National Space Science Data Center

NSSDCNEWS

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NOST Hosts Archiving Workshop

By Donald Sawyer and Jerry Winkler

The Digital Archive Directions (DADs) Workshop was convened by NSSDC's NOST and was held at the National Archive and Records Administration (NARA) facility in College Park, Maryland, from June 22-26, 1998. Participation was broad, including people supporting various NASA archives across multiple disciplines, other government agencies, various academic institutions, the Research Libraries Group (RLG), and several U.K. archives for science and academic materials. The workshop was extremely successful in achieving its objectives:

- To publicize the emerging Consultative Committee for Space Data Systems (CCSDS)/Standard Reference Model (ISO) for an Open Archival Information System (OAIS) through a tutorial session and to gain acceptance of the reference model, obtain comments, and proposed enhancements to the model from this broad community of archive providers and users.
- To seek and find common interest in developing various recommended practices, standards, and reports addressing archival issues and to document these as possible work items under various organizations including ISO Technical Committee 20/Sub-Committee 13 and the CCSDS.

The workshop consisted of a two-hour tutorial on the reference model, 12 invited presentations to identify the state of the art in related standards and practices, and then three parallel sessions as follows:

Working Group 1: Administration and Procedures — eight papers.
Working Group 2: Ingest and Storage — eight papers.
Working Group 3: Data Management and Access — ten papers.

There were two categories of recommendations that came from the DADs Workshop. The first category came from the working groups; these recommendations were basically technical in nature and included comments on the OAIS Reference Model and suggestions for future standardization topics such as the following:

- Data Ingest Methodology.
- Archival Submission Information Package Standard.
- Standard Consumer Archive Interface.

Further recommendations and details can be found in the final workshop report, which was available about the end of September 1998 from the DADs Web site at http://ssdoo.gsfc.nasa.gov/nost/isoas/dads/.

The second category of recommendations came from the plenary meeting that occurred on the last day of the workshop, and these recommendations tended to have a management or administrative orientation.

1. It would be useful to investigate the feasibility, practicality, and utility of establishing an international consortium, organized around the Reference Model, that would be responsible for developing a consensus understanding across a wide variety of communities facing digital archive needs. The consortium would promote cooperative efforts regarding digital archives.

2. Continuation of coordination and cooperation across bodies concerned with digital archiving is needed, including a widened review of the OAIS Reference Model to assure it services the needs of the global digital archiving community.

A third plenary recommendation is that accreditation of archives is important and should be pursued, but that it can only be accomplished when best practices are in place.

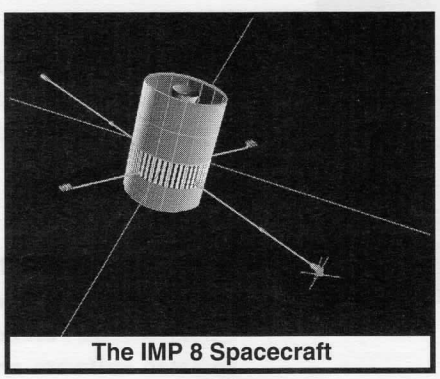
More information about the OAIS Reference Model or the DADs Workshop and about opportunities to participate in future work and related workshops are at http://ssdoo.gsfc.nasa.gov/nost/isoas/.

IMP 8's Twenty-Fifth Anniversary

By Joseph King

NASA's Interplanetary Monitoring Platform (IMP 8) spacecraft was launched 25 years ago from Cape Kennedy, late in the evening of October 25, 1973 (October 26, Universal Time), and continues to provide important in situ cosmic ray, energetic particle, plasma, and magnetic field data.

IMP 8 is in a nearly circular orbit about the Earth, at a distance a little more than half way to the Moon. The orbit is near 35 Earth radii (Re) and has a 12+ day period. In this orbit IMP is in the solar wind about seven days per orbit and is within the Earth's magnetosphere/magnetosheath system about five days per orbit.



The IMP 8 Spacecraft

Over the past 25 years more than one thousand scientific papers have been published in the refereed scientific literature in which IMP 8 data were the sole data used or were important adjuncts to data from other missions also used in those papers.

The IMP 8 spacecraft was built and has been operated over its lifetime at NASA Goddard Space Flight Center. IMP 8 was the last of the series of IMP spacecraft that included eight IMPs intended for (and achieving) geocentric orbit and two "Anchored IMPs" intended for lunar orbit. These ten spacecraft were launched by NASA in the ten-year period 1963-1973.

See Commonly Used Acronym List on Page 4.

