MESSENGER MDIS DATA in the NASA Planetary Data System

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PDS Imaging Node, USGS

March 15, 2015
LPSC MESSENGER MDIS Data Workshop
46th Lunar and Planetary Science Conference 2015
WHAT IS THE PLANETARY DATA SYSTEM (PDS)?

The PDS archives and distributes scientific data from NASA planetary missions, astronomical observations, and laboratory measurements. The PDS is sponsored by NASA's Science Mission Directorate. Its purpose is to ensure the long-term usability of NASA data and to stimulate advanced research.
OVERVIEW

How to find MESSENGER MDIS data in the PDS:

• PDS Home Page, Imaging & Geosciences Data Nodes
• PDS Imaging Node
  • PDS Data Portal, Online Data Volumes
  • PDS Imaging Node Online Data Volumes
  • PDS Planetary Image Atlas
  • PDS Map-A-Planet
  • PDS Planetary Image LOcator Tool (PILOT)
• PDS Geosciences Node
  • Mercury Orbital Data Explorer
Welcome to the PDS Imaging Node

The Imaging Node of the Planetary Data System is the curator of NASA's primary digital image collections from past, present, and future planetary missions. The node provides the NASA planetary science community the digital image archives, necessary ancillary data sets, software tools, and technical expertise necessary to fully utilize the vast collection of digital planetary imagery. For a guide to Imaging Node services download the PDS Imaging Node Tour.

Image of the Week

Mercury Global Coverage

The globe on the left was created from the MDIS monochrome surface morphology base map campaign. The globe on the right was created from the MDIS color base map campaign. Each map is composed of thousands of images, and the color view was created by using 3 of the 8 color filters acquired.

Image Credit: NASA/ Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

Full Image and caption at the Photojournal

Latest News

MESSENGER Release #9
March 9, 2013: MESSENGER ME05 Release #9 is now available via the online data volumes. This release will be updated when the data is available via the Image Atlas. ACT-REACT QuickMap has been added allowing users to explore images and data from MESSENGER’s orbital mission. Once data are specifically available at the PDS, the images are also available to be explored in QuickMap. An online tutorial for using ACT-REACT QuickMap is available at:
http://messeger.actlabs.com/mnr/quickmap.html

Mars Reconnaissance Orbiter (MRO)
HIRISE, CTX & MARCI Release #15
March 1, 2013: The 24th MRO release has occurred for HiRISE, CTX, & MARCI. The data covers volumes 1644-1723 for CTX, and volumes 0523-0541 for MARCI. Data coverage for HiRISE is from Dec, 1, 2012-Feb, 28, 2013, orbits 29400-30059. The data can be accessed via the online data volumes and the Image Atlas for HiRISE, CTX and MARCI.

Mars Science Laboratory (MSL)
Release #1
February 27, 2013: The first MSL EDLs release for Hazcam and Navcam (Solos 0-86) has occurred. The data may be accessed at the online data volumes and via the Image Atlas. The data are accumulating. RDR data is expected to be released on March 20. Release 1 does not include data from the MAHLI, MARLI, or MastCam instruments. Future release dates can be found on the MSL data release calendar. Additional information about MSL can be found at the Imaging Node MSL Mission page.

Mars Exploration Rover (MER) #35
February 25, 2013: The 25th MER release for Solos 2971-3060 has occurred. The data may be accessed at the online data volumes and via the Image Atlas. These data are accumulating.

HRSC Mars Express Release
January 10, 2013: Data for HRSC Mars Express, including HRSC Radiometrically Calibrated Image and HRSC Map. Projected Image data, orbits 10-10821, and HRSC Orthophoto and DTM data, orbits 10-5446, are now available.

http://img.pds.nasa.gov
DATA PORTAL

The PDS Imaging Node Data Portal is a scroll-down list that leads you to the Online Data Volumes, Image Atlas and Mission Documentation

