

## Japanese Aerospace Literature This month: *Japanese Spacecraft*

**N94-25585 Study on melted solution stirring under microgravity (Bisho juryoku kankyo ni okeru yueki no kakuhan ni kansuru chosa kenkyu).** SATO, AKIRA; SASABE, KEN; NAKATANI, ISAO; OZAWA, KIYOSHI; FUKUZAWA, AKIRA; SAKURAYA, KAZUYUKI; TOGANO, KAZUMASA; KUMAKURA, HIROAKI; DIETRICH, DANIEL ROBERT; TAKEYAMA, MASAO; et al. National Research Inst. for Metals, Tokyo (Japan). Advanced Materials Processing Div. In its Bulletin of National Research Institute for Metals in Fiscal Year 1993, No. 14 p. 387-392 (SEE N94-25544 07-26). Documents available from Aeroplus Dispatch.

The techniques of stirring and stopping the melted solution are studied for experiments to create materials to be used for Japanese Experiment Module (JEM) in space stations. The following results were obtained: (1) since the required material has to be solid and then melted and solidified again, mixing fins must be either put in/out in the melted solution or they must be solidified with alloys (if this issue is solved, fins will be effective under microgravity, and also convenient for experiments on a large scale); (2) there has not been many examples of sound wave or ultrasonic wave vibrations having been applied to material processing except for experiments on crystal refinement at solidification (mixing effects under normal gravity must be investigated first); (3) material processing by induction generates heat (there is more potential for utilizing electromagnetism under microgravity than under normal gravity, because little electric power is required to control melted materials under microgravity); (4) material property values must be assessed first before utilizing convection in mixing; and (5) under microgravity, it is possible to mix/stop mixing melted solution by generating artificial gravity. However, this seems to be more effective for removing bubbles and inclusions than for mixing. (Author)

**A94-18937 Development of Space Environment Monitor data transfer system for the space weather forecast.** TOKUMARU, MUNETOSHI; Kawasaki, Kazuyoshi, Communications Research Laboratory, Review (ISSN 0914-9279), Vol. 39, No. 2, June 1993, p. 65-71. In Japanese. Documents available from Aeroplus Dispatch.

The on-line data transfer system has been developed to collect observational data of the Space Environment Monitor (SEM) onboard Japanese Geostationary Meteorological Satellite (GMS-4). The system consists of two parts: the first part produces an ASCII data file (about 100 kbyte) of 2-min mean values of energetic particle flux for 24 hr on a floppy disk, and the second part transfers the data file from the Meteorological Satellite Center (Kiyose, Tokyo) to the Hiraio Solar Terrestrial Research Center of the Communications Research Laboratory (Hiraio, Ibaraki) via telephone line in 2 min. The system is being operated on daily basis, and the transferred SEM data are stored in the network computer system (Micro VAX 3500) in Hiraio to utilize for the space weather forecast services. (Author (revised))

**N94-19384 Development of ISY data set, part 2 (isy deta setto no seibi).** Remote Sensing Technology Center, Tokyo (Japan). Documents available from Aeroplus Dispatch.

This report describes the study for the data set preparation of the sea surface temperature (SST) and the polar region ice zone, and the data set preparation algorithms developed for ISY (International Space Year) activities. Preparation process of the SST data set (including the VTIR (visible and thermal infrared radiometer) data set, comparison of the data by different kinds of sensors and production of marginal data set, production of data set for evaluating the algorithm, and evaluation of the algorithms) and the polar region ice zone data set (including superposition of the MSR (microwave scanning radiometer) and VTIR images, MESSR (multispectral electronic self-scanning radiometer) and VTIR images, production of MSR mosaic images, superposition of MSR and MSS (multi-spectral scanner) images, study on superposition of MESSR and SAR (synthetic aperture radar) images, and auxiliary information overlays), and the development of algorithms for polar region ice zone data set (including the development of the algorithm for the MOS-1 (Marine Observation Satellite-1) data set, comparison evaluation of MSR data set and MSS data, and study on integrated use of SAR data and visible and near infrared data) are outlined. (Author)

**N94-15001 Development of Japanese Earth Resources Satellite-1 (JERS-1; FUYO-1) and its operational results (Chikyuu shigen eisei 1 gou (JERS-1) no kaihatsu oyobi sono seika).** National Space Development Agency, Tokyo (Japan). Documents available from Aeroplus Dispatch.

