dependences on many input parameters, thus suitable for a simplifying and diagnostic measure of nonlinear dynamical chaotic phenomena for various systems of particle wave interactions. The results of independent kinetic simulations verify those of nonlinear fluid simulations. Other standard routes to chaos via intermittent or quasiperiodic oscillations are also shown for the undriven plasma systems. Some correlation of linear characteristics to nonlinear phenomena was noted.
Author
Parameterization; Mathematical Models; Chaos; Nonlinear Systems; Period Doubling; Self Oscillation

19990071080 Australian National Univ., Research School of Physical Sciences and Engineering, Canberra, Australia

Reduced Form of MHD Lagrangian for Ballooning Modes

Dewar, R. L., Australian National Univ., Australia; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 74-79; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The derivation of the short-perpendicular-scale-length approximate reduction of the ideal magnetohydrodynamic Lagrangian is reviewed.

Author

Magnetohydrodynamic Stability; Ballooning Modes; Magnetohydrodynamics; Plasma Potentials; Plasma Physics; Plasma Control; Controlled Fusion

19990071081 Massachusetts Inst. of Tech., Research Lab. of Electronics, Cambridge, MA USA

Two-Fluid and Parallel Compressibility Effects in Tokamak Plasmas

Sugiyama, Linda E., Massachusetts Inst. of Tech., USA; Park, Wonchull, Princeton Plasma Physics Lab., USA; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 80-85; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper summarizes a set of two-fluid equations for toroidal (tokamak) geometry that has been developed and tested as the MH3D-T code and some results from the model. The electrons and ions are described as separate fluids. The code and its original MHD version, MH3D, are the first numerical, initial value models in toroidal geometry that include the full 3D (fluid) compressibility and electromagnetic effects. Previous nonlinear MHD codes for toroidal geometry have, in practice, neglected the plasma density evolution, on the grounds that MHD plasmas are only weakly compressible and that the background density variation is weaker than the temperature variation. Analytically, the common use of toroidal plasma models based on aspect ratio expansion, such as reduced MHD, has reinforced this impression, since this ordering reduces plasma compressibility effects.

Derived from text

Magnetohydrodynamics; Tokamak Devices; Toroidal Plasmas; Plasma Control; Plasmas (Physics); Plasma Density

19990071082 Cornell Univ., Dept. of Astronomy, Ithaca, NY USA

Magnetohydrodynamic Origin of Jets from Accretion Disks

Lovelace, R. V. E., Cornell Univ., USA; Romanova, M. M., Institute of Space Research, USSR; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 86-95; In English; See also 19990071067

Contract(s)/Grant(s): CRDF-RP1-173; NAGw-2293; NSF AST-93-20068; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A review is made of magnetohydrodynamic (MHD) theory and simulation of outflows from disks for different distributions of magnetic field threading the disk. In one limit of a relatively weak, initially diverging magnetic field, both thermal and magnetic pressure gradients act to drive matter to an outflow, while a toroidal magnetic field develops which strongly collimates the outflow. The collimation greatly reduces the field divergence and the mass outflow rate decreases after an initial peak. In a second limit of a strong magnetic field, the initial field configuration was taken with the field strength on the disk decreasing outwards to small values so that collimation was reduced. As a result, a family of stationary solutions was discovered where matter is driven mainly by the strong magnetic pressure gradient force. The collimation in this case depends on the pressure of an external medium. These flows are qualitatively similar to the analytic solutions for magnetically driven outflows. The problem of the opening of a closed field line configuration linking a magnetized star and an accretion disk is also discussed.

Derived from text

Magnetohydrodynamics; Plasma Physics; Plasmas (Physics); Toroidal Plasmas; Plasma Control; Poloidal Flux; Collimation; Accretion Disks

19990071083 Sydney Univ., Research Centre for Theoretical Astrophysics, Australia

Pulsar Electrodynamics: Some Outstanding Problems

Melrose, D. B., Sydney Univ., Australia; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 96-103; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The ”standard model” for pulsar electrodynamics is summarized. The properties of natural wave modes in the plasma rest frame in the region above the pair production front are discussed. This plasma is one dimensional and extremely strongly magnetized with a relativistic spread in energies. The break down of MHD in the pulsar wind is also discussed.

Author

Pulsars; Radio Emission; Electrodynamics; Standard Model (Particle Physics); Strong Interactions (Field Theory); Magnetohydrodynamics

19990071085 Academia Sinica, Purple Mountain Observatory, Nanking, China

Solitary Kinetic Alfven Waves in Low Aurora

Wang, D. Y., Academia Sinica, China; Huang, G. L., Academia Sinica, China; Wu, D. J., Academia Sinica, China; Faelthammar, C.–G., Royal Inst. of Tech., Sweden; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 110-115; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Solitary kinetic Alfven waves (SKAW) in the case of beta is much less than m(sub e)/m(sub i) have been studied from the observation events of Freja satellite and theory in detail. We find that (a) an analytic solution of finite-amplitude SKAW is presented. It is found that the exact solution of SKAW's have a wider structure and much stronger perturbed fields than the KdV solitary with the same parameters. These results have been preliminarily identified by Freja observation in low aurora. (b) The Poisson equation correction of SKAW has been considered, this correction is only important for the situation of K(sub x) approaches 0. (c) We suggest a dipole Alfven vortex model to explain not only single dip or hump density solitary structures; but also composite structures of a dip and a hump solitary, observed in Freja.

Author

Magnetohydrodynamic Waves; Solitary Waves; Auroras; Auroral Zones; Polar Regions

19990071086 Tokyo Univ., Dept. of Quantum Engineering, Japan

Nonlinear Physics of Twisted Magnetic Field Lines

Yoshida, Zensho, Tokyo Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 116-121; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Twisted magnetic field lines appear commonly in many different plasma systems, such as magnetic ropes created through interactions between the magnetosphere and the solar wind, magnetic clouds in the solar wind, solar corona, galactic jets, accretion disks, as well as fusion plasma devices. In this paper, we study the topological characterization of twisted magnetic fields, nonlinear effect induced by the Lorentz back reaction, length-scale bounds, and statistical distributions.

Author

Magnetic Field Configurations; Magnetic Clouds; Solar Corona; Solar Wind; Accretion Disks

19990071087 Max-Planck-Inst. fuer Plasmaphysik, Garching, Germany

On Creating Transport Barrier by Radio-Frequency Waves

Sen, S., Max-Planck-Inst. fuer Plasmaphysik, Germany; Cairns, R. A., Saint Andrew's Univ., UK; Dasgupta, B., Saha Inst. of Nuclear Physics, India; Pantis, G., Ioannina Univ., Greece; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 122-127; In English; See also 19990071067

Contract(s)/Grant(s): FUSC-131-83-7; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The use of radiofrequency (RF) waves in the range of Alfven frequency is shown to stabilize the drift-ballooning modes in the tokamak if the radial profile of the RF field energy is properly chosen. Stabilization is achieved by the ponderomotive force arising due to the radial gradie4nt in the RF field energy. The estimate of the RF power required for this stabilization is found to be rather modest and hence should be easily obtained in the actual experiments. This result therefore shows that the use of the RF waves can create a transport barrier to reduce the loss of particle and energy from the plasma. The new improve mode produced by the RF is expected to have all the advantageous features of the enhanced reverse shear (ERS) modes and at the same time will, unlike the ERS plasma, be sustainable for unlimited period of time and hence should be an attractive choice for the reactor-grade self-sustaining plasma.

Author

Radio Frequencies; Magnetohydrodynamic Stability; Ballooning Modes; Magnetohydrodynamic Waves; Plasma Control; Plasmas (Physics)

19990071088 National Inst. for Fusion Science, Toki, Japan

Computer Simulation of Complexity in Plasmas

Hayashi, Takaya, National Inst. for Fusion Science, Japan; Sato, Tetsuya, National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 128-132; In English; See also 19990071067; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

By making a comprehensive comparative study of many self-organizing phenomena occurring in magnetohydrodynamic and kinetic plasmas, we came up with a hypothetical grand view of self-organization. This assertion is confirmed by a recent computer

simulation for a broader science field, specifically, the structure formation of short polymer chains, where the nature of the interaction is completely different from that of plasmas. It is found that the formation of the global orientational order proceeds stepwise.
Author
Computerized Simulation; Magnetohydrodynamics; Plasmas (Physics); Plasma Physics

19990071089 Kyushu Univ., Interdisciplinary Graduate School of Engineering Sciences, Kasuga, Japan
Thermal Stability Analysis of Ignited Plasma on ELMy-H Mode, L-Mode and High Beta(sub p)-Mode
Tateishi, G., Kyushu Univ., Japan; Itoh, S.–I., Kyushu Univ., Japan; Yagi, M., Kyushu Univ., Japan; Itoh, K., National Inst. for Fusion Science, Japan; Fukuyama, A., Okayama Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 133-138; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

To understand the physics of ignited plasma is important in the design of the reactor. The ITER (International Thermonuclear Experimental Reactor) device, whose primal aim is to attain the self-ignition of plasma, is planned and the designing study has been continued. The organization of this paper is as follows. In Section II, basic model equations are introduced. In Section III, numerical results for the thermal stability of the ELMy-H mode, the L-mode, and the high beta(sub p)-mode are shown. Section IV is devoted to summary and discussion.
Derived from text
Thermal Stability; Stability Tests; Plasmas (Physics); Spontaneous Combustion; Ignition

19990071090 Kyushu Univ., Interdisciplinary Graduate School of Engineering Sciences, Kasuga, Japan
A Non-local Model Analysis of Heat Pulse Propagation
Iwasaki, T., Kyushu Univ., Japan; Itoh, S.–I., Kyushu Univ., Japan; Yagi, M., Kyushu Univ., Japan; Itoh, K., National Inst. for Fusion Science, Japan; Stroth, U., Max-Planck-Inst. fuer Plasmaphysik, Germany; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 139-144; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

In this paper, we investigate the role of the non-locality of the plasma transport in the study of the heat pulse propagation. For this purpose, a model equation is proposed, in which the non-local effect is taken into account in the heat flux. The properties of this model are investigated by performing a transport simulation. The organization of this paper is as follows: In Section II, the model equation is proposed and the properties of the model are explained. Using the model equation, the switching on-off experiment is simulated in Section III. Summary and discussions are given in Section IV.
Derived from text
High Temperature Plasmas; Thermal Plasmas; Plasma Temperature; Plasma Heating; Plasma Physics; Controlled Fusion

19990071091 Japan Atomic Energy Research Inst., Fusion Plasma Theory Lab., Naka, Japan
Investigation of Reversed Shear Equilibria in JT60U Using the Pies Code
Hudson, S. R., Japan Atomic Energy Research Inst., Japan; Tokuda, S., Japan Atomic Energy Research Inst., Japan; Monticello, D. A., Princeton Plasma Physics Lab., USA; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 145-150; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Reversed shear equilibria in JT60U with q(sub min) is less than 2 are analyzed using the PIES code. The dependence of the island formation on the beta value are investigated. Equilibria with low q(sub min) values display improved confinement, but experimentally there exists a stringent limit at q(sub min) = 2. The PIES code calculates fully three dimensional configurations with magnetic islands and stochastic regions. Therefore we may analyze tearing modes with finite magnetic islands and determine the nature of the breakdown process as the beta value increases. It is suggested that the double magnetic island chains may overlap and reconnect. A simple model field indicates that reconnection may occur if the phase of the island chains is opposite, and this is displayed by the q = 3/2 islands computed by PIES for JT60U. by resolving the magnetic field into an integrable plus perturbation field, the magnitude and phase of islands are determined.
Author
Magnetic Islands; Magnetic Field Reconnection; Magnetic Fields

19990071092 Yamaguchi Univ., Dept. of Electrical and Electronic Engineering, Ube, Japan
Gyro-Particle, Gyro-Reduced-MHD, and Hybrid Simulation of Internal Kink Modes
Naitou, Hiroshi, Yamaguchi Univ., Japan; Tokuda, Shinji, Japan Atomic Energy Research Inst., Japan; Matsumoto, Taro, Japan Atomic Energy Research Inst., Japan; Kozakai, Hiroshi, Toshiba Advanced Systems Co., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 151-156; In English; See also 19990071067; No Copyright;

Avail: CASI; A02, Hardcopy; A04, Microfiche

The collisionless reconnection process in tokamaks due to the nonlinear development of m = 1 (poloidal mode number) and n = 1 (toroidal mode number) kinetic internal kink mode is simulated by the gyro-particle code (GYR3D), the gyro-reduced MHD code (GRM3D-2F), and the particle-fluid hybrid code (Hybrid3D). These codes are based on the nonlinear gyrokinetic Vlasov-Poisson-Ampere system and have exact, energy invariances. GYR3D is a three-dimensional gyrokinetic magneto-inductive particle code with delta-f method. GRM3D-2F is a two-field and two-fluid model including the effects of electron inertia and the perturbed electron pressure gradients along the magnetic field. In Hybrid3D, electrons are treated as fluid, while ions are treated as particles. The results of these three codes agreed very well. We believe that the better understanding of the physics associated with the kinetic MHD phenomena in tokamaks will be achieved by executing simultaneously these codes.

Author

Magnetic Field Reconnection; Magnetic Fields; Magnetohydrodynamics; Space Plasmas; Tokamak Devices

19990071093 Tel-Aviv Univ., Ramat-Aviv, School of Physics and Astronomy, Tel-Aviv, Israel

On the Generation of Alfven Wave Current Drive in Low Aspect Ratio Tokamaks with Neoclassical Conductivity

Bruma, C., Tel-Aviv Univ., Ramat-Aviv, Israel; Cuperman, S., Tel-Aviv Univ., Ramat-Aviv, Israel; Komoshvili, K., Tel-Aviv Univ., Ramat-Aviv, Israel; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 157-162; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Several low aspect ratio (spherical) tokamaks (ST's) are now in operation or under construction. These devices would permit cost-effective and attractive embodiment of future fusion reactors: they would provide high beta, good confinement and steady state operation at modest field values. In this work we further investigate AWCD (current driven alfven waves) in ST's as follows: (i) we use consistent equilibrium profiles with neoclassical conductivity corresponding to an ohmic START discharge; (ii) incorporate effects due to neoclassical conductivity in the elements of the resistive MHD dielectric tensor, in the solution of the full (E(sub perp) no equal 0) wave equation as well as in the calculation of AWCD; and (iii) carry out a systematic search for antenna parameters optimizing the AWCD.

Derived from text

Magnetohydrodynamic Waves; Magnetohydrodynamics; Plasma Waves; Low Aspect Ratio; Tokamak Devices; Fusion Reactors

19990071094 Australian National Univ., Theoretical Physics Dept., Canberra, Australia

Drift Surface Geometry and Trapped Particle Fractions in the H-1NF Heliac

Dettrick, Sean, Japan Atomic Energy Research Inst., Japan; Gardner, Henry, Australian National Univ., Australia; Dewar, Robert, Australian National Univ., Australia; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 163-168; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Drift surface geometry and the trapped particle fraction in the H-1NF heliac are investigated, using cold ion orbits to trace out the surfaces. In the absence of electric fields, the drift surfaces of the helically trapped orbits are unclosed, but when electric fields of thermal magnitude are present the helically trapped drift surfaces are effectively closed. The drift surface geometries are used to suggest an ECH heating configuration which may have improved heating efficiency. A simple, quantitative method of classifying the geometrically different subclasses of trapped orbit is presented. It is used to show the effect of radial electric fields on the trapped particle populations.

