National Space Science Data Center

NSSDCNEWS

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New NSSDC Mass Storage Arrives

By Joseph King and Robert Candey

For nearly a decade now, NSSDC has provided astrophysics and space physics data files from NDADS, a VMS system with a pair of Cygnet jukeboxes holding 12" optical platters with a combined capacity of about 1.6 TB. Over that time more than two million data files have been downloaded by NSSDC's customers. User response times have typically been in the few-to-several minutes range.

The optical disk jukeboxes are approaching the end of their useful lives. NSSDC has just received from MetaStor a 1 TB RAID magnetic disk system that has been attached to a Sun Enterprise 3000 server running UNIX.

NSSDC expects that in the coming several months most space physics data on NDADS and the still popular data from the Infrared Astronomy Spacecraft (IRAS) will be migrated from Cygnet platters to the new RAID-based data dissemination environment. Initially, user access will be by anonymous/FTP through a directory heirarchy largely organized by spacecraft and experiment. After the data transition is completed and all new ingests are pointed to the RAID disk rather than to the Cygnets, the old NDADS service and its SPyCAT, WISARD, and ARMS interfaces will be retired.

NSSDC expects to integrate into this new RAID environment the spacecraft data files that have long been accessible from NSSDC via an anonymous/FTP pathway completely independent of the NDADS pathways. Whether NSSDC eventually creates higher level interfaces to these data files will depend on user feedback.

This change will not affect such popular data access pathways as CDAWeb and OMNIWeb. A key reason for needing less immediate capacity than the prior Cygnet-based NDADS system is that new electronic pathways outside NSSDC are now available to high energy (HEASARC) and UV (STScI/MAST) astrophysics data that previously were uniquely available from NDADS.

CD-ROMs on Comet Shoemaker/Levy 9 Collision Available

By David Williams

A set of six CD-ROM volumes prepared by NASA's Planetary Data System and containing observations of Comet D/Shoemaker/Levy 9 and Jupiter prior to, during, and after the collisions between the comet fragments and Jupiter in July 1994 is now available at NSSDC. The CDs include spectral data and images from the International Ultraviolet Explorer, Hubble Space Telescope, Galileo, and Earth-based observatories such as Mount Stromlo/Siding Spring and the European Southern Observatory. At least six additional CDs are being prepared and should be ready within the next year or so. For more information on these CD-ROMs and an on-line ordering form, see http://nssdc.gsfc.nasa.gov/cd-rom/web_store.cgi?category=sl9.

The full set of Shoemaker/Levy 9 CD-ROMs and accompanying documentation.

Note: FULL version of this article is available at http://nssdc.gsfc.nasa.gov/nssdc_news/

See Commonly Used Acronym list on page

Dr. Beth Brown Joins ADF

By David Leisawitz

NSSDC belatedly welcomes Dr. Beth A. Brown to the Astrophysics Data Facility (ADF). Dr. Brown joined the staff in November 1998 as a National Research Council Resident Research Associate (RRA). She divides her time between multiwavelength research on elliptical galaxies and educational outreach.

Dr. Beth A. Brown, National Research Council Resident Research Associate

Dr. Brown is studying the effects of the galactic environment on the X-ray luminosities of elliptical galaxies and is testing the cooling flow model. In her previous work on this subject (Brown and Bregman 1998), she measured X-ray fluxes from a sample of 34 elliptical galaxies and found important inconsistencies with theoretical models, raising new questions about the hot gas in ellipticals. Dr. Brown had hoped to obtain additional Roentgen Satellite (ROSAT) observations during her RRA tenure to strengthen her previous conclusions and provide the basis for a new understanding of elliptical galaxies. Undaunted by the recent decommissioning of ROSAT, she has pursued her research using archival ROSAT data and astronomical catalogs available through the Astronomical Data Center. Dr. Brown recently submitted a paper on her research to the *Astrophysical Journal.* A second paper is in preparation and will be submitted shortly.

Dr. Brown is keenly interested in educational outreach and has devoted some of her time to this during the past year. She has worked with her research advisor, Dr. David Leisawitz, on the Multiwavelength Milky Way project, an effort to make data on the Galaxy accessible to educators, students, and the general public. This past summer, Dr. Brown and Dr. Leisawitz collaborated with two teacher-interns — Lisa Alter and Lisa Bruck — to develop lesson plans suitable for middle and high school students and new Web pages for the Multiwavelength Milky Way.