Various aspects of development progress from the policy decision to the launch and early orbit phase operation of the JERS-1 (Japanese Earth Resources Satellite-1) are presented. The items presented are as follows: the fundamental development policy, related organizations, and the system for the development; the master schedule and the progress of the development; the outline of JERS-1 including its missions, the structure and characteristics of the system, and the operation plan; satellite mission and the system design analyses; the system development, including that of subsystems and components, production and test of the system development model, the integration and test of the system PFM (Proto-Flight Model), and the modification and post-modification test of the PFM; interfaces with other programs; program control; satellite operation in the launch and early orbit operation phase and the analysis and evaluation of the operation results; and the initial examination on on-orbit failures. (Author)

**N94-14286 NTT's activities in satellite communications technology development.** SAMEJIMA, SHUICHI, Nippon Telegraph and Telephone Public Corp., Yokosuka (Japan). Satellite Communication Systems Lab. In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2 p. 397-400 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

An overview of the recently developed ISDN (Integrated Services Digital Network) and its future expansion and technology development in mobile satellite communications by NTT (Nippon Telegraph and Telephone Corp.) is presented. A TDMA (Time Division Multiple Access) system developed for narrow band ISDN through satellite connection to meet the communication demand in the area where the terrestrial facilities are not equipped, and the concept of broad band ISDN undergoing development to offer more sophisticated service in the future are described. The frequency band, multibeam technology, services, orbits of the satellite used, and future prospects related to mobile satellite communication are outlined. (Author)

**N94-14285 Space communications technology research in CRL.** IIDA, TAKASHI, Ministry of Posts and Telecommunications, Tokyo (Japan). Communications Research Lab. In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 393-396 (SEE N94-14209 02-43) Documents available from Aeroplus Dispatch.

This report overviews the current research of space communications technology in Communications Research Laboratory (CRL), Ministry of Posts, and Telecommunications. The Engineering Test Satellite-5 (ETS-5) project has been conducted these five years for mobile communications development. The international cooperations using ETS-5 has been performed. It describes the project of Communications and Broadcasting Engineering Test Satellite (COMETS) to be launched in 1997 for experiments of advanced mobile satellite communication and advanced broadcasting. It also mentions the project of Engineering Test Satellite-6 (ETS-6), to be launched in 1994, in which the CRL's missions of ETS-6 are the inter-satellite communication of S-band, millimeter-wave, and optical. Finally, this report describes the technologies of large antenna assembly experiment, small satellite communications, and cluster satellite briefly. (Author)

**N94-14284 Joint experiments using ETS-5.** NAKATA, MUTSUMI, Ministry of Posts and Telecommunications, Tokyo (Japan). Space Communication Research Office. In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 389-392 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

An overview of the PARTNERS (Pan-Pacific Regional Telecommunications Network Research Satellite) project, which is the post-mission utilization of the ETS-5 (Engineering Test Satellite-5) is presented. The project was registered at SAFISY (Space Agency Forum for International Space Year) and includes the following experiments: (1) research on radio propagation characteristics in satellite links in Pan-Pacific region; (2) joint study on development of rural satellite network using simple mobile station; (3) experiments on telecommunication using personal computers for academic network; (4) experiments on remote education and training through satellite networks; (5) experiments on remote medicine; (6) experiments on the operation of medical information data base; (7) experiments on transmission of the earth observation data; and (8) demonstration of real time transmission of Asia-Pacific ISY (International Space Year) Conference. The experiment systems consisting of space segment (ETS-5) and simple and low cost ground system composed of 1.2 m aperture parabolic antenna, TV (Television) conference system, and terminal equipment are outlined. (Author)

**N94-14281 Spaceplane program at NAL: System concept and related technology issues.** MAITA, MASATAKA, National Aerospace Lab., Tokyo (Japan). In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 375-378 (SEE N94-14209 02-43) Documents available from Aeroplus Dispatch.

An overview of the space plane program planned by the NAL (National Aerospace Laboratory) is presented. The tentative base line mission requirements such as space transportation to and from LEO (Low Earth Orbit); short term experimental laboratory orbit for earth observation; microgravity; servicing to platforms, maintenance, and repair; space passenger tour through orbital and sub-orbital flight; etc. are outlined. The characteristics of the SSTO (Single Stage to Orbit) vehicle concept are summarized as follows: (1) integration of SCRAMJET (Supersonic Combustion Ramjet) engine and LACE (Liquid Air Cycle Engine); (2) fueling with slush hydrogen with fuel weight fraction of less than 70 percent; and (3) total gross weight of 350 tons with the structural weight reduction by 20 percent of the current technological potential. (Author)

**N94-14280 The status of the HOPE concept study.** KOUCHIYAMA, JIROU; EGUCHI, AKIHIRO, Tsukuba Space Center, Ibaragi (Japan). In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 369-374 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