Author

Trapped Particles; Stellarators; Toroidal Plasmas; Plasma Control; Magnetohydrodynamics

19990071095 Korea Advanced Inst. of Science and Technology, Taejon, Korea, Republic of

Test Particles Simulations in a Tokamak

Park, Hyoung–Bin, Korea Advanced Inst. of Science and Technology, Korea, Republic of; Heo, Eun–Gi, Samsung Display Devices, Korea, Republic of; Choi, Duk–In, Korea Advanced Inst. of Science and Technology, Korea, Republic of; Horton, Wendell, Texas Univ., USA; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 169-174; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

We execute test particle simulations for the motion of charged particles in toroidal magnetic confinement geometry including the Monte Carlo Coulomb collisional pitch angle scattering, model electrostatic drift wave fluctuation, and equilibrium potential. The numerically calculated microscopic diffusion coefficients for various values of collisionality v(sub *) in the case of no electrostatic potential agree well with the results of neoclassical theory. The diffusion coefficient increases with increasing fluctuation

amplitude while the equilibrium become potential diminishes the diffusion processes through both the orbit squeezing and the E(sub r) x B shear flow of the poloidal velocity.
Author
Charged Particles; Particle Motion; Tokamak Devices; Coulomb Collisions

19990071096 Korea Basic Science Inst., Taejeon, Korea, Republic of
A Theoretical Impedance Calculation for the Solenoidal Inductively Coupled Plasma
You, K.–I., Korea Basic Science Inst., Korea, Republic of; Yoon, N. S., Korea Basic Science Inst., Korea, Republic of; Hwang, S. M., Korea Basic Science Inst., Korea, Republic of; Choi, D.–I., Korea Basic Science Inst., Korea, Republic of; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 175-180; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A two-dimensional solution of the Maxwell Boltzmann equations in solenoidal inductively coupled plasma discharge including RF antenna source is obtained. Using this solution, we calculate the plasma impedance. The impedance is presented as a function of various parameters, such as plasma density, and temperature, antenna position, collision frequency, excitation frequency, chamber geometry, and so on.
Author
Plasma Density; Plasma Jets; Plasmas (Physics); Impedance; Plasma Temperature

19990071097 Korea Advanced Inst. of Science and Technology, Dept. of Physics, Taejon, Korea, Republic of
Theoretical Study on Helicon Plasma Discharge
Park, B. H., Korea Advanced Inst. of Science and Technology, Korea, Republic of; Choi, D. I., Korea Advanced Inst. of Science and Technology, Korea, Republic of; Yoon, N. S., Korea Basic Science Inst., Korea, Republic of; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 181-185; In English; See also 19990071067; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

We obtain the analytic solution of the wave equation with the cold plasma conductivity under realistic discharge conditions of helicon device which has a finite width antenna. Utilizing this solution. we calculate the plasma and antenna impedances as functions of various operational parameters such as width of antenna, plasma density, external magnetic field intensity, and so on.
Author
Cold Plasmas; Plasma Conductivity; Plasma Density; Plasma Jets; Impedance

19990071098 Kyonggi Univ., Suwon, Korea, Republic of
Excitation and Absorption of Electromagnetic Waves in Helicon Discharges by Plasma Immersed Antennas
Cho, Suwon, Kyonggi Univ., Korea, Republic of; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 186-191; In English; See also 19990071067
Contract(s)/Grant(s): BSRI-96-2458; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Excitation and absorption of electromagnetic waves are numerically studied for helicon discharges driven by antennas immersed in the plasma. The Maxwell equations are reduced to a set of ordinary differential equations, which are solved for radially inhomogeneous plasma by using the shooting method. Numerical results show that the plasma resistance is much larger and its peaks due to eigenmode resonance appear at higher densities for the antenna case than for the case of the antenna located outside the plasma under otherwise same conditions. It is also found that the m = -1 mode can be excited in the nonuniform plasma with an inner antenna, while it can be hardly excited when the plasma is driven by an outer antenna. In addition, the fast wave approximation neglecting the electron inertia is discussed.
Author
Excitation; Radiation Absorption; Electromagnetic Radiation; Nonuniform Plasmas; Plasma Antennas; Plasmas (Physics)

19990071099 National Inst. for Fusion Science, Theory and Computer Simulation Center, Toki, Japan
Kinetic Simulation on Collisional Bounded Plasma
Zhu, Shao–Ping, National Inst. for Fusion Science, Japan; Sato, Tetsuya, National Inst. for Fusion Science, Japan; Tomita, Yukihiro, National Inst. for Fusion Science, Japan; Hatori, Tadatsugu, National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 192-197; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A self-consistent kinetic simulation model on collisional bounded plasma is presented. The electric field is given by solving Poisson equation and collisions among particles (including charged particles and neutral particle) are included. The excitation and

ionization of neutral particle, and recombination are also contained in the present model. The formation of potential structure near a boundary for a discharge system was used as an application of this model.
Author
Simulation; Collisional Plasmas; Neutral Particles; Coulomb Collisions; Collision Rates

19990071100 Tohoku Univ., Dept. of Electronic Engineering, Sendai, Japan
Potential Structure Formed by Local Production of Negative Ions in a Magnetized Plasma
Oohara, W., Tohoku Univ., Japan; Ishiguro, S., Tohoku Univ., Japan; Hatakeyama, R., Tohoku Univ., Japan; Sato, N., Tohoku Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 198-203; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

We have investigated the formation process of field-aligned structures due to local production of negative ions in a plasma by means of one-dimensional electrostatic particle simulation. The plasma becomes unstable for a large production rate, being accompanied by the intermittent generation of negative solitary waves. The solitary waves play a role in making negative ions ejected rapidly from the system.
Author
Plasmas (Physics); Particle Production; Negative Ions; Plasma Physics

19990071101 Beijing Normal Univ., Dept. of Astronomy, China
Plasma Turbulent Acceleration Mechanism of the Relativistic Jets in AGNs
Yi, Tong, Beijing Normal Univ., China; Lirong, Tian, Beijing Normal Univ., China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 204-210; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

In this paper we use the acceleration mechanism of plasma turbulence (Alfven) wave to explain completely two characters of jets in Active Galactic Nuclei(AGNs): first the jets are kept collimating for a long distance from pc scales to several KPc scales; secondly the jets possess very high energy that the extreme relativistic speed reach to gamma = 20 (y is lorentz factor). Our theoretical Value (gamma = 15) is near the observational maximum value.
Author
Plasma Turbulence; Plasma Acceleration; Plasmas (Physics); Magnetohydrodynamic Waves; Plasma Jets; Relativistic Plasmas

19990071105 Chubu Univ., Coll. of Engineering, Kasugai, Japan
Anomalous Diffusion and Multiple-Periodic Accelerator Modes in the Standard Map
Ichikawa, Yoshi H., Chubu Univ., Japan; Hirose, Kei, Graduate Univ. for Advanced Studies, Japan; Kamimura, T., National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 230-235; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Analysis of the structure of magnetic fields, and of long time behavior of plasma particles in toroidal magnetic devices is the central problem for magnetic control fusion. Extensive research has been developed on these problems in terms of nonlinear dynamical approach. Thus the mapping analysis attracts active interests in cooperation with full advantage of computational methods. Since almost of all nonlinear dynamical mappings are reduced to the standard map in local approximation, the standard map have been the central focus in the field of nonlinear dynamics of the Hamiltonian system. In spite of the extensive studies of the systems continuing over three decades, there remains still unsolved critical problems. Here, we examine interplay of the anomalous stochastic diffusion phenomena and multiple-periodic accelerator modes in the standard map. Detailed analysis has been carried out to identify the observed anomalous enhancement of stochastic diffusion in the small nonlinear parameter region as due to contribution of the period-2, period-3 and period-5 accelerator modes.
Author
Plasmas (Physics); Magnetic Control; Controlled Fusion; Plasma Acceleration; Magnetic Fields

19990071106 Chuo Univ., Faculty of Policy Studies, Tokyo, Japan
Vortex Lattice Formation in 2D Magnetized Plasmas
Kono, M., Chuo Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 236-241; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

In this article we have shown the vortex lattice formation based on the point vortex equation with fluctuations and dissipation, whose basis is confirmed by solving eigen-value problems associated with the linear resonance both in a magnetically confined electron column and in a low frequency fluctuation which revealed the density discretization. Some of equilibrium configurations have been also obtained and shown realized in the numerical simulations. The structure of vortex lattice which is intimately related

to the profile of the linear eigen-function may be controlled by the unperturbed density profile. In experiments the density profile is rather sensitive to the plasma production and the relation between the unperturbed density profiles and the vortex lattice structures are not studied yet. We have used a random number generator in producing initial configurations of vortices by which the final structures are chosen among the equilibrium configurations. However the number of equilibrium configurations is large for the large number of vortices. We have not examined whether all the equilibrium configurations can be realized though we anticipate they are because dissipation plays an essential role for the structure formation.
Derived from text
Vortices; Lattices (Mathematics); Vortex Lattice Method; Plasmas (Physics); Plasma Equilibrium

19990071107 Nagoya Univ., Dept. of Physics, Nagoya, Japan
Collisionless Damping of Perpendicular Magnetosonic Pulses in a Two-Ion-Species Plasma
Dogen, Daiju, Nagoya Univ., Japan; Toida, Mieko, Nagoya Univ., Japan; Ohsawa, Yukiharu, Nagoya Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 242-247; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

One dimensional electromagnetic simulation code based on a three-fluid model is used to study evolution of perpendicular magnetosonic pulses in a two-ion-species plasma. A magnetosonic pulse accelerates heavy ions in the direction parallel to the wave front, which results in the excitation of a long-wavelength perturbation behind the original pulse. Thus the original pulse is damped even if the plasma is collisionless and the pulse amplitude is small. The damping rate of a solitary pulse is theoretically obtained. It decreases with increasing amplitude. The theory is in good agreement with the simulation result. Also, it is confirmed that small-amplitude periodic waves are not damped.
Author
Damping; Magnetoacoustics; Pulse Amplitude

19990071111 National Inst. for Fusion Science, Toki, Japan
Averaged RMHD Equations
Ichiguchi, Katsuji, National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 265-270; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A new reduced set of resistive MHD equations is derived by averaging the full MHD equations on specified flux coordinates, which is consistent with 3D equilibria. It is confirmed that the total energy is conserved and the linearized equations for ideal modes are self-adjoint.
Author
Magnetohydrodynamics; Poloidal Flux; Toroidal Plasmas; Plasmas (Physics)

19990071112 National Inst. for Fusion Science, Toki, Japan
Nonlinear Electromagnetic Gyrokinetic Equation for Magnetically Confined Plasmas with Large Flow Velocities
Sugama, Hideo, National Inst. for Fusion Science, Japan; Horton, Wendell, Texas Univ., USA; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 271-276; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A new nonlinear electromagnetic gyrokinetic equation is derived for plasmas with large flow velocities on the order of the ion thermal speed. The gyrokinetic equation derived here is given in the form which is valid for general magnetic geometries including the slab, cylindrical and toroidal configurations.
Author
Plasmas (Physics); Plasma Control; Plasma Turbulence

19990071113 National Inst. for Fusion Science, Toki, Japan
The Recipe for Handling Magnetic Field Properties for Desirable Stellarator Configurations
Masayuki, Yokoyama, National Inst. for Fusion Science, Japan; Noriyoshi, Nakajima, National Inst. for Fusion Science, Japan; Masao, Okamoto, National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 283-288; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Basic roles of several essential plasma boundary modulations on magnetic field properties are investigated. The appropriate combination of principle helical modulations to eliminate bumpy field is explained to realize quasi-axisymmetric (QAS) and quasi-helically symmetric (QHS) configurations. The triangular modulation is effectively utilized to form the magnetic well. The

bumpy modulations of plasma boundary is essential to reduce the toroidicity in the magnetic field, which can lead to QHS configurations. Based on these roles of plasma boundary modulations, the classification of QAS and QHS configurations is considered. The possibility of quasi-bumpy symmetric (QBS) configuration is also mentioned.
Author
Stellarators; Plasma Control; Toroidal Plasmas; Magnetohydrodynamics; Plasmas (Physics)

19990071115 Institute for Plasma Research, Gandhingar, India
Dust Acoustic Instabilities in a Plasma with a Background of Neutrals
Kaw, P., Institute for Plasma Research, India; Singh, R., Institute for Plasma Research, India; Sen, A., Institute for Plasma Research, India; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 295-305; In English; See also 19990071067; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Instabilities of dust acoustic waves in a plasma with a significant background pressure of neutrals has been investigated. A long wavelength mode, relevant at relatively high pressure, is found to be unstable due to recombination of electrons and ions on the surface of dust particles and ion-neutral collisional momentum transfer. At short wavelengths, a dissipative instability driven by relative drift between ions and the dust particles, is found to be important. Additional features of the instabilities associated with electron and ion temperature fluctuations, strong correlation in the dust fluid and dynamics of charge fluctuations on the dust particles have also been discussed. Nonlinear features of the instabilities have been investigated and are briefly commented upon.
Author
Dust; Acoustic Instability; Collisional Plasmas; Plasma Waves; Electron Plasma; Ion Acoustic Waves; Wave-Particle Interactions

19990071116 National Central Univ., Dept. of Physics, Chung-Li, Taiwan, Province of China
Dynamical Behaviors of Strongly Coupled Dusty Plasmas: From Crystal to Chaos
Lin, I., National Central Univ., Taiwan, Province of China; Juan, Wen–Tau, National Central Univ., Taiwan, Province of China; Liu, Jeng–Mei, National Central Univ., Taiwan, Province of China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 306-311; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A dusty plasma system consists of many fine dust particles immersed in a gaseous plasma background. In this strongly coupled system, the presence of dust particles with large charges and masses adds new degrees of freedom with slow time scale, modifies the dielectric properties, and generates many interesting ordered to disordered behaviors which can be directly monitored through an optical microscope. In this paper, our recent studies on the dynamical behaviors of different states from crystal, melting, liquid, dust density sliton, waves, etc. of a strongly coupled dusty plasma with micrometer size SiO2 suspensions in a low pressure rf argon discharge are reviewed. Our new first finding of the stable few body structures are also presented.
Author
Dust; Strongly Coupled Plasmas; Plasmas (Physics); Order-Disorder Transformations; Crystal Structure

19990071117 National Inst. for Fusion Science, Theory and Computer Simulation Center, Toki, Japan
Simulation Study of Magnetic Reconnection
Horiuchi, Ritoku, National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 312-317; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Dynamical process of collisionless driven reconnection is investigated by means of a two-and-one-half-dimensional particle simulation. Magnetic reconnection develops in two steps in accordance with the formation of ion and electron current layers. The dominant triggering mechanism for electron phase changes from electron meandering motion effect to electron inertia effect as a longitudinal magnetic field increases. It is also found that the energy conversion takes place from electrons to ions through the action of an electrostatic field excited in the downstream and thus the average ion temperature becomes about 1.5 of the average electron temperature.
Author
Magnetic Field Reconnection; Magnetic Fields; Magnetic Islands; Collisionless Plasmas

19990071120 Toyama Univ., Lab. for Plasma Astrophysics and Fusion Science, Japan
Nonlinear Magnetohydrodynamics of Weakly Ionized Plasmas
Bulanov, Sergei, Toyama Univ., Japan; Pegoraro, Francesco, Pisa Univ., Italy; Sakai, Jun–Ichi, Toyama Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 329-338; In English; See also

19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

We present, the results of our studies of the magnetic field line reconnection and of the Rayleigh-Taylor instability in weakly ionized plasmas. We investigate the propagation of small-amplitude MHD waves near the critical lines of the magnetic field and show the occurrence of accumulation of the electric current. This magnetic collapse is described by the self-similar solutions which show the formation of singular structures in the vicinity of the separatrix surfaces of the magnetic field. We obtain the growth rate of the tearing mode instability of the current sheet and present a solution of the Taylor problem corresponding to forced magnetic reconnection in a slab of weakly ionized plasma. In the case of the Rayleigh-Taylor instability of a thin shell of weakly ionized plasmas we present an analytical solution of the Cauchy problem for the evolution of nonlinear perturbations in the slab in terms of analytical functions of complex variable, and discuss the generic type of singularities formed in the nonlinear stage of the instability.

