PDS Map-A-Planet Cartographic Web Services: The Latest Updates. P. A. Garcia[1] , C. E. Isbell[1] , J. M. Barrett[1] , and L. R. Gaddis[1], [1]U. S. Geological Survey, 2255 N. Gemini Drive, Flagstaff, Arizona 86001, pgarcia@usgs.gov.

Introduction: The NASA Planetary Data System (PDS) Map-A-Planet Web Service is a Web-based data delivery system (http://www.mapaplanet.org) that serves a variety of digital cartographic map products for several hard-body planets and moons of the Solar System [1-3]. Map-A-Planet (MAP) originated in 1998 [1] as part of the PDS Planetary Image Atlas and initially it served only the Viking Orbiter global mosaic (a Mosaicked Digital Image Model or MDIM, [4, 5]). As the popularity of MAP grew, it was redesigned for increased interoperability and expanded for release as an independent Web site [3]. MAP now serves scientifically accurate planetary global mosaics via a Web interface that allows the user to visually navigate planetary imagery and create customized image maps.

Over time, members of the planetary science community, educators, and others have requested increased functionality of MAP and expansion of the data available. In response to these requests, we continue to add capabilities and to increase the number and types of data sets available to users. Here we describe MAP capabilities and data, and recent updates to both.

Cartographic Products and Data Served: MAP provides access to several diverse and scientifically interesting data sets. The system uses the Mapmaker processing engine and tiled MDIM data to create cartographic image maps of desired targets and regions [5-12]. An MDIM is compiled (typically with funding from the NASA Planetary Cartography Program) from mosaics of spacecraft images that have been geometrically, radiometrically, and photometrically corrected to provide a cartographically accurate and uniform representation of a planetary surface in a Sinusoidal Equal-Area map projection. The planetary bodies currently supported by MAP are Mars, Venus, Mercury, the Earth's Moon, four Galilean satellites (Callisto, Europa, Ganymede, Io), and five moons of Saturn (Rhea, Dione, Tethys, Iapetus, Enceladus).

Enhanced and New Capabilities of MAP:

MapMaker: In 2005-2006 the MAP site was redesigned to provide users with a more modern interface for searching for, selecting and downloading cartographic products [3]. Users can readily create and modify custom image maps of any area of a number of planetary bodies in a variety of resolutions, sizes, map projections, density stretches, and image formats. In 2008-2009 MapMaker was completely overhauled and it now leverages the extensive development efforts invested in the USGS Astrogeology Team's 'freeware' ISIS 2 cartographic processing software ([13-15], http://isis.astrogeology.usgs.gov/Isis2/isis-bin/isis.cgi). The direct link to ISIS 2 software significantly increases both the speed and the number of processing capabilities available for use within MAP. In keeping with modernization of ISIS, a link to the new ISIS 3 software [16] for MAP is also planned.

Output Formats: In addition to JPEG, TIFF, and GIF image formats, MAP now offers users the ability to order maps in 8-bit, 16-bit LSB, or 32-bit LSW, for PDS, RAW and ISIS2 formats. Products are delivered to an ftp address for easy access. Users can now choose between Nearest Neighbor and Bilinear Interpolation methods for resampling map products. The long-awaited implementation of Polar Stereographic map projection in MAP is complete and users can now order maps of all data in that projection.

Derived and User-Defined Products: MAP users can now apply six predefined functions as well as virtually unlimited custom arithmetic operations to the data served. Selected elemental abundance (including three FeO wt% [18-20] derivations and TiO_2 wt% [18]) and two optical maturity (OMAT [20,21]) functions are available for selection when ordering Clementine UVVIS multiband products. The user-defined arithmetic operation function, available through the 'Order' page on MAP, allows users to enter mathematical expressions and operators to be applied to any ordered data set. Examples of such applications include single- band manipulation (e.g., additive and multiplicative corrections as in radiometric calibration) or multi-band functions such as ratios, differences, and more sophisticated capabilities such as spectral curvature, band depths, and band tilt maps [e.g., 22].

