

PDS GEOSCIENCES NODE DATA AND SERVICES. S. Slavney, R. E. Arvidson, E. A. Guinness, and T. C. Stein, McDonnell Center for the Space Sciences, Washington University, 1 Brookings Drive, Campus Box 1169, St. Louis, Missouri, 63130, Susan.Slavney@wustl.edu.

Introduction: The Geosciences Node of NASA's Planetary Data System (PDS) works directly with NASA missions and the science community to ensure that quality science data archives are produced and made available to the planetary science community.

The Geosciences Node (<http://pds-geosciences.wustl.edu>) has been one of the PDS Discipline Nodes since the beginning of PDS in the early 1980s, focusing on science data related to the study of the terrestrial planets and the Moon. The Node maintains its data archives both for long term preservation and for immediate access by scientists, students, and the general public. The Geosciences Node Advisory Group, a group of scientists who are active users and contributors to the archives, provide advice and feedback from the user community to help guide Node activities, particularly in terms of providing web-based services for accessing Node holdings.

Data Holdings: The Node's holdings include data from all NASA missions to Mercury, Venus, the Earth's Moon, and Mars since planetary science data were first archived in digital form. Archives produced by the science community are also included. New data are delivered regularly from currently operating missions, including the 2001 Mars Odyssey orbiter, the twin Mars Exploration Rovers (MER), the MESSENGER orbiter at Mercury, the Mars Reconnaissance Orbiter (MRO), and most recently the Lunar Reconnaissance Orbiter (LRO). Archives from past missions include the Lunar Crater Observation and Sensing Satellite (LCROSS), the Mars Phoenix Lander, Mars Global Surveyor, Clementine, Lunar Prospector, Magellan, and the Viking Orbiters and Landers. The Node also undertakes projects to restore very early data sets, such as data from some Apollo experiments. Total data volume is about 89 terabytes and is expanding at the rate of at least one terabyte per month. Most active missions release new data once every three months.

The Geosciences Node is working with the Mars Science Laboratory (MSL) mission and the Gravity Recovery and Interior Laboratory (GRAIL) lunar mission, both scheduled to launch in fall 2011, to help design their science archives, which will eventually be delivered to PDS.

The Node also hosts data from the European Space Agency's (ESA) Mars Express mission and will receive the archives from the Forerunner Mini-SAR instrument on the Indian Space Research Organization's (ISRO) Chandrayaan-1 lunar mission. The Node is working with other national space agencies such as ESA, ISRO,

and the Japan Aerospace Exploration Agency (JAXA) through the International Planetary Data Alliance [1] to provide access to planetary data acquired by those agencies' missions.

Data sets contributed by individual researchers are also part of the Geosciences Node archives. Recent additions include laboratory measurements of Mars-analog soils (Michael Shepard, Bloomsburg University) and field-based images and measurements of Mars-analog soil samples (Aileen Yingst, Planetary Science Institute). Work is underway to archive a library of Mars-analog spectra (Janice Bishop, SETI).

Data Nodes: The Geosciences Node oversees a few Data Nodes that are created to provide a special service for a particular data set for a limited time period, usually the duration of a mission. For example, the LRO Lunar Orbiter Laser Altimeter (LOLA) Data Node at MIT is operated by the LOLA Science Team to provide public access to the most recent LOLA altimetry data, updated by the team with greater frequency than the scheduled releases to PDS every three months. The Mars Odyssey Gamma Ray Spectrometer (GRS) Data Node is operated by the GRS Science Team at the University of Arizona to provide customized processing of GRS data based on a user's criteria. When a Data Node's performance period comes to an end, the service it provides is transferred to the Geosciences Node.

Workshops: The Geosciences Node hosts occasional workshops to help users learn the most effective ways to use particular data sets. Presentations and other workshop materials are maintained on the Node web site after the workshop for anyone to use. The Node is always interested in suggestions from the community for workshop topics.

Web Services: The Geosciences Node's primary interface with the planetary science community is its web site at <http://pds-geosciences.wustl.edu>. Newly released data are announced on this web site. Almost all Node holdings are online and available for download by any user. There is no charge for downloads. The archives can be browsed by planet, mission, instrument, and data set. Users who can't find what they need on the web site are welcome to ask for help by sending email to geosci@wunder.wustl.edu. The Tools section of the site offers links to various tools for selecting, viewing, and processing data. Some are developed by the Geosciences Node, some by other parts of PDS, and some by other organizations.

Two locally developed tools are particularly useful for exploring the Geosciences Node archives. The Orbital Data Explorer (ODE, <http://ode.rsl.wustl.edu>) provides methods for conducting detailed searches on orbiter-based data sets from missions to Mars, Mercury, and the Moon [2]. A complementary tool for landed missions, the Analyst's Notebook concept was originally developed for the Mars Exploration Rovers (MER). It has been extended with additional capabilities for the Phoenix Lander, Apollo, and LCROSS archives, and a version for the MSL rover mission is planned. Along with search and download capabilities, the Analyst's Notebooks provide the user with the planning context for every science observation, allowing for a better understanding of how, when and why the data were acquired [3]. The Analyst's Notebooks are available at <http://an.rsl.wustl.edu/>.

On an average day the Geosciences Node web site, ODE, and the Analyst's Notebooks have about a thousand visitors from all over the world, who download about 66 gigabytes of data. In calendar year 2010 approximately 24 terabytes of data were downloaded by about 94,000 distinct users. These numbers are expected to increase as the total volume of data holdings increases.

2010 Highlights: In 2010 the Geosciences Node saw an increase in interest in lunar data with the first LRO release in March, along with the debut of the lunar version of ODE and the LOLA Data Node. LRO continues to release data to PDS every three months. LCROSS spacecraft and ground-based data were released in July and the LCROSS Analyst's Notebook in August. The ongoing Mars missions Odyssey, MER, and MRO continue to release data regularly every three months. The MESSENGER mission released data from its third Mercury flyby in March.

2011 Plans: Design and review of MSL science data sets planned for archiving in PDS will take place in the first half of calendar year 2011, in expectation of a launch in late fall 2011. Development of the MSL Analyst's Notebook will occur in parallel. GRAIL archive development will also be underway in 2011. MESSENGER's first release of orbital data is due in September 2011, and regular releases of data from other active missions will continue at three-month intervals.

References: [1] Slavney S. et al. (2007) *LPS XXXVIII*, Abstract #1336. [2] Wang J. et al. (2009) *LPS XL*, Abstract #1193. [3] Stein T.C. et al. (2010) *LPS XLI*, Abstract #1414.