Author

Magnetic Field Reconnection; Magnetic Fields; Magnetohydrodynamic Stability; Magnetohydrodynamic Waves; Magnetohydrodynamics; Plasmas (Physics); Tearing Modes (Plasmas)

19990071121 Seoul National Univ., Dept. of Nuclear Engineering, Korea, Republic of

Numerical Modeling on Thermal Plasma Characteristics and Plasma-Particle Interaction in Plasma Spray Process

Hong, Sang Hee, Seoul National Univ., Korea, Republic of; Kang, Kyoung Doo, Seoul National Univ., Korea, Republic of; Choi, Byoung Lyong, Seoul National Univ., Korea, Republic of; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 339-344; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A numerical analysis of thermal plasma produced by a nontransferred plasma torch is carried out both in an interior arc-gas interacting region and an exterior thermal plasma jet region. In addition, a numerical model is proposed to simulate the behavior of particles injected into the thermal plasma jet in atmospheric plasma spraying. The arc thermal plasma is described by a 2-D MHD model with the assumption of axisymmetric, LTE, and optically-thin plasma. A control volume method and a SIMPLER algorithm are used to solve conservation equations for mass, charge, momentum, and energy, along with standard k - epsilon equations for flow turbulence. Calculated images of arc thermal plasma jets are obtained from temperature and velocity distributions. Mixing effects of Ar-H2 on plasma characteristics are found, and the role of shroud gas injection around the plasma flame is also examined. The plasma-particle interaction model includes the particle dense loading effect and the particle internal heat transfer. The influence of local dense loading of particles on the plasma flow is considered as the sources in the fluid conservation equations for semi 3-D calculations by PSI-cell method. The calculated particle velocities are compared with the measured ones by laser interferometry. The present models are applicable to prediction of thermal plasma characteristics and sprayed particle behavior as well as optimization of plasma spray process.

Author

Magnetohydrodynamic Flow; Magnetohydrodynamics; Plasma Jets; Plasma Spraying; Plasma Torches; Plasma-Particle Interactions; Plasmas (Physics); Thermal Plasmas

19990071122 Academia Sinica, Inst. of Physics, Beijing, China

The Ion Sphere Model of a Dusty Plasma

Chen, Yan–Ping, Academia Sinica, China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 345-353; In English; See also 19990071067; Sponsored in part by AAAPT and Association for Plasma Studies of China; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

An ion sphere model is extended to the strongly coupled dusty plasma. The single and complex ion sphere models are introduced for dust grain and the surrounding plasma. Their electrostatic potential are evaluated. Various characteristics, e.g. interaction between dusts, coagulation of dusts, polarization of dusty plasma, molecule-like state, are discussed with this model.

Author

Dust; Strongly Coupled Plasmas; Plasma Potentials

19990071123 Academia Sinica, Inst. of Physics, Beijing, China

The Neighbor Effect on Dust Grain Charging in a Plasma

Chen, Yan–Ping, Academia Sinica, China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 354-360; In English; See also 19990071067; Sponsored in part by AAAPT and Association for Plasma Studies of China; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A current balance equation of a grain is established by considering the momentum variation due to other grains. The effect of the nearest neighboring grains on grain charging is phenomenologically evaluated, which shows the surface potential of a grain

decreasing with grain density and in the structure of simple cubic and body center cubic the surface potential will decrease about 30% - 40% with the isothermal electrons and ions.
Author
Plasma Currents; Plasmas (Physics); Plasma Potentials

19990071124 Korea Basic Science Inst., Taejeon, Korea, Republic of
Non-Local Heating Theory of Inductively Coupled Plasma Discharge
Yoon, N. S., Korea Basic Science Inst., Korea, Republic of; You, K.–I., Korea Basic Science Inst., Korea, Republic of; Choi, Duk–In, Korea Basic Science Inst., Korea, Republic of; Hwang, S. M., Korea Basic Science Inst., Korea, Republic of; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 361-366; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Recently developed one-and two-dimensional non-local heating theories of planar type inductively coupled plasma discharge are reviewed and some extensions of the results are presented. The important results of the one- and two-dimensional theories are integrated into the representative concepts of surface impedance and impedance of plasma respectively. Relevant physics are discussed and the works in progress are presented.
Author
Plasma Heating; Plasma Jets; Plasmas (Physics); Plasma Density; Electron Density (Concentration)

19990071125 Nagoya Univ., Dept. of Electrical Engineering, Furo, Japan
Large Diameter Plasma Production by Surface Waves in Bounded Plasmas
Ghanashev, I., Nagoya Univ., Japan; Nagatsu, M., Nagoya Univ., Japan; Sugai, H., Nagoya Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 367-371; In English; See also 19990071067; Sponsored in part by Nisshin Electronic Mfg. Co. Ltd.; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Surface-wave sustained microwave discharges have been exhaustively investigated, both theoretically and experimentally, in the case of a long cylindrical plasma column contained in a dielectric tube. In this case the plasma is sustained by a surface wave travelling along the interface between the plasma and the dielectric tube. Such discharges are easily reproducible, clean, stable and quiescent. Since no external DC magnetic field is needed, plasma sources applying surface-wave sustained plasmas are compact and easy to operate. We recently proposed a new large-area surface-wave plasma source applying a two-slot-antenna for coupling of the microwave to the plasma. An eigen-mode analysis assuming plasma homogeneity results in a closed form dispersion equation which was successfully applied to identify the modes observed experimentally.
Derived from text
Cylindrical Plasmas; Plasma Waves; Surface Waves; Plasma Density; Density Distribution; Electron Density (Concentration)

19990071126 National Inst. for Fusion Science, Toki, Japan
Effects of Net Current on the HINT Computation
Kanno, R., National Inst. for Fusion Science, Japan; Nakajima, N., National Inst. for Fusion Science, Japan; Hayashi, T., National Inst. for Fusion Science, Japan; Okamoto, M., National Inst. for Fusion Science, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 277-282; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The HINT computation is developed to study three-dimensional MHD equilibria in toroidal helical systems. This calculation is based on the time-dependent relaxation technique using small values of resistivity and viscosity, which was developed by Park. First targets of the computational study were finite beta stellarator equilibria with no not current. It was founded that stellarators have the possibility of net current-free, steady operation. The net current can change drastically, the rotational transform, and maybe it affects phenomena which are the magnetic surface breaking and formation/self-healing of magnetic islands. Thus, next target should be investigation of effects of net current; the Ohmic current, the bootstrap current, and the Ohkawa current. The HINT computation has a potential to overcome this trial. to apply the HINT computational method to obtaining equilibria with net current, we need to revise this computation.
Derived from text
Magnetohydrodynamics; Stellarators; Plasma Currents; Plasma Physics; Plasmas (Physics); Controlled Fusion

19990071279 Los Alamos National Lab., NM USA
Plasma Waves and Instabilities
Gary, S. Peter, Los Alamos National Lab., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 29-34; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave.,

NW, Washington, DC 20009), Hardcopy, Microfiche

Just a heated solid will melt into a liquid and a liquid heated further will evaporate into a gas, so will a gas subjected to yet further thermal input ome ionized. In other words, if the atoms or molecules of a gas are sufficient thermal energy, particle collisions can tear individual electrons away from these neutral particles so that the gas becomes a plasma, or a collection of negatively charged electrons and positively charged ions. Thus, the hot, dense fluid of the Sun's atmosphere becomes a plasma at sufficiently high altitudes, and that state is maintained as this atmosphere expands outward to form the solar wind. Ultraviolet radiation can also kick electrons out of their atomic or molecular orbits. If a planet has a neutral atmosphere, that atmosphere acts as shield against the ionizing effects of such radiation from the Sun. But at sufficiently high altitudes, the tenuous atmosphere is ionized by solar ultraviolet radiation to form the planetary ionosphere and magnetosphere. Thus, plasma is the primary constituent of both planetary magnetospheres and the interplanetary medium. Charged particles interact with one another through their intrinsic electric fields and through the magnetic fields generated by their relative motion. Neutral particles, such as the molecules of a gas, interact by strong collisions with one another; they do not sense one another until they are very close and then suffer "hard" collisions that cause large changes in their velocities. Electric and magnetic fields correspond to much longer-range forces than the molecular forces characterizing neutral particle interactions; since the charged particles of a plasma can sense one another at much greater distances, their interactions correspond to much "softer" collisions in which velocities change relatively little.

Derived from text

Plasma Waves; Magnetic Fields; Particle Collisions; Planetary Magnetospheres; Solar Radiation; Solar Wind; Thermal Energy; Ultraviolet Radiation

19990071309 Hokkaido Univ., Dept. of Nuclear Engineering, Sapporo, Japan

Reduction of Helium Ash in Fusion Plasma by Selective Helium Pumping

Hino, Tomoaki, Hokkaido Univ., Japan; Yanagihara, Hideto, Hokkaido Univ., Japan; Yamashina, Toshiro, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 55-59; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The concept for reduction of helium ash concentration in a fusion plasma, based on the selective pumping for helium ions, is described. In a case that this scheme is employed together with the pumping of divertor, the helium ash concentration can be considerably reduced. Thus, this method is helpful to sustain the burning plasma state or the ignition condition. The pumping condition required for the selective helium pumping metal is also discussed.

Author

Ashes; Fusion (Melting); Reduction (Chemistry); Helium Plasma

19990071480 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan

Gas Desorption Property of Carbon Based Material Used for Cathode-Ray Tube

Hashiba, Masao, Hokkaido Univ., Japan; Hirohata, Yuko, Hokkaido Univ., Japan; Hino, Tomoaki, Hokkaido Univ., Japan; Yamashina, Toshiro, Hokkaido Univ., Japan; Musumi, Akira, Hokkaido Univ., Japan; Hirasawa, Shigemi, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 61-68; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The gas desorption properties of several carbon based materials used for cathode-ray tube (CRT) were investigated by using a thermal desorption spectroscopy (TDS). The samples for the TDS measurement were prepared with baking for 1 hr at 450 C under atmosphere. The gas desorption measurements were carried out by heating the samples from 23 C up to 500 C in vacuum. The major gas species were CO2 and H2O. The desorption peaks of these species were observed at about 120-150 C. The desorption amount of CO2 was approximately twice larger than that of H2O for every sample. The desorption quantity of the sample with a high content of TiO2 was low. The sample with a high content of water glass had a large desorption quantity. The activation energy E(sub d), were obtained for desorptions of CO2 and H2O. The values of E(sub d) were 1.2 eV and 0.66 eV for CO2 and H2O, respectively. These results suggest that CO2 and H2O are due to chemically and physically absorbed states, respectively. The surface morphology of the samples were observed, and the relation between the surface roughness and the gas desorption was examined.

Author

Gas Composition; Carbon; Cathode Ray Tubes; Desorption; Activation Energy

19990073631 National Defence Research Establishment, Dept. of Weapons and Protection, Stockholm, Sweden

Numerical Simulation of Shock Wave Driven Magnetic Flux Compression with MFCICS ***Numerisk Simulering av Stoetvaegsdriven Magnetfloedeskompression med MFCICS***

Nyholm, Sten E.; Apr. 1998; ISSN 1104-9154; 74p; In English; Original contains color illustrations

Report No.(s): PB99-161952; FOA-R-98-00776-612-SE; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The computer code MFCICS is used at FOA to study the physics of shock wave driven magnetic flux compression in cylindrical geometry. MFCICS is a one-dimensional magneto-hydrodynamic (MHD) code written in C++, using a conservative finite difference scheme to solve the governing equations and a rezoning procedure to reduce the amount of calculations. The code offers four different equations of state, two equations describing either a density- or a temperature-dependent electric conductivity, and a model for electric breakdown of the matter. This report describes the derivation of the one-dimensional MHD equations, the numerical scheme used, and preparation of input parameters for MFCICS. The report includes an Axum script package, which has been written to automate the processing of MFCICS data. An appendix contains input data and results of a standard MFCICS calculations. Finally, some limitations of MFCICS are pointed out, and a few suggestions are given for extension and development of the source code.

NTIS

Computerized Simulation; Shock Waves; Magnetic Flux

19990074957 Electrotechnical Lab., Ibaraki, Japan

Role of High Beta Plasma in a Very Low q Tokamak Plasma in TPE-2

Kiyama, Hiroko, Electrotechnical Lab., Japan; Kiyama, Satoru, Electrotechnical Lab., Japan; Bulletin of the Electrotechnical Laboratory; 1994; ISSN 0366-9092; Volume 58, No. 1, pp. 9-19; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The existence of an inherent self-organized magnetic configuration in a high 8 very low q tokamak plasma (beta(p) greater than or equal to 1, q(I) less than 2) of the TPE-2 will be described. The necessary condition for relaxation to the low q stable plasma is that beta(p) is greater than 0.6 before and after the relaxation transition. The role of high beta(p) plasma in the relaxed plasma and the rotation of a ballooning like mode will be described. These results will be compared with the analysis of the ideal Magneto-hydrodynamic (MHD) stability.

Author

Plasmas (Physics); Tokamak Devices; Q Factors; Beta Factor; Self Organizing Systems

19990075844 Department of the Navy, Washington, DC USA

Large Area Plasma Processing System (LAPPS)

Neger, Robert A., Inventor; Fensler, Richard F., Inventor; Lampe, Martin, Inventor; Manheimer, Wallace, Inventor; Feb. 23, 1999; 7p; In English; Supersedes US-Patent-Appl-SN-917963

Patent Info.: Filed 27 Aug. 97,; US-Patent-Appl-SN-917,963; US-Patent-5,874,807

Report No.(s): AD-D019382; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The large area plasma processing system (LAPPS) is a system wherein an electron beam is used to produce a plasma. A large area uniform plasma is produced where length and width can be comparable (10's-100's of cm) and very much larger than the plasma thickness (approx. 1 cm). The plasma distribution is created independent of the surface to be processed and the bias applied to the surface. The beam produced plasma has a low intrinsic electron and excitation temperature plasma, allowing the process to be conducted with better control of free radical production. A material, such as a substrate, being processed may be placed in close proximity to plasma with controlled ion bombardment or without substantial bombardment by energetic ions. The system also offers a large available area for gas inflow and removal from the processing chamber and cathode chamber so as not to contaminate the material being processed or damage the cathode.

DTIC

Plasmas (Physics); Plasma Density; Distribution Functions; Electron Beams

76
SOLID-STATE PHYSICS

Includes superconductivity. For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

19990070387 Academy of Sciences of the Ukraine, Inst. of Physical Optics, Lvov, Ukraine

Elastic Properties of Cs2HgBr4 and Cs2CdBr4 Crystals

Kityk, A. V., Academy of Sciences of the Ukraine, Ukraine; Zadorozhna, A. V., Academy of Sciences of the Ukraine, Ukraine; Shchur, Y. I., Academy of Sciences of the Ukraine, Ukraine; Martynyuk–Lototska, I. Y., Academy of Sciences of the Ukraine, Ukraine; Burak, Y., Academy of Sciences of the Ukraine, Ukraine; Vlokh, O. G., Academy of Sciences of the Ukraine, Ukraine; Australian Journal of Physics; 1998; Volume 51, No. 6, pp. 943-957; In English; See also 19990070383; Copyright; Avail: Issuing

Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

Using ultrasonic velocity measurements all components of the elastic constant matrix C(sub ij) elastic compliances matrix S(sub ij) and linear compressibility constants matrix K(sub ij) of orthorhombic Cs2HgBr4 and Cs2CdBr4 crystals have been determined over a wide temperature range including the region of the phase transition from the normal to the incommensurate phase. Results obtained are considered within the framework of the phenomenological theory. Preliminary analysis of the acoustical properties at room temperature clearly indicates that both crystals are relatively important materials for acousto-optical applications.

Author

Elastic Properties; Ultrasonic Processing; Velocity Measurement

19990071189 Electrotechnical Lab., Tsukuba, Japan

Electronic States of Correlated Transition Metal Oxides: Ca(1 - x)SR(x)VO3 and SR2RuO4

Inoue, Isao H., Electrotechnical Lab., Japan; Researches of the Electrotechnical Laboratory; January 1999; ISSN 0366-9106, No. 986, pp. 1-121; In English; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This study has aimed at elucidating the electronic structure of the correlated metallic vanadate by means of the optical spectroscopy measurements. We have synthesized the Ca(l-x)SR(x)VO3 system to control solely the 3d band-width without varying the band filling. We have found that the low energy contribution to the optical conductivity spectra cannot be reproduced by the simple Drude model with the energy-independent scattering rate and effective mass. The energy dependent ygamma(omega) determined by the generalized Drude model shows relatively large energy dependence. However, gamma(omega) is proportional to omega rather than that of the electron-electron scattering omega(sup 2). The effective mass of the V 3d electron has been evaluated from the plasma frequency. The value of m*/m(sub o) gradually increases with decreasing the band-width W. However, any symptom of the critical mass enhancement has not been observed, even though the system is close to the Mott transition. We observed two anomalous peaks in the optical conductivity spectra around 1.7 eV and 3.5 eV. These features can be assigned to the possible combinations of transitions between the incoherent peaks and the coherent quasiparticle band around the Fermi level. This large spectral weight redistributed substantiates the strong electron correlation in this system, which is, however, not concomitant with a large effective-mass enhancement.