More on IMP 8 ...

New IMP 8 Data Set Created at NSSDC

By Joseph King and Natalia Papitashvili

Over the past 20 years the Interplanetary Monitoring Platform (IMP) 8 team at the University of Maryland has been providing to NSSDC on magnetic tape selected processed data from their IMP 8 investigation. This investigation consists of two detector systems for measuring energetic charged particles: the Electrostatic Energy-Charge Analyzer (EECA) and the UltraLow Energy Telescope (ULET). The ULET system failed a few years after launch, but the EECA continues to provide important data after 25 years of operation in space. The EECA is described in detail at http://umdsp.umd.edu/imp/imp-8-eeca_desc.html. The data came to NSSDC in IBM-binary format in 1991 and then in VAX-binary format thereafter. Each "normal" data record contains 11-min resolution EECA count rates and pulse height data enabling determination of physical parameters. In addition, each record contains much ancillary and engineering information of little potential value for science data users. Finally, each record has many words devoted to data from the ULET instrument, where such words are meaningfully filled for only the first five years of the IMP 8 life. In addition, each "normal" record was followed by zero, one or many special ULET records according to how many energetic particles were pulse-height-analyzed by ULET during the 11 minutes covered by the normal data record. (How many such ULET records followed a given normal record was given in a data word of the normal records.)

The full on-line version of this article describes NSSDC's definition and creation of a new and much more readily accessible and usable data set of EECA count rate and pulse height data for ions of various charge states and energy per charge windows. The new data set is accessible as monthly ASCII files (3-6 MB each) from NDADS/SPyCAT system. NSSDC consulted with UMD personnel in this data set definition and creation.

Additional IMP 8 Particle Data Accessible from NSSDC

By Joseph King

The 1973-launched Interplanetary Monitoring Platform (IMP) 8 spacecraft carries several energetic particle investigations covering complementary energy and species domains. This note is to inform readers of several recent milestones reached at NSSDC in making the uniquely long data sets from these investigations network-accessible.

Robert Decker of the Applied Physics Laboratory (APL) has provided to NSSDC more than 100 CD-ROMs containing 20-sec resolution count rate data from the Charged Particle Measurements Experiment (CPME-principal investigator [PI]: Decker; original PI: Krimigis) and Energetic Particles Experiment (EPE—PI: Williams; key person: Mitchell) supplemented by magnetometer (Lepping) and solar wind plasma (Lazarus) data. NSSDC has now loaded all available data (1973-1997) to NDADS for SPyCAT access.

NSSDC has also very recently ingested to NDADS 11-min resolution count rate data (charge state vs. energy) in ASCII from the University of Maryland charge state measurement investigation (PI: Ipavich; original PI: Gloeckler) for most of the 1973-1997 period. NSSDC's definition and creation of this data set are further discussed in the preceding article.

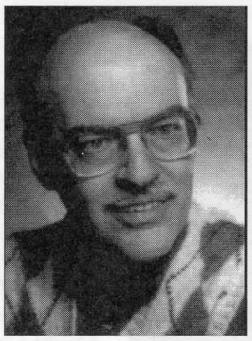
Another key IMP 8 particle data set extended through 1997 since the original announcement of NSSDC availability is 15-min count rate data from the University of Chicago (PI: Lopate; original PI: Simpson). Owing to its smaller data volume, this ASCII data set is held on magnetic disk for anonymous/FTP access rather than for access through NDADS/SPyCAT.

Finally, data from the McGuire/McDonald energetic particle experiment have been added to NDADS very recently and are described in the IMP 8 holdings file. They will be made accessible through SPyCAT imminently.

GSFC Reorganization Brings New Staffers to NSSDC

By Joseph King

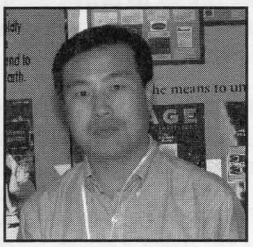
NSSDC has two new staffers matrixed to it from the newly Goddard-created Applied Engineering and Technlogy Directorate.



George Fleming, right, will play a key role in the management and evolution of NSSDC's physical archive and in the conversion of the right subset of NSSDC's film archive to digital form.

He began his Goddard career in 1966 immediately after receiving a B.S. in physics from Michigan State University.

David Han, right, will be the key person guiding the evolution of the Common Data Format (CDF) and associated software and documentation. David has an M.S. in computer science from George Washington University and has been at Goddard since 1991.



