IMPROVEMENTS TO THE PDS PLANETARY IMAGE LOCATOR TOOL (PILOT). M.S. Bailen, S.W. Akins, B. Sucharski, L. Gaddis, T.M. Hare, and R. Raub, U.S. Geological Survey, Astrogeology Science Center, 2255 N. Gemini Dr., Flagstaff, AZ, 86001 (mbailen@usgs.gov).

Introduction: The Planetary Image Locator Tool (PILOT) is a web-based interface (http://pilot.wr.usgs.gov) that provides a robust search interface for several Planetary Data System (PDS) image catalogs available from the Unified Planetary Coordinates (UPC) database [1]. The PILOT interface complements other PDS data search tools (e.g., PDS Imaging Node's Planetary Image Atlas, http://pds-imaging.jpl.nasa.gov/search; PDS Geosciences Node's Orbital Data Explorer, http://ode.rsl.wustl.edu/) and takes advantage of recent PDS developments. PILOT includes (1) use of improved spatial and catalogued information for each image as derived by the UPC, (2) access to data from a powerful Geographic Information Systems (GIS) database, and (3) easy, quick access through a customized web portal and mapping interface.

Background: An enormous amount of digital image data has been collected recently for Mars, the Moon, and other planetary bodies [e.g., 2, 3]. Historic photographic data such as those from Lunar Orbiter and Apollo are being digitally restored [4-6]. Ongoing missions deliver a constant flow of new data, and future planetary surveys promise to exponentially increase the amount of image holdings. 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 was created to address these discrepancies [1, 8, 9].

The UPC is a database containing improved geometric and positional information about planetary image data, computed using a uniform coordinate system and projected onto the most current coordinate system [10]. Positional and instrument 'metadata' are extracted from PDS image labels and used to calculate detailed geometric data for a given image. The database is populated with up-to-date spacecraft pointing information (e.g., SPICE kernels) which provides improved pointing for image corners, edges, and? nearly every pixel in the image. The UPC also benefits from image positional refinements resulting from cartographic processing and map development at the USGS. The USGS Integrated Software for Imagers and Spectrometers (ISIS, [e.g., 11, 12]) system is the primary tool for computing, maintaining, and continually improving the UPC database. An ISIS camera model [13] for a given imaging instrument is required for ingestion of image data into the UPC.

UPC Cluster: The method of processing the image data to populate the UPC database has been redesigned and now leverages a compute cluster. The cluster is driven by a single processing script which uses Extensible Markup Language (XML) configuration files to identify parameter and command differences between instruments. This method allows new instruments to be added to the UPC as soon as an ISIS camera model is made available. In addition, a processing database now tracks which files have been processed. The database permits quick reprocessing of image data when updates are made to an ISIS camera model. These UPC improvements have significantly increased the availability of image data through PILOT.

PILOT Approach: PILOT is built on an open-source infrastructure that includes software products such as OpenLayers map viewer [14], MapServer web map service (WMS) [15], and the PostGIS spatial database extensions [16]. The tool also strives to be community-minded and extendable by following standards established by the OGC (Open Geospatial Consortium) [17]. PILOT provides an interface to select planetary targets upon which the user can specify a geographic bounding box and execute searches resulting in rendered footprints, thumbnails, and browse images. The map is able to provide Simple Cylindrical, and north and south Polar Stereographic projections. Users can restrict searches based on instrument and observational and/or positional constraints (e.g., incidence angle, solar longitude, pixel resolution and phase angle). Users also can search based on mission dates and dates when the source files were added

to the UPC. Results are displayed as interactive footprints that allow quick access to image statistics and thumbnails. Complete or partial sets of resulting images can be retrieved using an automated download script.

PILOT Improvements: The PILOT web interface (**Figure 1**) has been enhanced with new features that include (1) a PDS Product ID search box on the homepage, (2) an animated planetary chooser that relays real-time status of the UPC database providing information such as image counts and last-published dates for each instrument, (3) simplified search form for geometry constraints and the bounding box, (4) improved navigation to search results and thumbnail images, (5) upgrades to the navigable map interface that include such features as graticles, a corrected scale bar, and a home button, and (6) additional maps added to the WMS and made visible through the navigable map interface.