Derived from text

Metal Oxide Semiconductors; Vanadates; Optical Measurement; Electronic Structure; Light (Visible Radiation)

19990071241 Kyushu Univ., Faculty of Engineering, Fukuoka, Japan

Magnetic Relaxation Measurements of a High-T(c) Oxide Superconductor Using Microwave Absorption

Noujima, Masafumi, Kyushu Univ., Japan; Shiiyama, Kenichi, Kyushu Univ., Japan; Kinoshita, Chiken, Kyushu Univ., Japan; Technology Reports of Kyushu University; September 1998; ISSN 0023-2718; Volume 71, No. 5, pp. 523-527; In Japanese; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The pinning potential of Bi2SR2CaCu2O(x) with and without electron irradiation has been determined. Single crystals of Bi2SR2CaCu2O(x) were irradiated with 1 MeV electrons at room temperature in a high voltage electron microscope. Magnetic relaxation of the non-irradiated and irradiated crystals was measured with use of a microwave absorption method at T = 79 K and magnetic fields, H = 0 approx. 0.13 T. The relaxation process was described in terms of the pinning potential and its anisotropy to get the following conclusions: (1) The pinning potential of the irradiated crystal is 2.2 times higher than that of the virgin crystal. (2) Isolated point defects, such as vacancies and interstitials provide good pinning centers. (3) The point defects produced by the electron irradiation make the pinning potential anisotropic.

Author

Magnetic Relaxation; Superconductors (Materials); Electromagnetic Measurement; Refractory Materials

19990071270 Australian Nuclear Science and Technology Organisation, Menai, Australia

Neutron Diffraction Study of Tetragonal Zirconias Containing Tetravalent Dopants

Hunter, B. A., Australian Nuclear Science and Technology Organisation, Australia; Howard, C. J., Australian Nuclear Science and Technology Organisation, Australia; Kim, D.–J., Korean Inst. of Science and Technology, Korea, Republic of; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 539-545; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

In tetragonal zirconia, the cation is coordinated by two interpenetrating tetrahedra of oxygen ions, implying two different cation-oxygen bond lengths. Neutron powder diffraction was used to study tetragonal ZrO-2 mol% Y2O3 incorporating various amounts of the different tetravalent ions Ge, Ti, Sn, and Ce. Precise and accurate values for the lattice parameters and the variable

oxygen position parameter have been obtained and from these the bond lengths derived. The results are compared with those from a an earlier x-ray and Raman study on the same materials. of interest are the confirmation of the increase in cell volume occurring when Zr is replaced by the smaller Sn ion, and the observation of departures from Vegard's law in the case of substitution of Zr by Ti.
Author
Cations; Oxygen Ions; Zirconium Oxides; Tetragons; Lattice Parameters

19990071272 South Africa Univ., Dept. of Physics, Pretoria, South Africa
Phase Transitions and Molecular Reorientations in Bilayered n-Heptadecylammonium Chloride
Reynhardt, E. C., South Africa Univ., South Africa; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 557-575; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

An investigation of phase transitions and molecular motions in polycrystalline n-heptadecylammonium chloride (C17H35NH3Cl) employing differential scanning calorimeter, x-ray powder diffraction and nuclear magnetic resonance techniques is reported. This compound can occur in two virgin polymorphs at room temperature, one interdigitated and one noninterdigitated. The temperature at which crystallization occurs determines the polymorph that forms. If these polymorphs are heated transitions to noninterdigitated gamma, beta,and alpha phases can occur. Cooling to room temperature shows the same phase transitions but the virgin phase is not formed. Instead a noninterdigitated epsilon phase is formed. Defect motions of chain ends play a significant role in spin-lattice relaxation rates in all phases. In the alpha phase a degree of chain melting is present. The molecular dynamics of chains differs during heating and cooling cycles in the epsilon phase. If the temperature is kept constant during a heating cycle in this phase fourfold motions of chains are frozen over a period of several hours, but the sample remains noninterdigitated. It seems that the interdigitation process is hampered by the population fo defect orientations of chain-ends. The methyl group executes classical threefold reorientations and the NH3 group jumps in an asymmetric threefold potential well
Author
Cooling; Crystallization; Heating; Methyl Compounds; Molecular Dynamics; Phase Transformations; Polycrystals; Molecular Chains

19990071604 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan
Effect of Incident Beam Power on Response Time of Transmission Grating in Photorefractive Crystal
Takayama, Yoshihisa, Hokkaido Univ., Japan; Okamoto, Atsushi, Hokkaido Univ., Japan; Mishima, Teruhito, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; Jun. 1994; ISSN 0385-602X, No. 169, pp. 30-39; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Effect of incident beam power on response time of transmission grating in photorefractive crystal is analyzed. Temporal variation of coupling strength of four-wave mixing by a photorefractive crystal is derived with physical parameters of the crystal. The time dependent coupling strength is applied to the phase conjugate reflectivity in the case of transmission grating. The calculation of the reflectivities is made and the reflection properties are shown as a function of time. Experiment on generating the phase conjugate beam via four wave mixing by a BaTiO3 crystal is performed. The response time of the phase conjugate beam is measured and shown at several beam intensities. The results fit an approximate function and are compared with theoretical ones.
Author
Time Dependence; Computation; Power Beaming

19990072350 NASA Marshall Space Flight Center, Huntsville, AL USA
Evolution of Local Microstructures: Spatial Instabilities of Coarsening Clusters
Frazier, Donald O., NASA Marshall Space Flight Center, USA; 1999; 1p; In English; Containerless Processing of Materials, 1-4 Mar. 1999, San Diego, CA, USA; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

This work examines the diffusional growth of discrete phase particles dispersed within a matrix. Engineering materials are microstructurally heterogeneous, and the details of the microstructure determine how well that material performs in a given application. Critical to the development of designing multiphase microstructures with long-term stability is the process of Ostwald ripening. Ripening, or phase coarsening, is a diffusion-limited process which arises in polydisperse multiphase materials. Growth and dissolution occur because fluxes of solute, driven by chemical potential gradients at the interfaces of the dispersed phase material, depend on particle size. The kinetics of these processes are "competitive," dictating that larger particles grow at the expense of smaller ones, overall leading to an increase of the average particle size. The classical treatment of phase coarsening was done by Todes, Lifshitz, and Slyozov, (TLS) in the limit of zero volume fraction, V(sub v), of the dispersed phase. Since the publication of TLS theory there have been numerous investigations, many of which sought to describe the kinetic scaling behavior over a 0

range of volume fractions. Some studies in the literature report that the relative increase in coarsening rate at low (but not zero) volume fractions compared to that predicted by TLS is proportional to v(sub v)(exp 1/2), whereas others suggcest V(sub v)(exp 1/3). This issue has been resolved recently by simulation studies at low volume fractions in three dimensions by members of the Rensselaer/MSFC team. Our studies of ripening behavior using large-scale numerical simulations suggest that although there are different circumstances which can lead to either scaling law, the most important length scale at low volume fractions is the diffusional analog of the Debye screening length. The numerical simulations we employed exploit the use of a recently developed ”snapshot” technique, and identifies the nature of the coarsening dynamics at various volume fractions. Preliminary results of numerical and experimental investigations, focused on the growth of finite particle clusters, provide important insight into the nature of the transition between the two scaling regimes. The companion microgravity experiment centers on the growth within finite particle clusters, and follows the temporal dynamics driving microstructural evolution, using holography.
Author
Microstructure; Coarseness; Stability

77
THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

19990071104 Beijing Normal Univ., Inst. of Low Energy Nuclear Physics, China
Resonance with Saddle Virtual Potential and Transition to Spatio-Temporal Chaos Via Crisis
Kaifen, He, Beijing Normal Univ., China; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 225-229; In English; See also 19990071067; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Chaotic motions with spatial coherence and incoherence are found to exhibit different spatial spectra. A crisis may induce a transition from the former to latter state. It is found that resonance of a realized solution with a ’virtual potential’ is responsible for the onset of crisis. Another solution that can not be realized due to saddle instability plays the role of ’virtual potential’.
Author
Chaos; Nonlinear Systems; Dynamical Systems; Branching (Mathematics)

19990071266 Adelaide Univ., Dept. of Physics and Mathematical Physics, Australia
Quantum Theory of Gravitation
Green, H. S., Adelaide Univ., Australia; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 459-475; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

It is possible to construct the non-euclidean geometry of space-time from the information carried by neutral particles. Points are identified with the quantal events in which photons or neutrinos are created and annihilated, and represented by the relativistic density matrices of particles immediately after creation or before annihilation. From these, matrices representing subspaces in any number of dimensions are constructed, and the metric and curvature tensors are derived by an elementary algebraic method; these are similar in all respects to those of Riemannian geometry. the algebraic method is extended to obtain solutions of Einstein’s gravitational field equations for empty space with a cosmological term. General relativity and quantum theory are unified by the quantal embedding of non-euclidean space-time, and the derivation of a generalization, consistent with Einstein’s equations, of the special relativistic wave equations of particles of any spin within representations of SO(3) (X) SO(4,2). There are some novel results concerning the dependence of the scale of space-time on properties of the particles by means of which it is observed and the gauge groups associated with gravitation.
Author
Annihilation Reactions; Euclidean Geometry; Gravitation; Gravitational Fields; Neutral Particles; Quantum Theory; Relativistic Particles; Wave Equations; Space-Time Functions

19990071273 Priyadarshini Coll. of Engineering, Nagpur, India
Higher Dimensional Exact Solutions of Einstein’s Field Equations for a Massive Point Particle with Scalar Point Charge
Joshi, M. P., Priyadarshini Coll. of Engineering, India; Khadekar, G. S., Visvesvaraya Regional Coll. of Engineering, India; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 577-584; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

The exact spherically symmetric static solution of Einstein's field equations in higher dimensions for a massive point particle with a scalar point charge as the source of a massless scalar field is derived in Schwarzschild coordinates. There exists no Schwarzschild horizon. This result is an extension of a similar one obtained by Hardell and Dehnen earlier for 4D space-time
Author
Relativity; Field Theory (Physics); Schwarzschild Metric; Space-Time Functions

19990075039 Niigata Univ., Niigata, Japan
The extension of Schroedinger's equation to general relativity
Tozuka, Shizuo, Niigata Univ., Japan; Research report of faculty of engineering niigata university; 1996; ISSN 0374-4345, No. 45, pp. 1-18; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper discusses the extention of the Schrodingers equations to general relativity. It also restates the Dirac equations to cover electromagnetic fields and gravitation.
CASI
Schroedinger Equation; Dirac Equation; Relativity

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

19990075827 General Accounting Office, Accounting and Financial Management Div., Washington, DC USA
Standards for Internal Control in the Federal Government
May 1999; 24p; In English
Report No.(s): PB99-163255; GA0/AIMD-99-21.3.1; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Federal policy makers and program managers are continually seeking ways to better achieve agencies' missions and program results, in other words, they are seeking ways to improve accountability. A key factor in helping achieve such outcomes and minimize operational problems is to implement appropriate internal control. Effective internal control also helps in managing change to cope with shifting environments and evolving demands and priorities. Although the present standards remain conceptually sound, this update gives greater recognition to the increasing use of information technology to carry out critical government operations and incorporates, as appropriate, relevant updated internal control guidance developed by the private sector.
NTIS
Information Systems; Management; Standards; Control

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DOCUMENTATION AND INFORMATION SCIENCE

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

19990071245 Royal Greenwich Observatory, Cambridge, UK
The New ING Data Archive
Lewis, James R., Royal Greenwich Observatory, UK; Zuiderwijk, E. J., Royal Greenwich Observatory, UK; Spretrum; March 1997; ISSN 1353-7784, No. 13, pp. 6-9; In English; Original contains color illustrations; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The ING data archive contains observations collected with all three telescopes of the Isaac Newton Group (La Palma) and has been operational since 1986. The catalogue has currently close to half a million entries describing over 10 years of observations. About 70% of these are of astronomical objects, while the remainder are calibrations or engineering data. The archive contains (for the moment) only the raw data which are kept off-line on about 7000 DAT cassettes. The database software in use until now, the ARCQUERY system, is an inhouse product, built by NFRA in Dwingeloo. It runs under VMS and has served us well.

A detailed description of the archive and its operation can be found in PASP 106,515 (1994). That the archive has been successful in recycling data is beyond question. In 1996 more than 19000 observations were de-archived for 110 requests.
Derived from text
Data Bases; Astronomy; Catalogs (Publications)

19990071318 Army War Coll., Carlisle Barracks, PA USA
Like a Lightning Bolt - Information Warfare
Boll, Kenneth; Feb. 01, 1999; 47p; In English
Report No.(s): AD-A364265; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Combatant commanders currently do not have the best possible support from information warfare doctrine and capabilities that facilitate organizing forces for offensive and defensive information warfare. A balance of offensive and defensive information power is required and this research project suggests clearer doctrinal command and control relationships, integrated ways of employment, and sufficient information warfare means to enable a joint force commander to project dominant information power. The appropriate organization for combat will include a Joint Information Warfare Task Force to assist the joint force commander's planning effort and execute information operations.
DTIC
Management Planning; Warfare; Military Operations

19990071473 Electrotechnical Lab., Ibaraki, Japan
Human Media Technology for Future Information Environment: Kasei Media Technology and its Application to Human Communication
Kato, T., Electrotechnical Lab., Japan; Hirai, S., Electrotechnical Lab., Japan; Tomita, F., Electrotechnical Lab., Japan; Niki, K., Electrotechnical Lab., Japan; Higuchi, T., Electrotechnical Lab., Japan; Tsukamoto, M., Electrotechnical Lab., Japan; Tanaka, K., Electrotechnical Lab., Japan; Sota, T., Electrotechnical Lab., Japan; Sakamoto, T., Electrotechnical Lab., Japan; Ono, E., Electrotechnical Lab., Japan; Kawai, Y., Electrotechnical Lab., Japan; Yamamoto, Y., Electrotechnical Lab., Japan; Inayoshi, H., Electrotechnical Lab., Japan; Kojima, H., Electrotechnical Lab., Japan; Bulletin of the Electrotechnical Laboratory; 1996; ISSN 0366-9092; Volume 60, No. 8, pp. 13-49; In Japanese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper gives an overview to "human media technology," which is our new initiative for the human-centered multimedia information infrastructure. Human media technology focuses on human-computer interaction as well as human communication through the multimedia information environment. It enables us to directly receive multimedia messages through our five senses, and to directly send those on a feeling on something, an intention, and so on. This paper also introduces the basic concept of subjective information ("kansei") media technology as an essential technology for human media. Kansei media technology models the subjectivity of individual user, such as a personal knowledge of something, a taste, a feeling on something, an emotion, an intention, and ideas, and so on, which can be modeled as the following four levels; physical level, physiological level, psychological level and mental level. It enables us to communicate multimedia messages in the most familiar representation to each of the specific users. It also enables us to share and re-use subjective information amongst users with different personal backgrounds.
Author
Information Systems; Multimedia; Sensory Perception; Communication; Human-Computer Interface

19990071487 Electrotechnical Lab., Ibaraki, Japan
Self-organizing Information Retrieval System on the Web: Sir-Web
Niki, K., Electrotechnical Lab., Japan; Sashima, A., Electrotechnical Lab., Japan; Bulletin of the Electrotechnical Laboratory; 1996; ISSN 0366-9092; Volume 60, No. 8, pp. 1-12; In Japanese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A Self-organizing Information Retrieval (IR) System, named Sir-Web, is being developed to contribute to a Self-organized Information Data Base Research Project. Sir-Web is designed to be useful in the future information oriented society, especially to allow novice user to access information references easily. The developmental goals of Sir-Web are summarized as follows: (1) Sir-Web is automatically constructed without an IR database generated by IR experts; (2) Sir-Web has a user-friendly graphic interface that supports the "Visualization of the information Retrieval Process" for novice users; (3) Sir-Web has the ability to learn through use and evaluation, and this ability makes Sir-Web adaptive and smart; (4) Sir-Web works as a distributed Information Retrieval system on the Internet. Sir-Web is a re-development of the system called SirX, which was designed as a user-friendly Self-organizing Information Retrieval System for X windows. Sir-Web can be used at an early stage of database construction when there is no hand-made database for information retrieval. It has intelligence in the sense that it has the ability to learn while being used. For this purpose, Sir-Web is designed as a connectionist information retrieval system, which has a user-friendly graphical

interface and a learning mechanism for automatically adapting links between data. We introduce the Internet facility in Sir-Web, with all the excellent features mentioned above, which makes Sir-Web accessible through the Internet. Sir-Web consists of Sir-Web clients and a Sir-Web network server on the Internet. A Sir-Web client is written in Java, with particular use of Java's AWT(Abstract Window Tools). A Sir-Web network server is written in Horb, a distributed version of Java under development at ETL. A Sir-Web client is accessible by WWW browsers, such as Netscape. Sir-Web is machine independent and portable, and sets a standard for information retrieval systems of the future.
Author
Graphical User Interface; Information Retrieval; Internets; World Wide Web; Java (Programming Language); Client Server Systems

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URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see also 03 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.