Apollo 11 Lunar Data Held at NSSDC

By David Williams

The primary objective of the Apollo 11 mission was stated succinctly back in 1961 by President John F. Kennedy: "... landing a man on the Moon and returning him safely to the Earth." Unlike later Apollo missions, which spent up to three days on the surface of the Moon and involved deployment of many experiments, Apollo 11 was a demonstration of the feasibility of such missions with the astronauts spending only about two and a half hours outside the Lunar Module. Much of this time was spent collecting samples and engaging in activities such as putting up the flag, unveiling a plaque, and talking to President Richard Nixon. However, there was some time to take valuable photographs, deploy two experiments on the surface, and conduct a third investigation; results from these efforts are archived at the National Space Science Data Center (NSSDC).

Not surprisingly, the most popular Apollo 11 data at NSSDC by far are the photographs taken by the astronauts on the lunar surface. NSSDC holds a complete set of these copied directly from the originals held at Johnson Space Center in Houston, Texas. NSSDC also has all the photographs taken from orbit, specialized photos such as the stereo camera images and 16-mm kinescope movie film.

The experiments set up on the Moon included a seismometer that operated on solar power for one lunar day (about two weeks) and a laser ranging retro-reflectometer (LRRR). The seismometer data at NSSDC are held as seismograms on microfilm. The results of Earth-based studies using the LRRR (a set of mirrors deployed to reflect laser light sent from Earth back to its origin and still in use today) are contained on magnetic tape.

Finally, NSSDC has a published report on microfiche of the results of the soil mechanics experiments and observations of the astronauts. All these data can be obtained from NSSDC through its Request Office at request@nssdc.gsfc.nasa.gov. For more detail on the Apollo 11 data available at NSSDC and on the Apollo 11 mission and experiments, see NSSDC's Web page at http://nssdc.gsfc.nasa.gov/planetary/lunar/apollo11info.html.

DE 2 Data Newly Accessible from ATMOWeb

By Natalia Papitashvili

To facilitate access to and use of ionospheric and atmospheric data, a discipline-oriented, WWW-based interface called ATMOWeb was designed and developed at NSSDC. ATMOWeb provides graphical browsing and numeric retrieval capabilities from http://nssdc.gsfc.nasa.gov/atmoweb/. ATMOWeb has provided access to Atmospheric Explorers-C, -D, and -E 15-sec Unified Abstract data for about a year now.

The Unified Abstract data from another atmospheric spacecraft, Dynamic Explorer (DE) 2, were recently added to the ATMOWeb interface. These data are at 16-sec resolution and cover the DE 2 life of August 6, 1981, through February 15, 1883. The available data set includes densities, temperatures, and drift velocities for neutrals, atoms, and ions of many species from several different instruments, that is, from the Neutral Atmospheric Composition Spectrometer (NACS), the Wind and Temperature Spectrometer (WATS), the Langmuir Probe (LANG), the Fabry-Perot Interferometer (FPI), the Retarding Potential Analyzer (RPA), and the Ion Drift Meter (IDM).

NSSDC continues to improve and expand graphic capabilities in the ATMOWeb interface. For listing and plotting users can now specify the time interval and any combination of parameters for any one spacecraft. For plotting they may select up to four parameters for the separate panels of a plot (screen) and specify the number of hours per plot.

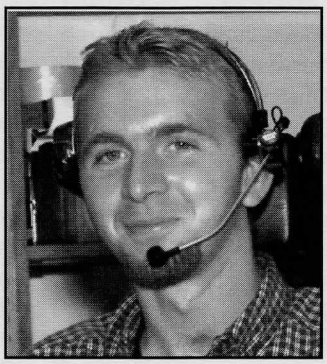
Where multiple plots are needed to span the full time interval selected, users can easily move forward and back through the sequence of plots. Finally, dragging the cursor over any curve causes results of an "on the fly" digitization to be listed on the plot.

ATMOWeb-accessible data can also be directly FTP-downloaded independently of ATMOWeb.

Summer Intern "Teaches" Software To Help in Research

By Ramona Kessel

Jesse Leaman and his attendant, Christina Lugo, both of East Stroudsburg University in Pennsylvania, were at the SSDOO for the summer of 1999. Jesse worked with mentor Ramona Kessel on a Sun-Earth connections research project. The project involved many things, not the least of which was learning several new computer systems. Jesse uses voice activation to operate computers, and the software had to be "taught" new environments and procedures. Jesse also took advantage of the vast data stores at the NSSDC and on CDAWeb to carry out the research.



Jesse Leaman, summer intern, uses voice activation equipment.