New Data: During the last two years we have significantly increased the number of data sets users have access to via Map-A-Planet. Among the more newly added data sets are the Clementine Near Infra-Red 6-Band Mosaic [24], Lunar Orbiter USGS Mosaic [17], Lunar Prospector Elemental Abundance data [23], Mars Global Surveyor (MGS) Thermal Emission Spectrometer (TES) Albedo and Thermal Inertia maps [25], MGS Mars Orbiter Camera (MOC) Wide Angle Mosaic [26], MGS Mars Orbiter Laser Altimeter (MOLA) maps [27], and MDIS/Mariner 10 Global Image Mosaic of Mercury [28].

Summary: The Map-A-Planet cartographic web services now offer an improved functionality and a wider variety of data sets. The development team will

continue to provide increased capabilities and additional high-interest data.

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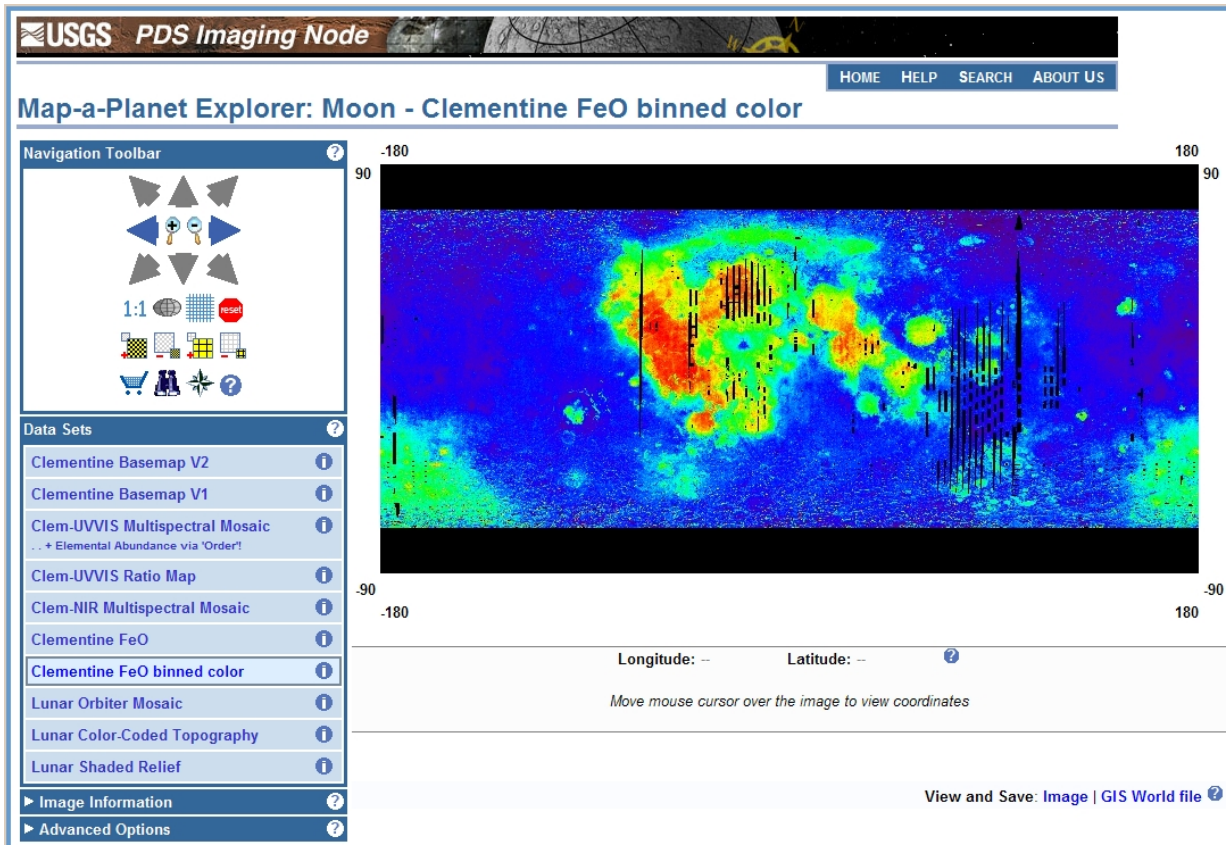

Figure 1. An example of the Map-a-Planet user interface featuring the FeO binned color product [13] for the Moon. This product is created from the Clementine UVVIS multispectral mosaic using MapMaker and ISIS 2 software.