NSSDC Tapes Moved as TSSF Closes

By George Fleming

Over the last several years NSSDC has kept copies of its NSSDC-held tapes at Goddard's Tape Staging and Storage Facility (TSSF). These tapes are in addition to other tapes held off site at the Washington National Records Center in Suitland, Maryland.

TSSF has provided storage space for tapes (and occasionally photo products) for the Goddard community since the early 1970s. With the removal of the last SpeedRacks, shelving, and pallets of boxes, an era has ended with the closing of the TSSF on September 30, 1998.

About 13,000 of these NSSDC tapes (and the tapes of other organizations) have been sent to a storage facility operated by Iron Mountain, Inc. (http://www.ironmountain.com/index.htm) while some racks have been salvaged for use by NSSDC. The arrangement of using Iron Mountain's facility will reduce TSSF costs dramatically as the cubic volume required for storage of data has been dropping monotonically for some time. Goddard will, through the use of the Tape Accounting System (TAS), keep track of approximately 100,000 units now "active."

TSSF has also had its turn in the spotlight. For instance, in 1996 TSSF was used as a backdrop for filming part of the documentary *Into the Future*. In 1990 the GAO challenged TSSF to prove that its tapes were readable. Using GAO's standards on a data set selected by GAO, all tapes passed.

NSSDC's tapes moved to Iron Mountain will gradually be called back. They will be released as their contents are migrated to new higher density media.

ATMOWeb Offers WWW/Java-Based Access to AE Data

By Natalia Papitashvili

The composition and temperature data produced by the NASA Atmospheric Explorer (AE) -C, -D, and -E spacecraft in the 1970s remain very important in coming to understand the Earth's ionosphere and upper atmosphere better. To facilitate access to and use of these data, NSSDC created in 1995 a CD-ROM holding 15-sec resolution "unified abstract"AE data plus selected other data.

This article announces a new WWW-based interface to these data, ATMOWeb, which provides graphical browsing and numeric retrieval of any subsets of these data. However, unlike CDAWeb and OMNIWeb, which are based on CDF format and IDL graphics, ATMOWeb is an interface to data that are available in ASCII on the NSSDC ANON/FTP site. Thus, these data can also be FTP-downloaded by users independent of ATMOWeb.

The data retrieval capabilities of ATMOWeb are realized through the C/C++ language, but its graphic capabilities are based on Java applets that are created and built into the Web home page by a C-based script. The applet runs on the user's local computer and reads data remotely from the NSSDC ANON/FTP server. (Java language can easily provide such a service.)

The IRI Continues To Improve

By Dieter Bilitza

The International Reference Ionosphere (IRI) is a joint project of the Committee of Space Research (COSPAR) and the International Union of Radio Science (URSI). IRI is the international standard for the representation of ionospheric temperatures and densities. Since 1992 the IRI Working Group, a team of two dozen ionospheric experts, has been headed by Dieter Bilitza (NSSDC/RITSS). The model is the most frequently requested model out of the NSSDC models archive. (Roughly one third of the approximately 3,000 accesses to the FTP site per month are for the IRI model.) IRI can be run on line using the NSSDC-developed Web interface at http://nssdc.gsfc.nasa.gov/space/models/iri.html. Several research groups are involved worldwide in efforts to improve the IRI model. Results and recommendations are presented during annual workshops, and the working group decides then which changes and additions should be included in the next version of the model. The last meeting was held during the COSPAR Scientific Assembly in Nagoya, Japan, this past summer. This article briefly lists the most important ongoing activities and the decisions made at the Nagoya meeting. A major improvement of the IRI electron density profile in the middle ionosphere was accomplished under the leadership of S. Radicella (ICTP), B. Reinisch (University of Massachusetts at Lowell), and D. Bilitza. Based on ionosonde data from low latitudes, the new model provides an improvement of 30% and more at the magnetic equator. The topside will be the next focus of this task force activity.

In the lower ionosphere the IRI has benefited from modeling efforts in Russia (A. Danilov), Austria (M. Friedrich), Switzerland (E. Kopp), and Germany (W. Singer). Compiled rocket data are the prime data base in this region. Indirect measurements from the ground are helping to resolve issues related to seasonal and solar cycle variations. Because of the data scarcity and the sometimes conflicting results, the group now has decided to allow three different options (models by Friedrich et al., Danilov et al., and Mechtley and Bilitza) for the representation of electron densities in the D region. The last of these is the default for many purposes, although descriptions and comparisons of these models will be available. K. Oyama (Japan) is using in situ data from several Japanese satellites to investigate shortcomings of the IRI temperature model and ways to overcome them. Triskova (Czech Republic) and her colleagues are in the process of mining the large data base from the Russian Interkosmos satellite series for IRI.