First of all, he learned to identify crossings of Earth's outer magnetic boundary or bow shock (at ~ 12 Earth radii in the sunward direction and more in other directions) from in-situ satellite measurements. He used the International Solar-Terrestrial Physics (ISTP) program satellites, Geotail and Wind, and also IMP 8. Then he used a least-squares fit of the data on either side of the bow shock to a set of conservation equations across the boundary to determine the normal direction to the surface. In general this surface follows a model surface that is an empirical fit of many satellite crossings since the 1960s. However, at times of transient solar wind features, the surface can deviate substantially from the model. Jesse and his mentor were studying the interaction of high speed solar wind streams with the bow shock. Jesse analyzed several of the high speed stream interactions of which there are multiple (up to 30) crossings of the bow shock by the satellite making the measurements. He also examined times in between the high speed streams for comparison. The surface normals he determined are the basis of the research and will be used in several presentations and papers in the next year by both Jesse and his mentor. In fact, Jesse won the Goddard-wide Rashaan Jackson award for best student presentation for his final summer presentation.

One interesting story about the summer involves Jesse's expectations. When Jesse first started as a student, he solved a few of the least squares problems and then asked, "What's the final answer?" His mentor, Ramona Kessel, explained that science answers take time, a lot of hard analysis of data, and persistent questioning. Jesse took that on board and continued to work hard and look for answers. In Jesse's final presentation he said he was naive when he started but now knew much more about how science is done.

CDF Java APIs Suite Now Available with CDF 2.7

By David Han

The NSSDC's Common Data Format (CDF) Office has completed the development of the CDF Java Application Program Interfaces (APIs) that began in January 1999. The APIs are available to the general public in addition to the current C and Fortran APIs as part of the CDF 2.7 package released in mid-September 1999. The advent of the CDF Java APIs significantly benefits the CDF user community since a CDF application can now be written in platform-independent Java language and can run on any of the Java-supported platforms without any modifications. (Java is supported virtually on all platforms today.) The platform-independent Java encourages the sharing of scientific data analysis code among scientists and also promotes science.

Java versions of the CDF tools (e.g., SkeletonCDF, SkeletonTable, CDFConvert, etc.) except CDFedit are also available as part of CDF 2.7. CDF 2.7 is backward-compatible with the previous CDF releases, and it includes a more robust CDF library and some features that were not available in CDF 2.6.x, such as the ability to copy a variable with or without data.

The CDFedit tool is now being converted to Java utilizing new Java APIs followed by the development of the sparse array/matrix. This conversion is currently scheduled to be completed in November 1999. Further details are available on the CDF home page at http://nssdc.gsfc.nasa.gov/cdf/cdf_home.html.

IRI Improved and Proposed as ISO Standard

By Dieter Bilitza

The annual task force activity of the International Reference Ionosphere (IRI) at the International Center for Theoretical Physics (ICTP) in Trieste, Italy, on June 28 - July 2, 1999, resulted in several improvements of the IRI electron density model. The activity, now in its sixth year, tackles a number of very focused and specific modeling questions with the help of data and tools accessed over the Internet during a week-long meeting of about a dozen experts. Of special importance is the much improved representation of the equatorial ionosphere since this region has the largest impact on waves propagating through the ionosphere. This model improvement was possible because of the use of modern digisonde software with data from several ionosondes from the equatorial region. The results are a good example for the benefits of collaboration among scientists from developed and developing countries; one of the primary goals of ICTP (http://www.ictp.trieste.it) is to enable such activities. The presentations during the task force activity are published in ICTP Reports. Meetings summaries together with the references for the reports can be found on the IRI home page http://nssdc.gsfc.nasa.gov/space/model/ionos/iri.html.

IRI was developed and is being updated by a joint working group of the primary scientific unions dealing with ionospheric science, the Committee on Space Research (COSPAR) and the International Union of Radio Science (URSI). It is the most mature of the empirical ionospheric models having undergone testing with many data sets and having been used by a wide range of users for a multitude of applications. It is the de facto international standard for the ionosphere.

The international organization in charge of standards is the International Standardization Organization (ISO). Its TC20/SC14/WG4 is responsible for standards for the Earth environment (Technical Committee 20: Aircraft and Space Vehicles; Subcommittee 14: Space Systems and Operations). Following an invitation from this ISO body, the IRI team presented a proposal to make IRI the ISO standard during the recent ISO/TC20/SC14 Meeting in Turino, Italy (May 10-14, 1999). The proposal was received favorably by the participants, and a new ISO Work Item was initiated. The road from an ISO Work Item to the final standard is, however, a long one and is complicated in the case of the ionosphere because of a counter proposal from Russia (SMI-88).

History and Radio JOVE Join at NRAO

By James Thieman

The Radio JOVE education and outreach project recently emulated radio astronomy pioneer Karl Jansky by successfully observing Jupiter using the Radio JOVE receiver kit connected to a reconstruction of the 1932 Jansky telescope at the National Radio Astronomy Observatory (NRAO) in Green Bank, West Virginia. The Radio JOVE project gives schools and the general public the opportunity to build a radio astronomy receiver and antenna and use them to record and analyze the radio emissions from Jupiter and the Sun. Project members Chuck Higgins (National Research Council Research Associate) and Len Garcia and James Thieman (Goddard Space Flight Center scientists) journeyed to Green Bank together with University of Maryland astronomy student Albie Davison and Annapolis High School student Autumn Thayer, who were working with the project for the summer. There, the group met Richard Flagg, another project member from Hawaii and designer of the Radio JOVE receiver. Together, they gave a presentation about Radio JOVE to the annual meeting of the Society of Amateur Radio Astronomers (SARA).