19990071180 National Science and Technology Council, Subcommittee on Transportation Research and Development, Washington, DC USA
National Transportation Science and Technology Strategy
Apr. 1999; 66p; In English
Report No.(s): PB99-151383; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The National Science and Technology Council (NSTC) Committee on Technology, Subcommittee on Transportation Research and Development (R&D), has created a National Transportation Science and Technology Strategy that builds on the earlier strategy published in 1997. Like its predecessor, the National Strategy is intended to help Congress and the Administration establish national transportation R&D priorities and coordinated research activities. The National Strategy articulates goals for transportation system safety, mobility and access, economic growth, the environment, and national security. It proposes the broader involvement of State, local, and tribal agencies; academic institutions; and private industry in national transportation R&D strategic planning and system assessment, private-public technology partnerships, enabling research, and transportation education and training.
NTIS
Research and Development; Transportation; Technologies; Strategy

19990074935 Department of Transportation, Volpe National Transportation Systems Center, Cambridge, MA USA
US Department of Transportation's Research and Development Plan. First Edition
May 1999; 132p; In English
Report No.(s): PB99-162653; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

This document has been prepared in keeping with the guidance and direction reflected by these and related policy and planning documents to bring greater consistency and cohesion to the Department's separate R&D programs and to address transportation system-level performance through better coordinated and integrated R&D. This R&D Plan has six major sections. Chapter I provides a brief description of the key elements of the national transportation system, as well as the challenges and opportunities that confront us when making technological improvements to it. Chapter II describes the close relationship between the Department's strategic goals and those outlined by the NSTC in the S&T Strategy. Chapter III shows in detail the cooperative nature of these R&D activities. Chapter IV presents the DOT near-term and long-term enabling research programs. Chapter V describes the process by which measures of success for DOT R&D programs are being developed. Finally, Chapter VI discusses several key issues that impact the implementation of the results of these R&D activities in the transportation system, as well as important incentives that are available to assist in this process.
NTIS
Research and Development; Urban Transportation

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SPACE SCIENCES (GENERAL)

19990071275 American Geophysical Union, Washington, DC USA
From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays
Suess, Steven T., Editor, American Geophysical Union, USA; Tsurutani, Bruce T., Editor, American Geophysical Union, USA; 1998; In English; See also 19990071276 through 19990071291; Original contains color illustrations
Report No.(s): LC-98-46324; ISBN 0-87590-292-8; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

Bright streamers and a corkscrew-shaped coronal mass ejection appear in this image of the normal K- or electron corona. The twisted mass of ionized gas, expelled from the lower atmosphere, and contorted by the magnetic fields that hold it together, is seen stretching across the field of view out to more than three million kilometers above the Sun's visible surface. The blue image superimposed on the center of the picture shows the hot ionized gas in the low solar corona at nearly the same time as the larger image. This image of the Earth's northern auroral zone, taken aboard the POLAR spacecraft, shows the onset of a geomagnetic substorm. Author
Auroral Zones; Magnetic Storms; Solar Flares; Cosmic Rays; Solar Corona

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ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

19990070488 Space Research Organization Netherlands, Groningen, Netherlands
Observational Properties of SiO Masers in The Galactic Bulge Iras Sources
Izumiura, H., Space Research Organization Netherlands, Netherlands; 1994; ISSN 0911-5501; 2p; In English; Unsolved Problems of the Milky Way, 23-27 Aug. 1994, Hague, Netherlands; Sponsored by International Astronomical Union, Netherlands; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We surveyed 313 color-selected IRAS sources in the Bulge in the SiO J=1- 0 (v=1,2) lines with the Nobeyama 45 m telescope, which resulted in 222 detections. The detection rates exceeded 80% for the brighter samples. We discuss the observed SiO maser characteristics and the implications of the obtained I-v diagram. SiO Maser Intensity: We examined the integrated SiO intensity against the 12 microns flux density. On average, our sample stars show much stronger SiO intensities for a particular 12 microns flux than found by Jewell et al. (1991) for stars in the solar neighborhood. The highest observed value of the SiO intensity for a fixed 12 microns flux is 10 times as high as theirs. This large discrepancy should be confirmed with future observations of the nearby stars with the 45 m telescope. Completeness of our survey: In terms of 12 microns flux, our survey is almost complete down to F(sub 12) approx. 1.5 Jy in the absolute value of b =7 deg - 8 deg strips. According to Whitelock et al. (1991) our survey reached the far side of the Bulge, as far as 4 kpc away from the galactic center. Our sample, however, may be biased to the intrinsically brighter objects in the far-side. In the absolute value of b =4 deg - 5 deg strips the sampling is complete down to F(sub 12) = 3 Jy, which means that our survey is almost complete in the near side of the Bulge. The far side has also been substantially sampled as far as 10 kpc from the Sun. In addition, these arguments are valid for the region of l greater than -8 deg due to the declination limit at Nobeyama. Implications of the I-v diagram: Izumiura et al. (1993) suggested a possible asymmetry in the I-v diagram. It has turned out to come mostly from sources in the 7 deg - 8 deg strips in quadrant "A". The 4 deg - 5 deg strips sources are distributed rather symmetrically around the origin in the diagram, in spite of the somewhat smaller distance coverage. Author
Observation; Silicon Oxides; Masers; Galactic Bulge; Infrared Lasers; Surveys

19990070489 Nobeyama Radio Observatory, Nobeyama, Japan
SiO Maser Survey of the IRAS Bulge Sources
Izumiura, Hideyuki, Space Research Organization Netherlands, Netherlands; Yamamura, I., Tokyo Univ., Japan; Deguchi, S., Nobeyama Radio Observatory, Japan; Ukita, N., Nobeyama Radio Observatory, Japan; Hashimoto, O., Seikei Univ., Japan; Onaka, T., Tokyo Univ., Japan; Nakada, Y., Tokyo Univ., Japan; 1994; ISSN 0911-5501; 2p; In English; Formation of the Milky Way, 5-10 Sep. 1994, Granada, Spain
Report No.(s): NRO-379; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We searched for SiO maser emission from the J= 1 - 0, v = 1 and 2 transitions toward color - selected IRAS sources in the Galactic Bulge. The detection rate exceeds 80% for the brighter sources. The line of sight velocities of the SiO masers agree within

3 km/sec with the center velocities of the OH masers. The completeness of our survey is discussed. Kinematics of the Bulge is examined in terms of the longitude versus radial velocity diagram. There is possibly a hole (a zone of avoidance) in the diagram, which might be related to the bar structure in the Bulge.
Author
Sulfur Oxides; Observation; Interstellar Masers; Hydroxyl Emission; Galactic Bulge

19990070759 Nobeyama Radio Observatory, Nobeyama, Japan
Aperture Synthesis Observations of HCN J=1-0 Emission from Y Canum Venaticorum
Izumiura, H., Tokyo Gakugei Univ., Japan; Fujiyoshi, A., Tokyo Gakugei Univ., Japan; Ukita, N., Nobeyama Radio Observatory, Japan; 1995; ISSN 0911-5501; 2p; In English; Circumstellar Matter 1994, 29 Aug. - 2 Sep. 1994, Edinburgh, UK; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have made high resolution observations of HCN (1-0) emission from the carbon star Y Canum Venaticorum using the Nobeyama Millimeter Array. We find that the emission region is not well resolved by the synthesized beam of 3.7 in x 4.6 in over the entire velocity range (V(sub LSR) = 10 to 35 km/s). We find that the true brightness temperature probably exceeds 200 K at many velocity channels as well as at the 26 km/s maser spike. The broad emission component may be the result of superimposed maser spikes. The high brightness requires an unreasonably high HCN fractional abundance if LTE is assumed. It is likely that the HCN abundance previously reported for the star is considerably affected by the maser action. A new maser spike has been found at V(sub LSR) = 29 km/s.
Author
Synthetic Apertures; Observation; Brightness Temperature; Masers

19990070940 Tuebingen Univ., Institut fuer Astronomie und Astrophysik, Germany
RXTE Observations of LMC X-1 and LMC X-3
Wilms, J., Tuebingen Univ., Germany; Nowak, M. A., Colorado Univ., USA; Dove, J. B., Colorado Univ., USA; Pottschmidt, K., Tuebingen Univ., Germany; Heindl, W. A., California Univ., San Diego, USA; Begelman, M. C., Colorado Univ., USA; Staubert, R., Tuebingen Univ., Germany; Oct. 06, 1998; 4p; In English
Contract(s)/Grant(s): NAG5-7340; NAG5-3225; NAG5-4621; NAG5-4737
Report No.(s): astro-ph/9810077; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Of all known persistent stellar-mass black hole candidates, only LMC X-1 and LMC X-3 consistently show spectra that are dominated by a soft, thermal component. We present results from long (170 ksec) Rossi X-ray Timing Explorer (RXTE) observations of LMC X-1 and LMC X-3 made in 1996 December. The spectra can be described by a multicolor disk blackbody plus an additional high-energy power-law. Even though the spectra are very soft (Gamma approximately 2.5), RXTE detected a significant signal from LMC X-3 up to energies of 50 keV, the hardest energy at which the object was ever detected. Focusing on LMC X-3, we present results from the first year of an ongoing monitoring campaign with RXTE which started in 1997 January. We show that the appearance of the object changes considerably over its approximately 200d long cycle. This variability can either be explained by periodic changes in the mass transfer rate or by a precessing accretion disk analogous to Her X-1.
Author
X Ray Timing Explorer; Black Holes (Astronomy); X Ray Astronomy; Stellar Spectra

19990070946 NASA Marshall Space Flight Center, Huntsville, AL USA
Analysis of Line Candidates in Gamma-Ray Bursts Observed by BATSE
Briggs, M. S., NASA Marshall Space Flight Center, USA; Band, D. L., NASA Marshall Space Flight Center, USA; Preece, R. D., NASA Marshall Space Flight Center, USA; Paciesas, W. S., NASA Marshall Space Flight Center, USA; Pendleton, G. N., NASA Marshall Space Flight Center, USA; 1999; 1p; In English, 1999, Amsterdam, Netherlands; Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

A comprehensive search of BATSE Spectroscopy Detector data from 117 Gamma Ray Bursts (GRBs) has uncovered 13 statistically significant line candidates. The case of a candidate in GRB-930916 is discussed. In the data of SD-2 there appears to be a emission line at 46 keV, however the line is not seen in the data of SD-7. Simulations indicate that the lack of agreement between the results from SD-2 and SD-7 is implausible but not impossible.
Author
Gamma Ray Bursts; Gamma Ray Observatory; Gamma Ray Astronomy; Line Spectra; Conferences

19990071196 National Optical Astronomy Observatories, Tucson, AZ USA

Abundance Anomalies in Stars: A 30-Minute Tour of the HR Diagram

Pilachowski, C. A., National Optical Astronomy Observatories, USA; October 1998; 26p; In English

Report No.(s): NOAO-Preprint-818; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The HR diagram is home to an astounding diversity of odd stars. to cover all these anomalous stars in a modest review paper is, of course, impossible. And if I tried to do justice to all the anomalous stars in the heavens, I'd probably leave you in confusion about the differences among the beta Cephei stars, the BY Draconis stars, the SX Phoenecis stars, the RV Tauri stars, and the RS CVn (or AM CVn!) stars. to begin, we need a definition of what an abundance anomaly is. I suggest the following: a stellar abundance anomaly is a difference in the stellar surface composition from the general galactic composition at the time the star formed. Given the relative simplicity of the general picture of stellar evolution, the extraordinary variety of real stars is truly amazing. I will approach the subject of abundance anomalies in stars not as a visit to the stellar zoo, but rather by reviewing how the physical processes described in many of the other lectures of this Symposium are manifest in the surface abundances of stars. Mass loss, element segregation, mixing, mass transfer, and other processes can all have subtle to profound effects on stellar surface abundances. Understanding the patterns these processes impose on stellar surface abundances can help us identify the cause of peculiar abundances, and the observed abundances, in turn, constrain the physical processes. Studying abundance anomalies in stars provides a laboratory for modeling physical processes, and provides clues for us to follow the step-by-step evolution of stars from one stage to the next. Abundance anomalies also illuminate the complexities of stellar populations and galactic chemical enrichment. I suspect, however, that the underlying motivation for the study of abundance anomalies by stellar astronomers is primarily both the challenge of a puzzle to be solved and the confrontation with standard theory - the unsolved problems of stellar evolution.

Author

Abundance; Anomalies; Hertzsprung-Russell Diagram; Stellar Evolution; Asymptotic Giant Branch Stars; Dwarf Stars

19990071254 NASA Marshall Space Flight Center, Huntsville, AL USA

Discovery and Orbital Determination of the Transient X-Ray Pulsar GRO J1750-27

Scott, D. M., NASA Marshall Space Flight Center, USA; Finger, M. H., NASA Marshall Space Flight Center, USA; Wilson, R. B., NASA Marshall Space Flight Center, USA; Koh, D. T., California Inst. of Tech., USA; Prince, T. A., California Inst. of Tech., USA; Vaughan, B. A., California Inst. of Tech., USA; Chakrabarty, D., Massachusetts Inst. of Tech., USA; Astrophysical Journal; Oct. 20, 1997; Volume 488, pp. 831-835; In English

Contract(s)/Grant(s): NAG5-3293; NAG5-1458; NAG5-3109; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We report on the discovery and hard X-ray (20 - 70 keV) observations of the 4.45 s period transient X-ray pulsar GRO J1750-27 with the BATSE all-sky monitor on board CGRO. A relatively faint out- burst (less than 30 mcrab peak) lasting at least 60 days was observed during which the spin-up rate peaked at 38 pHz/s and was correlated with the pulsed intensity. An orbit with a period of 29.8 days was found. The large spin-up rate, spin period, and orbital period together suggest that accretion is occurring from a disk and that the outburst is a "giant" outburst typical of a Be/X-ray transient system. No optical counterpart has yet been reported.

Author

X Rays; Pulsars; Observation; Exploration

19990071255 NASA Marshall Space Flight Center, Huntsville, AL USA

A Correlation Between Length of Strong-Shear Neutral Lines and Total X-Ray Brightness in Active Regions

Falconer, D. A., NASA Marshall Space Flight Center, USA; Solar Physics; 1997; Volume 176, pp. 123-126; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

From a sample of 7 MSFC vector magnetograms,of active regions and 17 Yohkoh SXT soft X-ray images of these active regions, we have found that the total x-ray brightness of an entire active region is correlated with the total length of neutral lines on which the magnetic field is both strong (less than 250 G) and strongly sheared (shear angle greater than 75 deg) in the same active region. This correlation, if not fortuitous, is additional evidence of the importance of strong-shear strong-field neutral lines to strong heating in active regions.