AAAS Provides NASA Curriculum Standards

By Carolyn Ng and Farzad Mahootian

NSSDC/SSDOO and groups throughout NASA are developing products related to their science areas for use at varying levels in the nation's K-12 education endeavor. Many of these efforts are being done by or in collaboration with teachers. This article describes an approach to using science education standards developed by the American Association for the Advancement of Science (AAAS) to ensure classroom effectiveness of these products.

In the first week of August 1998, three SSDOO staff members joined 25 other Goddard scientists and educators in a five-day pilot program that trained developers and reviewers of NASA educational materials on how to apply AAAS science education standards. The AAAS Project 2061 published these standards in a number of publications, starting with *Science for All Americans* and subsequently *Benchmarks for Science Literacy* and a continuing series of resource volumes. The *Benchmarks for Science Literacy* publication illustrates a system of learning goals for each science discipline at each grade level (K-2, 3-5, 6-8, and 9-12) as well as elucidating goals for mathematics and cross-disciplinary "common themes." The goal of the workshop was to learn about the philosophy of 2061 and about the tools that contribute to facilitate both the

analysis and the design of standards-based NASA curriculum support materials for K-12 science and math education and to learn seven criteria clusters for determining the extent to which a material's instructional strategy was likely to help students learn the content. At the end working groups generated action plans.

New White Paper on NASA Science Data Retention Issued

By Joseph King

At the request of NASA's chief information officer, NSSDC has generated a white paper to be used as the basis for a new science data retention policy of NASA. This paper is available on the WWW at http://nssdc.gsfc.nasa.gov/nssdc/data_retention.html.

Among the chief tenets of the paper is that for each data-generating NASA science investigation there is a definitive data set containing all the science potential of the investigation, and this data set needs to be held within NASA indefinitely. This data set, not yet irreversibly transformed, is called level 1A in some circles. It either contains or is accompanied by all the supporting material (documentation, calibration files, software, etc.) needed to make the data correctly and independently usable.

Data sets from an investigation that are earlier than the definitive data set in the processing cycle (for example, the raw telemetry data) may be released after sufficient testing shows that definitive data sets faithfully reproduce the content of the earlier data sets. Data sets derived from the definitive data sets may be archived indefinitely or may be recreated on demand from the definitive data sets.

It is suggested that a small subset of the data to be retained indefinitely within NASA archives will be designated as permanently important from an historic perspective for the nation's life. A copy of this small subset will be made and transferred to the National Archives and Records Administration (NARA) for its permanent retention. NARA officials are currently reviewing this suggestion.

NSSDC Assesses Ending Paper Newsletter

By Joseph King

Five years ago, NSSDC changed its newsletter dissemination format from the paper-only distribution of 16-20-page newsletters to a mixed mode of paper distribution of a four-page newsletter containing summaries or abstracts of articles with full articles being available over the Web. With the increasing ubiquity of the Web as an information access tool, NSSDC is seriously considering terminating the issuance of the paper version of the newsletter after 1998. Readers' opinions on this would be of interest to NSSDC.

Interns Aid NSSDC/SSDOO, Summer 1998

By Nathan James and Carolyn Ng

Sixteen high school, college students, and teachers participated in various summer programs at SSDOO this past summer. Their projects involved a mix of computer-related and science-related activities plus the preparation of programs specifically intended for subsequent classroom use. Their host programs, work projects, and SSDOO mentors are all included in the full on-line version of this article.

NSSDCNEWS

NSSDC News is published quarterly by NASA's National Space Science Data Center. Please send your address changes and requests to the appropriate address listed in the box below. Your comments are welcome.

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To access NSSDC's WWW home page, enter this URL:

http://nssdc.gsfc.nasa.gov/

To access NSSDC's education home page, enter this URL:

http://www.gsfc.nasa.gov/education/education_home.html

Commonly Used Acronyms

CDF	Common Data Format
FTP	File Transport Protocol
GAO	General Accounting Office
ICTP	International Center for Theoretical Physics
IDL	Interactive Data Language
NDADS	NSSDC Data Archive Distribution System
NOST	NASA Science Office of Standards and Technology
RITSS	Raytheon Information Technology and Scientific Services
SECEF	Sun-Earth Connection Education Forum
SSDOO	Space Science Data Operations Office
SPyCAT	Space Physics Catalog