STATUS OF THE PDS UNIFIED PLANETARY COORDINATES DATABASE AND THE PLANETARY IMAGE LOCATOR TOOL (PILOT). S.W. Akins, L. Gaddis, K. Becker, J. Barrett, M. Bailen, T. Hare, L. Soderblom, and R. Raub, U. S. Geological Survey, Astrogeology Program, 2255 N. Gemini Dr., Flagstaff, AZ, 86001 (sakins@usgs.gov).

Introduction: An enormous amount of digital image data has been collected for Mars, the Moon, and other planetary bodies from many missions and instruments in the past four decades. Historic photographic data such as those from Lunar Orbiter and Apollo are being digitally restored [1-3], and large volumes of data from new missions are being acquired daily [e.g., 4]. In many cases, these data exist in a wide range of disparate coordinate systems, making it difficult for the scientific and mapping communities to correlate, combine, and compare data from different missions and instruments. The Unified Planetary Coordinates (UPC) database of the PDS Imaging Node addresses these and other discrepancies [5, 6]. The UPC is a database that improves data search and retrieval capabilities for PDS image data for Mars and the Moon (at present), and permits geographic data searches. It allows users to readily identify, correlate and analyze cross-mission PDS data. The UPC provides an invaluable tool for cartographic data processing by enhancing the ability to identify overlapping image sets to create mosaics and maps. Finally, because it is compatible with Open Geospatial Consortium (OGC) standards, it can easily be used by other search tools, within [e.g., Imaging Node's Planetary Image Atlas (http://ode.rsl.wustl.edu/mars/index.aspx) and Mars Orbital Data Explorer of the Geoscience Node (http://ode.rsl.wustl.edu/mars/index.aspx)] and outside the PDS.

UPC Overview: The UPC has three main parts: (1) a database containing improved geometric and positional information about planetary image data that has been computed using a uniform coordinate system and projection onto a common (preferably 3D) planetary surface shape, (2) a process by which continual maintenance and updates to the content of the database are performed, and (3) a web-based interface, called the Planetary Image Locator Tool (PILOT; see http://pilot.wr.usgs.gov) to search the database quickly and efficiently, to view image footprints and thumbnails for information on data coverage,

and to download multiple image files easily. The goals of the UPC are to build a uniform geometric database for all planetary orbital remote sensing data using the most current coordinate system [7] and to make this database available to the scientific community in a variety of useful forms. The PILOT web site provides the primary interface to the database, and a web services interface is under development to enable searches to be embedded in other web resources and applications.

Approach: Positional and instrumental 'metadata' are extracted from PDS image labels and used to calculate detailed geometric data for a given image in the UPC database. The database is populated with up-to-date SPICE kernels, and improved pointing and location data are calculated for corners, edges, and for potentially every pixel in an image. The UPC benefits from image positional refinements resulting from cartographic processing and map development at USGS. The USGS Integrated Software for Imagers and Spectrometers (ISIS, [8, 9]) system is the primary tool for computing, maintaining, and continually improving the UPC database. An ISIS camera model [10] for a given imaging instrument is required for ingestion of image data into the UPC.

The UPC recently has been refined to provide a more generic, flexible database solution that supports all common and instrument-specific data values for PDS image data. The new database design improves search speed and performance significantly and has facilitated creation of an advanced search interface for accessing PDS image data. The PILOT interface (**Figure 1**) features a navigable Web Map Service (WMS) map of the planetary target where the user can specify a geographic bounding box and view image footprints and browse images. Map views in simple cylindrical and north and south polar stereographic projections are available. Display of coordinate systems can be varied, and users can select instrument, observational and/or positional constraints (e.g., incidence angle, solar longitude, pixel resolution and phase angle) to refine their search. Users also can search based on when the

source files were added to the UPC so that repeat searches can be made to see new files added. Search results are viewed as footprints, and these can be highlighted to further refine a search. Finally, the complete or a partial set of resulting images can be retrieved via wget or through a download script.