Author

Light Beams; X Rays; Brightness

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also 75 Plasma Physics.

19990070388 University of Western Australia, Dept. of Physics, Nedlands, Australia

Quasi-Dipole Magnetic Fields

Burman, R. R., University of Western Australia, Australia; Australian Journal of Physics; 1998; Volume 51, No. 6, pp. 959-969; In English; See also 19990070383; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

This paper describes the development of an analytical technique for including the modification to the poloidal magnetic field that is generated by the toroidal component of motion of the charged particles in the axisymmetric pulsar magnetosphere model of Mestel and co-workers. This 'quasi-dipole' technique, and its 'distorted dipole' case, are developed in such a way as to retain as much as possible of the earlier formalism in which the poloidal magnetic field was taken to be the dipole field of the star. The field is described in terms of a 'magnetic Stokes stream function', which is constant on each poloidal field line. The technique involves using the cylindrical polar radial coordinate and this stream function (in preference to the axial coordinate) as the independent variables, forming a non-orthogonal coordinate set in meridian planes. The field contains an unspecified function, which represents the modification to the dipole field of the star generated by the toroidal magnetospheric currents. Expressions are calculated for the curl of the poloidal magnetic field, which must be matched to an expression obtained for the toroidal electric current density from a magnetosphere model, thus determining the unspecified function.

Author

Magnetic Fields; Procedures; Cylindrical Bodies; Charged Particles; Magnetic Dipoles

19990070389 Commonwealth Scientific and Industrial Research Organization, Australia Telescope National Facility, Epping, Australia

A VLA Survey of Rich Clusters of Galaxies, 4, An Analysis of the Results

Slee, O. B., Commonwealth Scientific and Industrial Research Organization, Australia; Roy, A. L., National Radio Astronomy Observatory, USA; Andernach, H., Guanajuato Univ., Mexico; Australian Journal of Physics; 1998; Volume 51, No. 6, pp. 971-1010; In English; See also 19990070383; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

We present a detailed analysis of the results of a two-frequency VLA survey with scaled arrays of 60 fields near 58 Abell clusters. The sample of sources is complete to a flux density of 2.0 mJy at 1.5 GHz, from which we chose two sub-samples of radio galaxies from clusters that had been surveyed completely out to 0 24, and 0 51 times the Abell radius RA respectively. The following conclusions are drawn from these samples: (1) The sources are strongly concentrated towards their cluster centres, showing a power-law variation of surface density with radius, with an exponent of approx. 1 6. Each cluster contains an average of two radio galaxies. (2) The ratios of flux density and surface brightness in the lobes of cluster and background doubles are very similar, as are their spectral indices; the ratios of component area are significantly different. (3) The lobes of cluster doubles have spectra that steepen with radio power, but a less significant relationship is found between spectral index and surface brightness. (4) Relationships are found between source area and radio power, optical luminosity and r/RA, spectral index and r/RA, and between radio power and optical luminosity. (5) We define three polarisation classes on the basis of the presence or absence of observable polarisation at 4 9 and 1 5 GHz; the physical parameters vary systematically across the classes. (6) Depolarisation in sources that are partially polarized at both frequencies (Class 1) is predominantly caused by tangled fields; sources that are polarised at only the higher frequency (Class 2) or at neither frequency (Class 3) are depolarized by a combination of tangled fields and differential Faraday rotation. The rms dispersion in the scale size of the tangled fields within the radio plasma is approx. 5 kpc. (7) Differential Faraday depolarisation in Classes 1 and 2 suggests that thermal electrons are entrained in the radio plasma with densities in the range 1.1 - 2.3xl0(exp -4)/cc. (8) The magnetic fields in Class 1 doubles (with minimum Faraday rotation) favour directions predominantly parallel to the major axis of the double. (9) The univariate fractional luminosity function suggests that an early-type cluster galaxy with M(sub R) less than -21.0 has a probability of approx. 0.02 of creating a radio source with P(sub 1.5) less than 10(sup 24.9) W/Hz. (10) The integrated bivariate fractional luminosity function shows that higher luminosity cluster galaxies are more likely to form radio sources, although in each bin of absolute magnitude the fraction of radio sources decreases with increasing radio power. (11) The average lifetime of a cluster source of approx. 2 X 10(exp 6) yr is consistent with the travel-time of the plasma at approx. 3000 km/s from a once-only acceleration site near the centre of the host galaxy. (12) The confinement of the radio lobes can be easily accomplished by the static pressure of the hot intra-cluster gas and/or ram pressure generated by the passage of the galaxy through the gas. (13) Radio powers of cluster sources and optical luminosities of their hosts are both indepen-

dently correlated with cluster X-ray luminosity. This suggests that radio power is maintained by the confining pressure of the hot gas, but the cause of the optical correlation is unknown. 15 Finally, core powers in cluster radio galaxies are of the same order as those in non-cluster sources, indicating that the hot intra-cluster gas does not provide an extra fuel supply for the nuclear engine. Author

Galactic Clusters; Depolarization; Faraday Effect; Flux Density; High Temperature Gases; Magnetic Fields; Observation; Radiant Flux Density; Spectra; Radio Galaxies

19990070758 Nobeyama Radio Observatory, Nobeyama, Japan

Extended Dust Shells Around Carbon Stars Resolved by "HIRAS"

Izumiura, H., Space Research Organization Netherlands, Netherlands; Kester, D. J. M., Space Research Organization Netherlands, Netherlands; DeJong, T., Space Research Organization Netherlands, Netherlands; Loup, C., Institut d'Astrophysique, France; Waters, L. B. F. M., Amsterdam Univ., Netherlands; Bontekoe, TJ. R., Bontekoe Data Consultancy, Netherlands; 1994; ISSN 0911-5501; 2p; In English; Circumstellar Matter 1994, 29 Aug. 2 Sep. 1994, Edinburgh, UK; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have examined forty-two carbon stars which show an excess emission at 60 and/or 100 microns by applying maximum entropy image reconstruction techniques to the IRAS 60 micron survey data. Thirteen stars are found to be extended in the reconstructed images. Four of them show a detached ring centered on the stellar position. In particular, U Ant may have a double detached dust shell. The implications of our results are discussed concerning the variation of mass loss on the AGB evolution. Author

Carbon Stars; Dust; Surveys

19990070933 SciberNet, Inc., San Diego, CA USA

Physics of Boundaries and Their Interactions in Space Plasmas ***Final Report, 1-30 Jun. 1999***

Omidi, Nojan, SciberNet, Inc., USA; Karimabadi, Homayoun, SciberNet, Inc., USA; Krauss–Varban, Dietmar, SciberNet, Inc., USA; June 1999; 11p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS5-96101

Report No.(s): NASA/CR-1999-209250; NAS 1.26:209250; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report, we provide a summary of our most significant research accomplishments resulting from this contract. For the sake of brevity, most of the projects are explained in a paragraph length, highlighting only pertinent results. Author

Plasma Interactions; Magnetopause; Research; Boundaries

19990071161 Innsbruck Univ., Inst. for Astronomy, Austria

Asteroid Hazards: An Assessment of Current Survey and Alert Strategies

Groemer, Gernot E., Innsbruck Univ., Austria; Proceedings of the Seventh International Space University Alumni Conference; July 1998, pp. 33-40; In English; See also 19990071155; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Asteroids and comets impacts have been widely regarded as phenomena only happening in the early solar system during the so-called "Early bombardement", billions of years ago. Detailed surveys, theoretical analysis as well as the collision of comets with Jupiter and the sun have shown, that the Earth is subjected to a continuing "celestial rain". The intention of this article is to give an up-to-date overview on major observational campaigns as well as the standard procedures if a new asteroid/comet is discovered. Author

Asteroids; Comets; Asteroid Collisions; Cometary Collisions; Solar System

19990071201 Lunar and Planetary Inst., Houston, TX USA

Traces of Catastrophe: A Handbook of Shock-Metamorphic Effects in Terrestrial Meteorite Impact Structures

French, Bevan M., Smithsonian Institution, USA; 1998; 132p; In English

Contract(s)/Grant(s): NASw-4574

Report No.(s): LPI-Contrib-954; Copyright Waived; Avail: CASI; A07, Hardcopy; A02, Microfiche

This handbook of Shock-Metamorphic Effects in Terrestrial Meteorite Impact Structures emphasizes terrestrial impact structures, field geology, and particularly the recognition and petrographic study of shock-metamorphic effects in terrestrial rocks. Individual chapters include: 1) Landscapes with Craters: Meteorite Impacts, Earth, and the Solar System; 2) Target Earth: Present, Past and Future; 3) Formation of Impact Craters; 4) Shock-Metamorphic Effects in Rocks and Minerals; 5) Shock-Metamor-

phosed Rocks (Impactities) in Impact Structures; 6) Impact Melts; 7) How to Find Impact Structures; and 8) What Next? Current Problems and Future Investigations.
Derived from text
Earth (Planet); Meteorite Craters; Structural Properties (Geology); Metamorphism (Geology); Cratering; Hypervelocity Impact; Handbooks; Shock Loads; Meteoritic Damage

19990071214 Vanguard Research, Inc., Fairfax, VA USA
Investigating Galactic Structure with COBE/DIRBE ***Final Report, 21 Aug. 1995 - 20 Aug. 1999***
Cohen, Martin, Vanguard Research, Inc., USA; September 1999; 8p; In English
Contract(s)/Grant(s): NAS5-32949; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this work I applied the current version of the SKY model of the point source sky to the interpretation of the diffuse all-sky emission observed by COBE/DIRBE. The goal was to refine the SKY model using the all-sky DIRBE maps of the Galaxy, in order that a search could be made for an isotropic cosmic back-ground. Arendt et al. constructed their ”Faint Source Model” (FSM) to remove Galactic foreground stars from the ZSMA products. The FSM mimics SKY version 1 but Arendt et al.’s concluded that it was inadequate to seek cosmic background emission because of the sizeable residual emission in the ZSMA products after this starlight subtraction. At this point I can only support Arendt et al.’s conclusion, namely that such models are currently inadequate to reveal a cosmic background. Even SKY5 yields the same disappointing result. On the positive side, our knowledge of the fundamental parameters of stars is increasing through the legacy of the Hipparcos mission. These parameters are critical inputs to any model of the stellar sky and it is my hope to revisit the problem once the new values are for visual-absolute magnitudes and stellar, space densities. I also hope to make progress through an independent analysis of Pioneer optical starlight with SKY, under a NASA Heliospheric Mission Guest Investigator proposal.
Author
Galactic Structure; Observation; Electric Current; Isotropy; Magnitude; Point Sources

19990071244 Queens Univ., Belfast, UK
Cool Carbon Stars in the Galactic Halo
Totten, Edward J., Queens Univ., UK; Spectrum; March 1997; ISSN 1353-7784, No. 13, pp. 10-12; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Most carbon stars are high luminosity giants. With characteristic spectra and distinctive optical and infrared colours, they can readily be detected out to large distances in the galactic halo. The surface density of such faint carbon stars is low, approx. 1 per 50 square degrees, and there seem to be at least three kinds of halo carbon stars present: the normal asymptotic giant branch stars, known as N-type carbon stars, the first generation old carbon stars of the galactic halo, known as CH-type carbon stars and a lesser number of faint high latitude carbon stars which show significant proper motion and have the luminosity of main sequence dwarfs, the dwarf carbon stars. N-type carbon stars, with intermediate ages of 1-7 Gyrs, seem unlikely to have formed in the galactic halo in isolation from other star forming regions. Before the APM survey, only a handful of these stars were known and there was much speculation as to their origin. One possibility that we are investigating is that they either arise from the disruption of tidally captured dwarf satellite galaxies or are a manifestation of the long-sought optical component of the Magellanic stream.
Derived from text
Carbon Stars; Galactic Halos; Cool Stars; Dwarf Galaxies; Dwarf Stars; Surveys

19990071274 Nigeria Univ., Dept. of Physics and Astronomy, Nsukka, Nigeria
Implications of a Nonzero Cosmological Constant and Luminosity Selection Effects on Cosmological Tests
Ubachukwu, A. A., Nigeria Univ., Nigeria; Australian Journal of Physics; 1998; Volume 51, No. 3, pp. 585-589; In English; See also 19990071265; Copyright; Avail: Issuing Activity (Australian Journal of Physics, P.O. Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia), Hardcopy, Microfiche

This paper examines the implications of a nonzero cosmological constant Lambda(sub 0) on the amount of linear size evolution and the luminosity selection effects usually required in the interpretation of the angular diameter - redshift (Theta - Zeta) test. This is based on3 three typical cases chosen on various plausible assumptions which can be made concerning the contribution of lambda(sub 0) to the density of the universe (parametrized by Omega(sub 0). The results show a fairly strong linear size evolution will be required to interpret the theta-zeta data of extended steep spectrum quasars for all three cases, if luminosity effects are neglected. However, this evolution is significantly steeper in a matter-dominated universe with Omega(sub m) - Omega(sub 0) = 1, than in a flat universe, with Omega(sub Lambda) = 0.8, Omega(sub M) = 0.2 and an open universe with Omega(sub M) = 0.2, Omega(sub Lambda) = 0. Furthermore, when the luminosity selection effects present in the sample are considered, a milder size evolution is obtained for the Omega(sub M) = 1, Omega(sub Lambda) = 0 model while little or no size evolution is found

for the other two cases. There is therefore no significant difference in our results for a n open low density universe with Omega(sub Lambda) = 0 and a flat universe dominated by Omega(sub Lambda) predicted by inflation. The present results therefore imply that an open low density universe with Omega(sub M) = 0.2 and Omega(sub Lambda) = 0 is compatible with an inflationary model of the universe with Omega(sub M) = 0.2 and Omega(sub Lambda) = 0.8. This leads to a contradiction since the universe cannot be open and spatially closed at the same time (the existence of one should preclude the other).
Author
Astronomical Models; Cosmology; Universe; Red Shift; Quasars; Luminosity; Missing Mass (Astrophysics); Dynamic Stability

19990072354 Smithsonian Astrophysical Observatory, Cambridge, MA USA
ASCA Temperature Maps for Merging and Relaxed Clusters and Physics of the Cluster Gas
Markevitch, M., Smithsonian Astrophysical Observatory, USA; Sarazin, C., Smithsonian Astrophysical Observatory, USA; Nevalainen, J., Smithsonian Astrophysical Observatory, USA; Vikhlinin, A., Smithsonian Astrophysical Observatory, USA; Forman, W., Smithsonian Astrophysical Observatory, USA; 1999; 1p; In English; 4th; Heating and Acceleration in the Universe, 16-20 Mar. 1999, Tokyo, Japan; Sponsored by ASCA
Contract(s)/Grant(s): NAS8-39073; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

ASCA temperature maps for several galaxy clusters undergoing strong mergers will be presented. From these maps, it is possible to estimate velocities of the colliding subclusters. I will discuss several interesting implications of these estimates for the physics of the cluster gas and the shape of the gravitational potential. I will also present temperature maps and profiles for several relaxed clusters selected for X-ray mass determination, and present the mass values derived without the assumption of isothermality. The accurate mass-temperature and luminosity-temperature relations will be discussed. This talk will review how AXAF will revolutionize X-ray astronomy through its radically better imaging and spectroscopic resolution. Examples from many fields of astrophysics will be given.
Author
Astrophysics; Galactic Clusters; Astronomical Maps; Gas Temperature