By good fortune the meeting coincided with a time period when Jupiter radio storms had been predicted. The group not only set up the standard Radio JOVE receiver kit and antenna but also connected a Radio JOVE receiver to the reconstructed Karl Jansky telescope, which NRAO maintains at its facility. The effort was rewarded by the recording of Jupiter radio emissions at NRAO and their verification by simultaneous acquisition by Francisco Reyes, another project member, at the University of Florida Radio Observatory.

Wind Plasma Data Added Among OMNI Upgrades

By Joseph King and Natalia Papitashvili

NASA launched the Wind spacecraft on November 1, 1994, primarily to provide data on variations of solar wind input to the magnetosphere as part of the overall (ISTP) program. Since then, Wind has provided a nearly continuous record of solar wind variations in front of the Earth's magnetosphere.

The March 1998 *NSSDC News* announced the first inclusion of Wind interplanetary magnetic field data in the OMNI data set of hourly resolution, multisource solar wind magnetic field and plasma parameters, energetic particle fluxes, and solar and geomagnetic activity indices.

Solar wind plasma parameters spanning 1994 to 1999 from the Wind spacecraft's Solar Wind Experiment (SWE) have just been added to OMNI. K. W. Ogilvie of GSFC is the SWE PI, and A. J. Lazarus is a Co-I and the provider of data to NSSDC. Inclusion of the Wind data increases the fractional OMNI coverage from about 50% achieved with only IMP 8 to greater than 95%. Details of the Wind data time shifting and normalizations and of the comparisons between Wind and IMP/MIT plasma parameter values can be found at http://nssdc.gsfc.nasa.gov/omniweb/html/addswe/addswe.html.

The primary pathway to the OMNI data set is through the OMNIWeb interface at http://nssdc.gsfc.nasa.gov/omniweb/. Other pathways include anon/FTP for annual ASCII files (ftp://nssdc.gsfc.nasa.gov/spacecraft_data/omni/) and CD-WO disks made on request.

NSSDC has newly provided the option in OMNIWeb for users to request that 27-day (solar rotation period) averages be displayed or downloaded. A single file of 27-day averages is available for anon/FTP download from the FTP address given above.

Goddard To Be Certified as ISO-9001-Compliant

By Nancy Laubenthal

The ISO (International Standardization Organization)-9001 standard specifies how customer-responsive organizations work with an emphasis on quality products for their customers. Many organizations have become ISO-9001 certified through an independent audit process. Such certification is viewed as beneficial to a commercial organization in attracting and retaining customers.

Within the government many agencies and subunits are also becoming ISO-9001 certified for the recognition that their processes are high quality and lead to high quality products. NASA is becoming ISO-9001 certified. NASA's field centers are being independently audited for their levels of compliance to the ISO-9001 standard. Goddard's ISO registrar is Det Norske Veritas (DNV).

During the week of August 23-27, 1999, the DNV third party audit team visited Goddard Space Flight Center, both Greenbelt and Wallops Island, and examined the processes and state of documentation thereof carried out by each of many Goddard groups. NSSDC and the Space Science Data Operations Office (SSDOO) were among the groups audited. The audit revealed a number of minor non-conformances to the ISO standard Goddard-wide, and corrective action will be taken on these. None of these involved SSDOO or NSSDC.

The DNV audit team will recommend to the DNV Registrar that Goddard be certified as ISO-9001-compliant. DNV will issue the Goddard ISO certificate. Further information on ISO in general is available at http://www.iso.ch/. Further information on ISO at Goddard is available at http://arioch.gsfc.nasa.gov/iso9000/index.htm.

NSSDCNEWS

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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

ARMS	Automated Retrieval Mail System	**NDADS**	NSSDC Data Archive and Distribution System
CD-WO	Compact Disc-Write Only		
FTP	File Transfer Protocol	**SPyCAT**	Space Physics Catalog
HEASARC	High Energy Astrophysics Science Archive Research Center	**SSDOO**	Space Science Data Operations Office
		STScI	Space Telescope Science Institute
IMP	Interplanetary Monitoring Platform	**UV**	Ultraviolet
ISTP	International Solar-Terrestrial Physics	**WISARD**	Web Interface for Searching Archived Research Data
MAST	MAss Spectrometer Telescope		