National Space Development Agency of Japan (NASDA) has been studying an unmanned winged vehicle called the H-2 Orbiting Plane (HOPE). The HOPE will be launched by H-2 launch vehicle or H-2 derivative launch vehicle, and injected into low orbit. After a few days stay in space for access to the space station, HOPE will de-orbit and go back to a named landing site au-

tomatically. The concept of the 10-ton class vehicle launched by H-2 launch vehicle was prepared in 1988. However, its payload capability is not enough for the practical use of the space station expected at the beginning of the 21st century. Therefore, the concept of 20-ton class vehicle launched by the Solid Rocket Booster (SRB)- added H-2 launch vehicle without the second stage (Liquid Engine-5A (LE-5A) engine) was studied in 1989. This vehicle will be injected into low orbit by its own propulsion system. Its payload capability was estimated at 3 tons. In the study from 1990 to 1991, it was revealed that the reduction of the HOPE weight is the most important problem. At present, the shapes of the main wing, the orbital injection systems (reusable engine or expendable one), and the materials of the main structure (carbon/polyimide) are being studied to reduce the weight. (Author)

**N94-14279 Mission scenario of HOPE.** KAWAI, YASUSHI; TAKEUCHI, KENJI, Mitsubishi Research Inst., Inc., Tokyo (Japan). In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 364-368 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

An overview of the study for analyzing the HOPE (H-2 Orbiting Plane) utilization, which will be launched by the H-2 launch vehicle by the end of the 1990's, and the HOPE contributions to the progress in science and technology is presented. A questionnaire was sent out for potential user organizations of the HOPE, namely, universities, national laboratories, foundations, and private enterprises. Also, other methods such as cross impact matrix method, are being used to clarify the relation between the manufacture of high quality glass under microgravity and the technological development. (Author)

**N94-14278 Contributions of winged re-entry vehicle to space activities.** YANAGIHARA, MASAAKI, Science and Technology Agency, Tokyo (Japan). Research and Development Bureau. In its Asia-Pacific ISY Conference, Vol. 2, p. 360-363 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

An overview of some results of the space infrastructure study based on the fundamental policy of Japan's space development decided by the SAC (Space Activities Commission) is presented. Three phases of the life cycle of space segment, five kinds of systems composing space infrastructure, an example of a space infrastructure with a central system called LASER (Low Earth Orbit Advanced Station Equipped with Robot), reusable space transportation systems such as space plane, the ultimate manned space transportation system, and the unmanned space transportation system HOPE (H-2 Orbiting Plane) launched by the H-2 launch vehicle under development by the NASDA (National Space Development Agency of Japan) are outlined. (Author)

**N94-14277 Research and development of space transportation systems in ISAS.** ONODA, JUNJIROU, Tokyo Univ., Sagami-hara (Japan). Inst. of Space and Astronautical Science. In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 356-359 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

An overview of the research and development activities in the ISAS (the Institute of Space and Astronautical Science) focusing on the Mu-5 launch vehicle, the winged space vehicle, and the ATR (Air Turbo Ramjet) engine is presented. The design guidelines, characteristics, dimensions, and sub-systems, such as rocket motor, nose fairing, and attitude control subsystem of the Mu-5 launch vehicle, one of the versions of Mu series rocket, which is capable of launching 1.8 tons of payload into LEO (Low Earth Orbit) are outlined. The research and development activities on winged space vehicle called the HIMES (Highly Maneuverable Experimental Space) Vehicle and the ATR propulsion system are outlined. (Author)

**N94-14274 Space transportation systems and space activities in the 21st century.** KOBAYASHI, SHIGEO, Science Univ. of Tokyo (Japan). Dept. of Mechanical Engineering. In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 337-342 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

An overview of the space activities, the demands for space transportation, the future space transportation systems, and the scenario of future space transportation system in Japan expected in the 21st century are outlined. The following topics are covered: the architecture of space activities in which Japan will actively participate showing the summary of the report of the Committee on the Long-term Policy for the Space Development in Japan; the earth and low earth orbit; low earth orbit and geostationary orbit; the moon base and planets; partially or fully reusable manned or unmanned winged vehicles; expendable or reusable orbit transfer vehicles; and expendable or reusable cost-effective cargo launching vehicles; and the HOPE (H-2 Orbiting Plane). (Author (NASDA))

**N94-14271 Atmospheric correction for sea surface temperature by application of microwave dual-channel technique to VTIR data.** TAKAYAMA, YUZO, Meteorological Research Inst., Tsukuba (Japan). In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 317-320 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

Atmospheric correction for estimating sea surface temperature (SST) from VTIR data by using the IR split-window technique (11 and 12 microns) and dual-frequency microwave channels (23.8 and 31.4 GHz) are presented. Both methods have the same capability for correcting the water-vapor absorption effect to estimate SST. However, the microwave dual-frequency method bring

better SST estimation than the split-window technique for VTIR data. The simulation study shows that this better estimation of SST by the microwave dual-frequency is due to a better signal-to-noise ratio for correction of atmospheric absorption than the split-window technique, in the case of VTIR observation. By using the different radiation characteristics between infrared and microwave channels, it is feasible to improve the accuracy in estimating the SST in the case of the existing dense stratospheric aerosol. (Author)