19990072811 NASA Marshall Space Flight Center, Huntsville, AL USA
Spectral Energy Distributions and Light Curves of GRB 990123 and its Afterglow
Galama, T. J., Amsterdam Univ., Netherlands; Briggs, M. S., Alabama Univ., USA; Wijers, R. A. M. J., State Univ. of New York, USA; Vreeswijk, P. M., Amsterdam Univ., Netherlands; Rol, E., Amsterdam Univ., Netherlands; Band, D., California Univ., San Diego, USA; VanParadijs, J., Amsterdam Univ., Netherlands; Kouveliotou, C., NASA Marshall Space Flight Center, USA; Preece, R. D., Alabama Univ., USA; Bremer, M., Institut de Radio Astronomie Millimetrique, France; 1999; 2p; In English, USA; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Investigations of the 'fireball' model currently believed to explain the prompt gamma-ray and afterglow emissions of gamma-ray bursts. On January 23 a gamma-ray burst (GRB) occurred for which for the first time prompt optical emission was detected. We here report the results of gamma-ray, optical/infrared, sub-mm, mm and radio observations of this burst and its afterglow, which indicate that the prompt and afterglow emissions from GRB 990123 are associated with three distinct regions in the fireball. The afterglow synchrotron spectrum one day after the burst has a much lower peak frequency than those of previous bursts; this explains the short-lived nature of the radio emission, which is not expected to reappear. We suggest that such differences reflect variations in the magnetic-field strengths in the afterglow emitting regions.
Author
Energy Distribution; Light Curve; Afterglows; Light Emission; Astrophysics; Gamma Ray Bursts; Gamma Ray Spectra

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SOLAR PHYSICS

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

19990070955 National Optical Astronomy Observatories, Tucson, AZ USA
The Prolate Solar Chromosphere
Auchere, F., Paris Univ., France; Boulade, S., Institut d'Astrophysique, France; Koutchmy, S., Institut d'Astrophysique, France; Smartt, R. N., National Solar Observatory, USA; Delaboudiniere, J. P., Paris Univ., France; Georgakilas, A., National Observatory of Athens, Greece; Gurman, J. B., NASA Goddard Space Flight Center, USA; Artzner, G. E., Paris Univ., France; Astronomy and Astrophysics; October 1998; 8p; In English
Report No.(s): NOAO-Preprint-817; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We present a comparative analysis of the chromospheric solar limb prolateness, using strictly simultaneous H-alpha, ground-based observations and HeII space-based observations. The typical prolateness is found to be DeltaD/D = 5.5 x 10(exp -3) in HeII and 1.2 x 10(exp -3) in H-alpha. The first measurements in the 30.4 nm HeII line over a period of two years. as well as coronal data, are discussed to explore further the origin of the prolateness and its possible consequences.
Author
Chromosphere; H Alpha Line; Prolateness; Solar Limb; Sun; Solar Corona; Ultraviolet Astronomy

19990071084 Science Univ. of Tokyo, Physics Dept., Japan
Astrophysical Plasma MHD Processes Revealed by the Solar X-Ray Satellite "YOHKOH"
Uchida, Yutaka, Science Univ. of Tokyo, Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 104-109; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

We describe in this paper some of the new findings about solar plasma dynamical processes derived by the Solar X-ray Satellite 'Yohkoh'. These new findings require considerable revisions of our previous pictures on what are occurring in those dynamical processes, and therefore in the much more violent activities producing superhot and high energy phenomena on active stars and accretion disks in astrophysical objects for which those dynamical activities on the Sun have in some cases been taken as their prototypes.
Author
Magnetohydrodynamics; Plasmas (Physics); Space Plasmas; Plasma Physics; Solar X-Rays; Radio Astronomy

19990071170 Saint Andrew's Univ., UK
Spiral Waves in a Solar-Size Accretion Disc
Harlaftis, Emilios, Saint Andrew's Univ., UK; Steeghs, Danny, Saint Andrew's Univ., UK; Spectrum; March 1997; ISSN 1353-7784, No. 13, pp. 4-5; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Accretion is one of the most efficient energy mechanisms known, converting a substantial fraction of the rest mass of infalling material into radiation and heat. In systems known as cataclysmic variables (CVs), a mass-losing red star feeds an accretion disc around a white dwarf. CVs are ideally suited for studying accretion discs because of their proximity (approx. 100 pc), the dominance of the accretion disc light over the dwarf star, and the short timescales well suited for human observers (dynamical timescale of approx. minutes, orbital periods of approx. hours and viscous timescales of approx. days). Since CVs have orbital periods of a few hours, the SERVICE programme at the ING telescopes is well suited for undertaking a quick look on new CVs or provide complimentary emission line information for old ones. But the programme's main advantage is that it offers the observers the opportunity of some flexibility over the predetermined schedule to cover unexpected events such as nova outbursts. Indeed, we observed the dwarf nova prototype IP Peg while it was on the rise to outburst on 19 August 1993 with the intermediate dispersion spectrograph on the 2.5 m Isaac Newton telescope during SERVICE time. As we will describe in the following this resulted in the discovery of spiral structure in the binary's accretion disc.
Derived from text
Dwarf Stars; Spectrographs; Electromagnetic Surface Waves; Deposition

19990071175 Academy of Sciences (USSR), Inst. of Terrestrial Magnetism Ionosphereand Radio Wave Propagation, Moscow, USSR
Monitoring and Investigation of Ground Level Solar Cosmic Ray Enhancements by Means of High Altitude Neutron Monitor *Final Report*
Belov, Anatoly V.; Jan. 1999; 17p; In English
Contract(s)/Grant(s): F617089-98-W-E064
Report No.(s): AD-A364163; EOARD-SPC-98-4035; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report results from a contract tasking IZMIRAN as follows: The contractor will investigate high-energy solar neutrons which are produced at solar flare sites. He will improve the registration system of the Alma-Ata neutron monitor and develop methods of reliable selection of the solar neutron events, as well as methods to study high energy solar proton events and calculate their spectra. He will supplement the GLE database existing at the Space Vehicles Directorate of AFRL with the GLE data files from Russian and Kazakh stations.
DTIC
Solar Physics; Solar Cosmic Rays; High Altitude; Neutron Counters; Solar Neutrons

19990071283 National Oceanic and Atmospheric Administration, Space Environment Center, Boulder, CO USA

The Human Impact of Solar Flares and Magnetic Storms

Joselyn, Jo Ann, National Oceanic and Atmospheric Administration, USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 67-72; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

The Sun shines, and Earth and its inhabitants benefit. But the Sun radiates more than light, and these radiations are variable over time scales of seconds to days to years. The consequences for people range from glorious celestial displays-auroras-to subtle but potentially damaging effects on the technological systems that are increasingly important for daily living. For example, electric power transmission systems and communication links have proven vulnerable to solar phenomena. and outside of Earth's protective atmosphere and magnetic shield, there is a small but genuine risk of a solar energetic particle burst that would be lethal to satellite sensors and command and control systems and astronauts. It has been known since the time of Galileo that the Sun is neither featureless nor steady. Besides ordinary sunlight, there are three classes of solar emanations that can be directly associated with effects at Earth-photon radiation from solar flares, solar energetic particles, and inhomogeneties in the solar wind that drive magnetic storms. Below, the emanations are summarized and their effects are described.

Author

Solar Radio Bursts; Solar Wind; Solar Prominences; Solar Physics; Solar Activity; Magnetic Storms; Energetic Particles; Damage; Human Reactions

19990071284 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

The Solar Wind

Goldstein, B. E., Jet Propulsion Lab., California Inst. of Tech., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 73-79; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

The first evidence of the solar wind was provided through observations of comet tail deflections by L. Biermann in 1951. A cometary ion tail is oriented along the difference between the cometary and solar wind velocities, whereas the dust tail is in the antisunward direction; the ion tail directions demonstrated the existence of an outflow of ionized gas from the Sun (the solar wind) and allowed estimates of solar wind speed. Spacecraft observations have now established that at 1 AU the solar wind has a typical ion number density of about 7 /cc and is composed by number of about 95% protons and 5% Helium, with other minor ions also present. The solar wind as observed at 1 AU in the ecliptic has speeds typically in the range 300-700 km/ s. At such speeds ions travel from the Sun to 1 AU in from 2.5 to 6 days. The impact of the solar wind on planets with magnetic fields (Earth, Jupiter, Saturn, Uranus, Neptune) causes phenomena such as magnetospheres, aurorae, and geomagnetic storms, whereas at objects lacking magnetospheres (Mars, Venus, comets), atmospheric neutrals undergo charge exchange and are picked up by the solar wind flow. The solar wind also shields the Earth from low energy cosmic rays, and is responsible for the existence of the anomalous component of the cosmic rays a low energy component that is created locally rather than in the galaxy. Presented here is a brief introduction to the solar wind and a description of some current topics of research. Solar wind properties vary a great deal due to the changing magnetic structure on the Sun.

Derived from text

Solar Wind; Atmospheric Chemistry; Atmospheric Circulation; Comet Tails; Cosmic Rays; Magnetic Field Configurations

19990071285 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Solar Flares

Rust, David, Johns Hopkins Univ., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 81-90; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

The Sun is constantly changing. Not an hour goes by without a rise or fall in solar x-radiation or radio emission. Not a day goes by without a solar flare. Our active star, this inconsistent Sun, this gaseous cloud that blows in all directions, warms the air we breathe and nourishes the food we eat. From Earth, it seems the very model of stability, but in space it often creates havoc. Over the past century, solar physicists have learned how to detect even the weakest of solar outbursts or flares. We know that flares must surely trace their origins to the magnetic strands stretched and tangled by the rolling plasma of the solar interior. Although a century of astrophysical research has produced widely accepted, fundamental understanding about the Sun, we have yet to predict successfully the emergence of any magnetic fields from inside the Sun or the ignition of any flare. As in any physical experiment, the ability to predict events not only validates the scientific ideas, it also has practical value. In astrophysics, a demonstrated

understanding of sunspots, flares, and ejections of plasma would allow us to approach many other mysteries, such as stellar X-ray bursters, with tested theories.
Derived from text
Solar Flares; X Rays; Stability; Radio Emission; Magnetic Fields; Explosives; Ejection

19990071286 California Univ., Physics Dept., Berkeley, CA USA
Solar Flare Particles
Lin, R. P., California Univ., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 91-101; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

The Sun is the most powerful natural particle accelerator in our solar system, able to accelerate ions to energies of many GeV and electrons to hundreds of MeV. This acceleration occurs as a consequence of transient releases of energy in solar flares and/or coronal mass ejections (CNMS). Solar flares are explosions occurring near sunspots, regions of strong, approx. 10(exp 3) Gauss, magnetic fields. Traditionally, flares have been detected by ground-based optical observatories as brightenings in the emission of the hydrogen-alpha line. In the largest flares, as much as approx. 10(exp 32) ergs is released in approx. 10(exp 3) seconds. Energy is thought to be stored in the magnetic field and released through some type of instability. Because the number of sunspots waxes and wanes over an approx. 11-year cycle, the frequency of occurrence of flares also varies with this solar activity cycle; the last solar maximum occurred in 1989-1990. CMEs are transient ejections of material from the solar corona-the outer atmosphere of the Sun-into the interplanetary medium. On average, approx. 5 x 10(exp 15) g of material are ejected per CME, traveling at speeds of less or equals to 100 km/s to approx. 2000 km/ s. About one-third of all CMEs are traveling fast enough to drive a collisionless shock wave. These shocks appear to be responsible for accelerating some of the solar energetic particles, mostly at energies below a few tens of MeV. Although many large solar flares are accompanied by a fast CME, only a few CMEs accelerate particles in the absence of flares while many flares accelerate particles without CMES. Some of the accelerated particles travel to the near-Earth interplanetary medium where they can be detected by spacecraft. The most energetic of these particles produce effects at the surface of the Earth.
Derived from text
Solar Flares; Solar Physics; Solar Activity Effects; Magnetic Fields; Energetic Particles; Activity Cycles (Biology)

19990071288 NASA Marshall Space Flight Center, Huntsville, AL USA
The Solar Dynamo
Hathaway, David H., NASA Marshall Space Flight Center, USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 113-122; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

The solar dynamo is the process by which the Sun's magnetic field is generated through the interaction of the field with convection and rotation. In this, it is kin to planetary dynamos and other stellar dynamos. Although the precise mechanism by which the Sun generates its field remains poorly understood despite decades of theoretical and observational work, recent advances suggest that solutions to this solar dynamo problem may be forthcoming. Two basic processes are involved in dynamo activity. When the fluid stresses dominate the magnetic stresses (high plasma beta = 8(pi)rho/B(sup 2)), shear flows can stretch magnetic field lines in the direction of the shear (the "alpha effect") and helical flows can lift and twist field lines into orthogonal planes (the "alpha effect"). These two processes can be active anywhere in the solar convection zone but with different results depending upon their relative strengths and signs. Little is known about how and where these processes occur. Other processes, such as magnetic diffusion and the effects of the fine scale structure of the solar magnetic field, pose additional problems.
Author
Solar Magnetic Field; Solar Activity; Magnetic Fields; Planetary Magnetic Fields; Dynamo Theory

19990071291 NASA Marshall Space Flight Center, Huntsville, AL USA
The Outer Heliosphere
Axford, W. I., Max-Planck-Inst. fuer Aeronomie, Germany; Suess, S. T., NASA Marshall Space Flight Center, USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 143-152; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

In explaining and describing the forces that shape the bubble of solar wind surrounding the Sun, there is a dearth of information. But observations from space are alleviating this situation. Three spacecraft moving away from the Sun-Pioneer 10 and Voyagers 1 and 2-are expected to penetrate the boundaries of the heliosphere within the next few years. All three spacecraft first passed close to Jupiter, and now their extended missions have become explorations of the outer heliosphere. The boundaries of the helio-

sphere are a standing ”termination shock” in the solar wind surrounding the Sun and the ”heliopause,” dividing the solar wind from the local interstellar medium. Uncertainties about the size and shape of these boundaries make it difficult to estimate exactly the time when the spacecraft will pass them. The termination shock may be nearly spherical or highly elongated, depending on how fast the local interstellar medium is flowing past the heliosphere. Pioneer 10, traveling downstream from the oncoming interstellar wind, may reach the termination shock first if, in fact, the shock is spherical. If the shock is elongated, having a larger dimension in the downstream direction, then Voyagers 1 and 2, traveling upstream, will encounter the shock first. Once these two spacecraft reach the termination shock, they will then pass through a region of solar wind plasma that has been heated by the shock. After a few years, they will pass the heliopause and go into the interstellar medium.
Author
Solar Wind; Sun; Heliosphere; Plasma Interactions; Interstellar Matter

19990071325 National Optical Astronomy Observatories, Tucson, AZ USA
The Granular Magnetic Fields of the Quiet Sun
Lin, Haosheng, National Solar Observatory, USA; Rimmele, Thomas, National Solar Observatory, USA; October 1998; 18p; In English
Report No.(s): NOAO-Preprint-816; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We report new observations that combine high precision infrared polarimetry and high resolution imagery in the visible to demonstrate that most of the quiet solar surface contains measurable magnetic field. We found that, when observed at 1 inch (exp 2) resolution, 68 % of the observed area contains magnetic flux higher than 5 X 10(exp 15) Mx (corresponding to an apparent average field of 1 G). The majority of these magnetic features have magnetic flux below 5 x 10(exp 16) Mx. Their magnetic field strengths range from below 200 G to 1000 G, which means that their filling factors are on the order of one percent. The spatial distribution and time evolution of these magnetic features are closely associated with the solar granulation. The properties of these weak granular magnetic features we observed differ from those of the intranetwork fields described in earlier observations. We also observed the formation and disappearance of a kilogauss magnetic feature associated with the development of intergranular lanes that may be evidence of convective collapse.
Author
Magnetic Fields; Magnetic Flux; Solar Granulation; Sun; Solar Magnetic Field; Limb Brightening; Infrared Astronomy

19990073342 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
Inconstant Solar Constants and Their Connection with Solar Activity ***Konstanta Matahari Yang Tidak Konstan Dan Kaitannya Dengan Aktivitas Matahari***
Sinambela, Wilson, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; LAPAN Supplementary Issue; July 1998; ISSN 0126-9754; Volume 22, No. 56, pp. 1-12; In Malay-Indonesian; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Direct measurements of solar constant by satellite show variations over time scales from days, month to years and probably decades. Variations in solar constant caused by changes in the solar active feature such as dark sunspot or bright faculae. Analysis influence of solar activity on the yearly average solar constant by using linear regression analysis shows a strong similarity between solar constant and yearly relative sunspot number. Linear regression analysis between sunspot number and yearly average solar constant for periods 1978 - 1992 found a strong correlation with correlation coefficient of 0.73. In general, the solar constant increased with an increase in solar activity with relative sunspot number as indicator. On solar cycle - 21, the yearly mean value of solar constant reached a maximum in 1979 is 1973,30 W/m(exp 2) , and this occurred during the peak of solar activity. Solar constant then decreased slowly to a minimum which lasted from 1981 through 1986 with a lowest value is 1971,3 W/m(exp 2) in 1984, while the minimum of solar cycle - 21 on 1986. Solar constant then increased slowly towards a new maximum of solar cycle - 22. On solar cycle - 22, the yearly maximum mean value of solar constant in the active sun years from 1989 through 1992 white the value of 1372,80 W/m(exp 2) on 1992, while the maximum of solar cycle - 22 on 1989. The yearly mean value of the solar constant for the period 1978 -1992 is 1372,04 w/m(exp 2). The amplitude of the variation from minimum of solar cycle - 21 to maximum of solar cycle - 22 is 150 W/m(exp 2) (0,11%). The solar constant variability shows an eleven year cycle, analogous to the eleven year sunspot cycle.
Author
Solar Constant; Solar Activity; Solar Physics

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SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see 52 Aerospace Medicine. For theory see 73 Nuclear and High-Energy Physics.