Datasets Supported: Currently the UPC provides access to PDS image data for the Moon and Mars, and other planetary targets will be supported in future years. For these targets, images are available via PILOT from Mars Reconnaissance Orbiter (CTX and HiRISE), Mars Odyssey (THEMIS IR), Mars Global Surveyor (MOC Narrow and Wide Angle Cameras), and Clementine (UVVIS and NIR). Data from Viking Orbiter cameras, Lunar Orbiters III, IV, and V, and THEMIS VIS are being added.

Future: New image data will continue to be added to the UPC database to expand its applications to research and mapping. The Web Services interface that is now under development will allow users to access the UPC database from their own web applications or by imbedding the search capability in their own standalone or command-line tools. Ingestion of data into the UPC will ultimately use this Web Services capability so that image data can be more seamlessly and rapidly incorporated into the UPC database, improving the turn-around time on new data being made available to the public. An additional planned improvement of PILOT focuses on expansion of the map interface to include feature names from the NASA Planetary Nomenclature Database (see http://planetarynames.wr.usgs.gov/). Such a feature-based search capability will be implemented as a Web Feature Service that can be turned on or off with the map display, facilitating identification of key features in PDS image data. Finally, additional image and derived map layers (e.g., geologic and mineral maps) will be added to PILOT to facilitate thematic searches for PDS data.

References: [1] Becker, T. et al., 2008, LPSCXXXIX, abs. #2357; [2] Wingo, D. et al., LOIRP project (see http://www.moonviews.com/archives.html); [3] Lawrence, S.J. et al., 2008, NLSI LSC abs. #2066. [4] McEwen et al., 2007, JGR 112, E05S02. [5] Becker, K. et al., 2005, LPS XXXVI, abs. # 1369. [6] Becker, K. et al., 2007, LPS XXXVIII, abs. # 2031. [7] Seidelmann, P. K. et al. 2007, Cel. Mech. & Dyn. Ast., 98, 155. Archinal, B., LGCWG status, this volume. [8] Torson, J.M., and Becker, K.J., 1997, LPS XXVIII, #1443. [9] Anderson, J. A. et al. 2004, LPSC XXXV, #2039 (see http://isis.astrogeology.usgs.gov/). [10] Anderson, 2008, LPS XXXIX, abs. #2159.
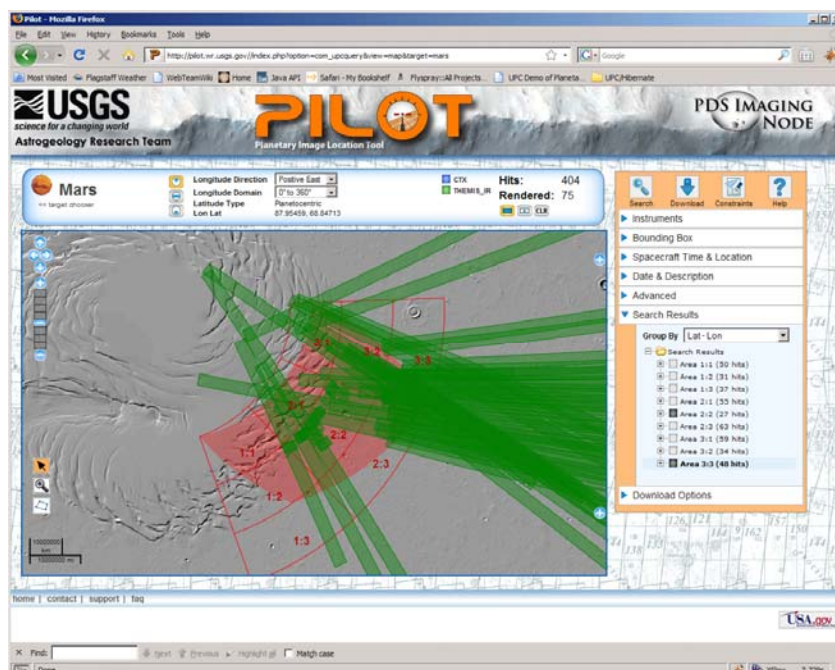

Figure 1. An example of the PILOT interface showing image search results (as footprints) for MRO/CTX and MO1/THEMIS IR data at the North Pole of Mars. Note that the results can be displayed at different levels of detail so that desired images can be readily identified and listed for retrieval on a local system.