**N94-14268 Outline of ISY Kuroshio observation experiment.** MAEJIMA, HIRONORI; OCHIAI, HIROAKI (Toba Merchant Marine Coll., Japan.); TAMEISHI, HIDEO (Japan Fisheries Information Service Center, Tokyo.), National Space Development Agency, Ohashi (Japan). Earth Observation Center. In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 303-306 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

An overview of the ISY (International Space Year) Kuroshio observation experiment conducted in Kumanonada using the data by the MOS-1 (Marine Observation Satellite-1) observation, the AXBT (Airborne Expendable Bathy Thermography), and vessel observation is presented. The observation area; the AXBT configuration; the airborne MSS (Multi Spectral Scanner) characteristics; and the data obtained by the MOS-1/VTIR (Visible and Thermal Infrared Radiometer), airborne MSS, and 3-D (Dimensional) sea temperature profile image from AXBT data are shown. (Author)

**N94-14267 Tracking of change of a warm-core ring structure.** INAGAKE, DENZOU; TOMOSADA, AKIRA, Tohoku Regional Fisheries Research Lab., Miyagi (Japan). In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 299-302 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

A warm streamer, which was observed by a hydrographic survey onboard the research vessel Soyo Maru from May 20 to 22 in 1989, was tracked by MOS-1 (Marine Observation Satellite-1) VTIR (Visible and Thermal Infrared Radiometer) images and NOAA-10/AVHRR (Advanced Very High Resolution Radiometer) images from February to August in 1989. These images presented a generation of the streamer, spiraling warm water into the Kuroshio warm core ring, and development of the ring. The warm streamer around the Kuroshio warm core ring had a structure beyond 500 m in depth with a geostrophic current structure. Also, another warm streamer was observed in the warm core ring. It can be considered that the inner streamer was taken into the warm core ring several weeks before and that the spiraling outer warm band was a new warmstreamer around the Kuroshio warm core ring. (Author)

**N94-14266 On the sea truth data of the Kuroshio meander and cold eddy movement.** HISHIDA, MASATAKA; MICHIDA, YUTAKA, Maritime Safety Agency, Tokyo (Japan). Hydrographic Dept. In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 290-298 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

An overview of observed phenomena of the KLM (Kuroshio Large Meander), relationship of sea level difference in the Tokara Strait where the ocean condition is strongly affected by that in the ECS (East China Sea), and formation of TCW (Tanegashima Cold Water) and KLM are presented. A new schematic representation of the ocean current system in the ECS obtained by compiling the knowledge derived from satellite IR (Infrared) image data provided by the MOS-1 (Marine Observation Satellite-1) and NOAA is proposed. The quick bulletin about the ocean condition named 'Kaiyou Sokuhou', and trajectories of surface drifters, an oceanographic atlas of the Japan-China Joint Research Program on the Kuroshio (JRK), and many other references are also proposed. The SST (Sea Surface Temperature) image in spring is useful to analyze the Kuroshio meander because TCW formation occurs, and this phenomenon will trigger the formation of the KLM. SST images from satellite show many changes of time dependent eddy movements. The satellite image data suggest that new physical ocean process or theory has to be considered. (Author)

**N94-14262 Integration of SST data sets using MOS-1 satellite data: For validation and monitoring.** TAKEUCHI, SHOUJI; NAKAYAMA, YASUNORI; TOMITA, TSUYOSHI, Remote Sensing Technology Center, Tokyo (Japan). In Science and Technology Agency, Asia-Pacific ISY Conference, Vol. 2, p. 274-277 (SEE N94-14209 02-43). Documents available from Aeroplus Dispatch.

The configuration of the integrated SST (Sea Surface Temperature) data set derived from the MOS-1 (Marine Observation Satellite-1)/VTIR (Visible and Thermal Infrared Radiometer) combined with those by other MOS-1 sensors, such as MSR (Microwave Scanning Radiometer) and MESSR (Multispectral Electronic Self-Scanning Radiometer) and derived from the NOAA/AVHRR (Advanced Very High Resolution Radiometer) and sea truth data by several ocean data buoys is outlined. The results of preliminary validation using the data set are also outlined. The regional SST data set around Japan acquired by VTIR and by the combination of VTIR and AVHRR is outlined. Results of regression analysis for the MOS-1/VTIR data set and that for the VTIR and MSR combined data set are presented. The relation between SST estimate errors and the number of days from launch of the MOS-1 is shown. (Author)