19990070951 NASA Marshall Space Flight Center, Huntsville, AL USA
X-Ray Spectral Behavior of the Relativistic Jet Source Cygnus X-3
McCollough, M. L., Universities Space Research Association, USA; Robinson, C. R., Universities Space Research Association, USA; Zhang, S. N., Universities Space Research Association, USA; Harmon, B. A., NASA Marshall Space Flight Center, USA; Paciesas, W. S., Alabama Univ., USA; Dieters, S., Alabama Univ., USA; Phengchamnan, S., Alabama Univ., USA; Hjellming, R. M., National Radio Astronomy Observatory, USA; Rupen, M., National Radio Astronomy Observatory, USA; Mioduszewski, A. J., National Radio Astronomy Observatory, USA; Waltman, E. B., Naval Research Lab., USA; Ghigo, F. D., National Radio Astronomy Observatory, USA; Pooley, G. G., Mullard Radio Astronomy Observatory, UK; Fender, R. P., Amsterdam Univ., Netherlands; Cui, W., Massachusetts Inst. of Tech., USA; Trushkin, S., Special Astrophysical Observatory, USSR; 1998; 1p; In English; The Extreme Universe, 1999, Amsterdam, Netherlands; Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

Cyg X-3 is an unusual X-ray binary which shows remarkable correlative behavior between the hard X-ray, soft X-ray, and the radio. We present an analysis of these long term light curves in the context of spectral changes of the system. This analysis will also incorporate a set of pointed RXTE observations made during a period when Cyg X-3 made a transition from a quiescent radio state to a flaring state (including a major flare) and then returned to a quiescent radio state.
Author
X Ray Spectra; Cygnus Constellation; X Ray Binaries; Radio Jets (Astronomy); X Ray Astronomy

19990070953 NASA Marshall Space Flight Center, Huntsville, AL USA
Galactic Superluminal Sources
Harmon, B. A., NASA Marshall Space Flight Center, USA; 1998; 1p; In English, Taormina, Italy; Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

A new class of X-ray sources was clearly established with the discovery of highly relativistic radio jets from the galactic sources GRS 1915+105 and GRO J1655-40. Both of these objects have given us a broader view of black holes and the formation of jets, yet they also show the complexity of the accretion environment near relativistic objects. The fast apparent motion of the jets, their luminosity and variability, high energy spectrum, and approximate scaling to the behavior of active galactic nuclei, certainly warrant the description 'microquasar". I present a review of the observational data on these sources, and discuss where we stand on a physical picture of GRS 1915+105 and GRO J1655-40 as taken from multi-wavelength studies. I also point out other galactic sources which share some of the properties of the microquasars, and what to look for as a high energy "signature' in future observations.
Author
Luminosity; Radio Jets (Astronomy); Radio Galaxies; X Ray Astronomy

19990071102 Japan Atomic Energy Research Inst., Naka, Japan
X-Ray Variability and Mass Outflows in Class I Protostar
Hayashi, Mitsuru, Japan Atomic Energy Research Inst., Japan; Shibata, Kazunari, National Astronomical Observatory, Japan; Matsumoto, Hyoji, Chiba Univ., Japan; Proceedings of the Second Asian Pacific Plasma Theory Conference (APPTC 1997); Aug. 1998, pp. 211-216; In English; See also 19990071067; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Recent X-ray astronomical observations show that magnetohydrodynamic (MHD) view is of vital importance in understanding the dynamics of the X-ray emitting hot plasmas in the universe. Especially they show that magnetic reconnection plays a key role. The Solar X-ray satellite, Yohkoh, showed various evidences of magnetic reconnection in solar corona. Here we extend the magnetic reconnection model of solar flares to hard X-ray flares observed in star forming regions. We carried out 2.5-dimensional magnetohydrodynamic (MHD) simulations of the disk-star interaction. The closed magnetic loops connecting the central star and the disk are twisted by the rotation of the disk. In the presence of resistivity, magnetic reconnection takes place in the current sheet formed inside the expanding loops. Hot, outgoing plasmoid and post flare loops are formed as a result of the reconnection. Numerical results are consistent with the observed plasma temperature (10(exp 7) - 10(exp 8)K), the length of the flaring loop (10(exp 11) - 10(exp 12)cm), and the velocity of optical jets (200 - 400km/s). We showed by high-resolution numerical simulations using parallel computers that multiple magnetic islands are created in the current sheet due to the growth of the tearing mode instability.

The magnetic islands are ejected quasi-periodically. the intermittent flaring activity continues so long as the disk matter twists the post-flare loops.
Author
High Temperature Plasmas; Plasma Temperature; Thermal Plasmas; Magnetic Field Reconnection; Magnetic Islands; Magnetohydrodynamic Stability; Magnetohydrodynamics; Plasmas (Physics); Solar X-Rays; Tearing Modes (Plasmas)

19990071174 NASA Marshall Space Flight Center, Huntsville, AL USA
Discovery of Correlated Behavior Between the Hard X-Ray and the Radio Bands in Cygnus X-3
McCollough, M. L., Universities Space Research Association, USA; Robinson, C. R., Universities Space Research Association, USA; Zhang, S. N., Universities Space Research Association, USA; Harmon, B. A., NASA Marshall Space Flight Center, USA; Hjellming, R. M., National Radio Astronomy Observatory, USA; Waltman, E. B., Naval Research Lab., USA; Foster, R. S., Naval Research Lab., USA; Ghigo, F. D., National Radio Astronomy Observatory, USA; Briggs, M. S., Alabama Univ., USA; Pendleton, G. N., Alabama Univ., USA; Johnston, K. L., Naval Observatory, USA; Astrophysical Journal; Jun. 01, 1999; Volume 517, pp. 951-955; In English; Copyright; Avail: Issuing Activity, Hardcopy

Using Compton Gamma Ray Observatory BATSE hard X-ray (HXR) data and GHz radio monitoring data from the Green Bank Interferometer, we have performed a long-term study (approx. 1800 days) of the unusual X-ray binary Cyg X-3, resulting in the discovery of a remarkable relationship between these two wavelength bands. We find that during quiescent radio states, the radio flux is strongly anticorrelated with the intensity of the HXR emission. The relationship switches to a correlation with the onset of major radio flaring activity. During major radio flaring activity, the HXR drops to a very low intensity during quenching in the radio and recovers during the radio flare. Injection of plasma into the radio jets of Cyg X-3 occurs during changes in the HXR emission and suggests that disk-related and jet-related components are responsible for the high energy emission.
Author
X Rays; Radio Jets (Astronomy); Gamma Ray Bursts; Interferometers; X Ray Binaries

19990071205 NASA Marshall Space Flight Center, Huntsville, AL USA
Generic Signatures of the Time Profiles of BATSE Cosmic Gamma-Ray Bursts
Mitrofanov, Igor G., Institute of Space Research, USSR; Pozanenko, Alexei S., Institute of Space Research, USSR; Briggs, Michael S., Alabama Univ., USA; Paciesas, William S., Alabama Univ., USA; Preece, Robert D., Alabama Univ., USA; Pendleton, Geoffrey N., Alabama Univ., USA; Meegan, Charles A., NASA Marshall Space Flight Center, USA; Astrophysical Journal; Sep. 10, 1998; Volume 504, pp. 925-934; In English; Sponsored in part by the RFBR
Contract(s)/Grant(s): RFBR-96-02-18825; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A new method is proposed, which allows the study of generic signatures of cosmic gamma-ray burst time histories. We average the 64 ms resolution time profiles of 275 bright bursts detected by BATSE. The profile of each burst is normalized by the maximum number of counts at the peak of the primary pulse, and individual pulses and interpulse valleys are selected from the normalized profiles by identical selection criteria. New generic temporal parameters are introduced, which characterize the duration and equivalent width of each pulse and the duration of each valley. The histograms of the total equivalent pulse width and summed pulse duration are bimodal. Bimodality is also seen in the histogram of the mean duration of individual pulses. Bursts from the short and long peaks of these distributions correspond to the two modes of the Third BATSE Burst Catalog T(sub 50) and T(sub 90) distributions. Therefore, these new burst parameters demonstrate that the observed bimodal temporal behavior results from properties of the pulsed emission of gamma-ray bursts. The long mode of the T(sub 90) histogram includes bursts with from one to approximately 20 pulses; the logarithmic mean pulse duration is 1.17 +/- 0.09 S; for the long events with more than one pulse, the logarithmic mean valley duration is 1.28 +/- 0.15 S. Bursts of the short mode of T(sub 90) are mainly single-pulse events, and the logarithmic mean pulse duration is much smaller, 0.20 +/- 0.01 s. For multipulse bursts of the T(sub 90) long mode, marginal correlations were found between the parameters of the pulses and valleys and the number of pulses. The basic signatures of the evolution of pulses and valleys along the time course of bursts are examined. Conclusions are drawn concerning the physics of gamma-ray emission by taking into account these signatures.
Author
Gamma Ray Bursts; Pulse Duration; Pulse Repetition Rate; Flux (Rate); Gamma Ray Astronomy; Width

19990071233 Alabama Univ., Dept. of Physics, Huntsville, AL USA
The Synchrotron Shock Model Confronts a Line of Death in the BATSE Gamma Ray Burst Data
Preece, R. D., Alabama Univ., USA; Briggs, M. S., Alabama Univ., USA; Mallozzi, R. S., Alabama Univ., USA; Pendleton, G. N., Alabama Univ., USA; Paciesas, W. S., Alabama Univ., USA; Band, D. L., California Univ., San Diego, USA; Astrophysical Journal; Oct. 10, 1998; Volume 506, pp. L23-L26; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The synchrotron shock model (SSM) for gamma-ray burst emission makes a testable prediction: that the observed low-energy power-law photon number spectral index cannot exceed -2/3 (where the photon model is defined with a positive index: dN/dE varies as E(exp alpha)). We have collected time-resolved spectral fit parameters for over 100 bright bursts observed by the Burst And Transient Source Experiment on board the Compton Gamma Ray Observatory. Using this database, we find 23 bursts in which the spectral index limit of the SSM is violated. We discuss elements of the analysis methodology that affect the robustness of this result, as well as some of the escape hatches left for the SSM by theory.
Author
Gamma Ray Bursts; Spectrum Analysis; Synchrotron Radiation; Photons; Self Absorption; Gamma Ray Astronomy

19990071289 Arizona Univ., Dept. of Planetary Science, Tucson, AZ USA
Cosmic Rays
Jokipii, J. R., Arizona Univ., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 123-131; In English; See also 19990071275; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

For many years cosmic rays provided the most important source of energetic particles for studies of subatomic physics. Today, cosmic rays are being studied as a natural phenomenon that can tell us much about both the Earth's environment in space and distant astrophysical processes. Cosmic rays are naturally occurring energetic particles-mainly ions- with kinetic energies extending from just above thermal energies to more than 1020 electron volts (eV). They constantly bombarded the Earth from all directions, with more than 10's particles having energies greater than 1 MeV striking the top of the Earth's atmosphere each second. The broad maximum in the spectrum at 10(exp 8) - 10(exp 9) eV defines the typical cosmic rays proton having approximately 10(exp 9) eV. The abundances of certain unstable isotopes in meteorites show that cosmic rays have been present at nearly their current level for hundreds of millions of years. Studies of electromagnetic waves produced by cosmic rays in distant astrophysical sources reveal that they are present throughout the disk and halo of our galaxy and in other galaxies as well. Cosmic rays are now believed to be produced naturally in astrophysical plasmas, nearly all by a process called diffusive shock acceleration, which occurs naturally at collisionless shock waves. Observations of cosmic rays began in the early part of this century when C.TR. Wilson, using his cloud chamber, studied the puzzlingly high level of atmospheric ionization. In 1912, with balloon-borne ionization detectors, Victor Hess showed that this ionization increased with increasing altitude and concluded that radiation was coming from above the atmosphere, a discovery which earned him the Nobel Prize in 1936.
Author
Cosmic Rays; Atmospheric Ionization; Earth Atmosphere; Electromagnetic Radiation; Energetic Particles; Shock Waves; Space Plasmas; Thermal Energy; Spectra

19990071290 California Inst. of Tech., Downs Lab., Pasadena, CA USA
Anomalous Cosmic Ray: Interstellar Interlopers in the Heliosphere and Magnetosphere
Mewaldt, R. A., California Inst. of Tech., USA; Cummings, A. C., California Inst. of Tech., USA; Stone, E. C., California Inst. of Tech., USA; From the Sun: Auroras Magnetic Storms, Solar Flares, Cosmic Rays; 1998, pp. 133-141; In English; See also 19990071275; Original contains color illustrations; Copyright; Avail: Issuing Activity (American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009), Hardcopy, Microfiche

Since the beginning of the space age, it was known that two main populations of energetic particles pervade interplanetary space: Galactic cosmic rays (GCRS), which originate in sources outside the solar system, and solar energetic particles (SEPs), associated with transient events on the Sun. But over 20 years ago, instruments on the Pioneer 10, IMP 5, and IMP 7 spacecraft discovered a third component of energetic particles known as "anomalous cosmic rays" (ACRs), that represents a sample of nearby inter-stellar material. Over the past 2 decades, ACRs have been used to study the acceleration and transport of energetic particles within the solar system, deduce the global properties of the heliosphere-the bubble of solar wind that envelopes the solar system, and study the interstellar material itself. It has recently been shown that some of these ACRs become trapped in Earth's magnetic field, where they form a radiation belt composed of interstellar material. Also, ACRs are being used to address a question that has existed ever since the discovery of the solar wind: "How large is the heliosphere?"
Author
Interstellar Radiation; Heliosphere; Galactic Cosmic Rays; Solar Wind; Solar Physics; Radiation Belts

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GENERAL

19990071155 NASA Glenn Research Center, Cleveland, OH USA

Proceedings of the Seventh International Space University Alumni Conference

Bailey, Sheila, Editor, NASA Glenn Research Center, USA; Proceedings of the Seventh International Space University Alumni Conference; July 1998; 108p; In English; 7th; International Space University Alumni Conference, 23-26 Jul. 1998, Cleveland, OH, USA; Sponsored by International Space Univ., Inc.; See also 19990071156 through 19990071168

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The Seventh Alumni Conference of the International Space University, coordinated by the ISU U.S. Alumni Organization (IUSAO), was held at Cleveland State University in Cleveland, Ohio on Friday, July 24, 1998. These proceedings are a record of the presentations. The following topics are included: Remote sensing education in developing countries; Integrated global observing strategy; NASA's current earth science program; Europe's lunar initiative; Lunarsat: Searching for the South Polar cold traps; Asteroid hazards; ESA exobiological activities; Space testbed for photovoltaics; Teledesic Space infrastructure; Space instrument's concurrent design; NASA advanced fuel program; Mission preparation and training for the European Robotic Arm (ERA); and Global access to remote sensing systems.

Author

Conferences; Research and Development; Aerospace Sciences; Technology Assessment

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