Datasets Supported: Currently the UPC provides access to PDS image data for the following missions and instruments:

- Cassini ISS and VIMS
- Clementine UVVIS, NIR, HIRES & LWIR
- Odyssey THEMIS IR
- Mars Reconnaissance Orbiter CTX & HiRISE
- Mars Global Surveyor MOC NA & WA
- Viking Orbiter VIS 1A, 1B; 2A, 2B
- Voyager NAC & WAC

Future: New missions, instruments, and image data will continue to be added to the UPC database to expand PILOT's applications for research and mapping. Web services will be developed to allow users to access the UPC database from their own web applications or standalone tools. Planned improvements to PILOT include feature-based search capabilities, stereo image searches, and additional download formats. The WMS also will provide image and derived layers (e.g., geologic and mineral maps) to facilitate thematic searches for PDS data.

References: [1] Akins, S. et. al., 2009, LPS XL, abs. # 2002. [2] McEwen, A. et al., 2007, JGR 112, E05S02. [3] Robinson, M.S. et al., 2010, Space Sci. Rev, 150, 81-124. [4] Becker, T. et al., 2008, LPS XXXIX, abs. #2357; [5] Wingo, D. et al., 2009, LPS XXXX, abs. #2517; [6] Lawrence, S.J. et al., 2008, NLSI LSC abs. #2066. [7] Akins, S. et. al., 2009, LPSC XL, abs. # 2002.[8] Becker, K. et al., 2005, LPS XXXVI, abs. # 1369. [9] Becker, K. et al., 2007, LPS XXXVIII, abs. # 2031. [10] Archinal, B., et. al., 2010, LPSC XLI, abs. # 2609. [11] Torson, J.M., and Becker, K.J., 1997, LPS XXVIII, #1443. [12] Anderson, J.A. et al., 2004, LPS XXXV, abs. #2039. [13] Anderson, 2008, LPS XXXIX, abs. #2159. [14] see http://openlayers.org/ [15] see http://mapserver.org [16] see http://postgis.refractions.net/ [17] see http://www.opengeospatial.org/

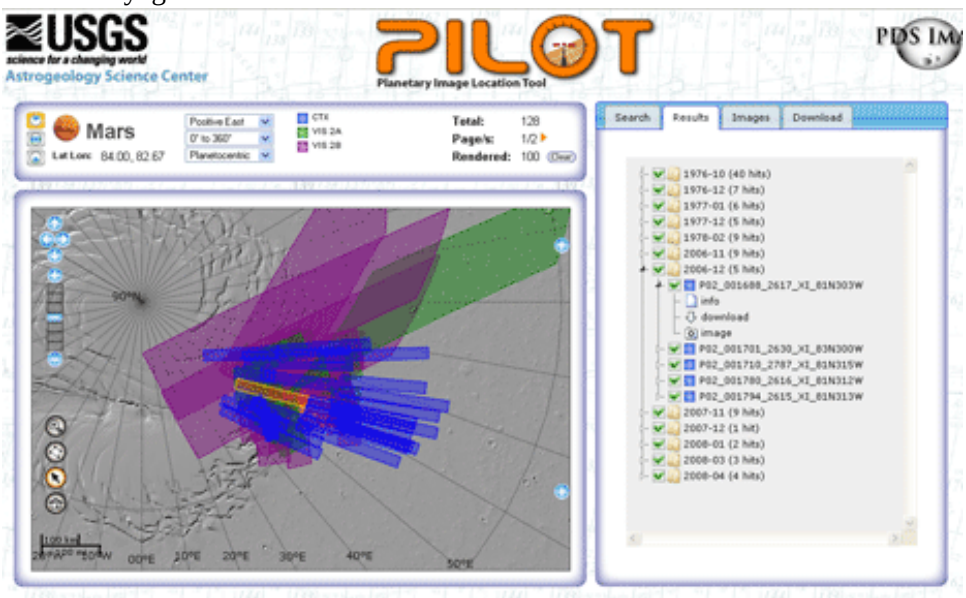

Figure 1. Screenshot of the PILOT search interface showing results (footprints) for an MRO/CTX and Viking search at the North Pole of Mars.