<table>
<thead>
<tr>
<th>Mission</th>
<th>Instrument(s)</th>
<th>Target</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mars Science Laboratory</td>
<td>HAZCAM, NAVCAM, MAHLI, MAORDI, Mastcam</td>
<td>Mars</td>
<td>Atlas Product Search Online Data Volumes</td>
</tr>
<tr>
<td>MESSENGER</td>
<td>MDIS</td>
<td>Mercury/Venus</td>
<td>Atlas Product Search Online Data Volumes Documentation</td>
</tr>
<tr>
<td>Phoenix</td>
<td>SSI, RAC, OM</td>
<td>Mars</td>
<td>Atlas Product Search Online Data Volumes</td>
</tr>
<tr>
<td>Viking Lander</td>
<td>LCS</td>
<td>Mars</td>
<td>Atlas Product Search Online Data Volumes</td>
</tr>
<tr>
<td>Viking Orbiter</td>
<td>VISA, VISB</td>
<td>Mars Deimos/Phobos</td>
<td>Atlas Product Search Online Data Volumes</td>
</tr>
</tbody>
</table>

http://img.pds.nasa.gov/portal/
**This is currently the only way to access DDRs, MDRs, BDRs, MD3s, HIWs, HIEs, and RTMs**

This is a good option if you are familiar with PDS volumes and know exactly what you're looking for.
The full definitions of the various types of data products can be found on each respective volume within the DOCUMENT directory in the related Software Interface Specification (SIS) document.

<table>
<thead>
<tr>
<th>Volume Name</th>
<th>Product Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSGRMDS_1001</td>
<td>EDR – Experiment Data Record</td>
</tr>
<tr>
<td>MSGRMDS_2001</td>
<td>RDR – Reduced Data Record</td>
</tr>
<tr>
<td>MSGRMDS_3001</td>
<td>DDR – Derived Data Record, Image Backplanes</td>
</tr>
<tr>
<td>MSGRMDS_4001</td>
<td>BDR – Basemap Data Record</td>
</tr>
<tr>
<td>MSGRMDS_5001</td>
<td>MDR – Multispectral Data Record</td>
</tr>
<tr>
<td>MSGRMDS_6001</td>
<td>MD3 – 3-Color Multispectral Data Record</td>
</tr>
<tr>
<td>MSGRMDS_7001</td>
<td>HIE – High Solar Incidence Angle Basemap, East Illumination</td>
</tr>
<tr>
<td>MSGRMDS_7101</td>
<td>HIW – High Solar Incidence Angle Basemap, West Illumination</td>
</tr>
<tr>
<td>MSGRMDS_8001</td>
<td>RTM – Regional Targeted Mosaics</td>
</tr>
</tbody>
</table>
ORGANIZATION OF THE DATA ON THE MDIS PDS VOLUMES

The **EDRs** and **CDRs** are organized into subdirectories (within the DATA or CDR directory) containing the EDRs/CDRs for one day of the mission. The directory name is of the form `YYYY_DOY` where `YYYY` is the year, and `DOY` is the day of year. An inclusion of a EDR/CDR in a folder is determined by the UTC time of the start of the exposure.

The **BDRs** and **MDRs** are organized into subdirectories based on the Mercury Chart containing the BDR/MDR. Latitude and longitude limits of Mercury Charts and the corresponding subdirectory names are given in the table below.

<table>
<thead>
<tr>
<th>Quadrangle</th>
<th>Subdirectory name</th>
<th>Latitude (degrees)</th>
<th>Longitude (deg. east)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1 Borealis</td>
<td>H01</td>
<td>65 to 90</td>
<td>0 to 360</td>
</tr>
<tr>
<td>H-2 Victoria</td>
<td>H02</td>
<td>22.5 to 65</td>
<td>270 to 360</td>
</tr>
<tr>
<td>H-3 Shakespeare</td>
<td>H03</td>
<td>22.5 to 65</td>
<td>180 to 270</td>
</tr>
<tr>
<td>H-4 Liguria</td>
<td>H04</td>
<td>22.5 to 65</td>
<td>90 to 180</td>
</tr>
<tr>
<td>H-5 Apollonia</td>
<td>H05</td>
<td>22.5 to 65</td>
<td>0 to 90</td>
</tr>
<tr>
<td>H-6 Kuiper</td>
<td>H06</td>
<td>-22.5 to 22.5</td>
<td>288 to 360</td>
</tr>
<tr>
<td>H-7 Beethoven</td>
<td>H07</td>
<td>-22.5 to 22.5</td>
<td>216 to 288</td>
</tr>
<tr>
<td>H-8 Tolstoj</td>
<td>H08</td>
<td>-22.5 to 22.5</td>
<td>144 to 216</td>
</tr>
<tr>
<td>H-9 Solitudo Criophori</td>
<td>H09</td>
<td>-22.5 to 22.5</td>
<td>72 to 144</td>
</tr>
<tr>
<td>H-10 Pieria</td>
<td>H10</td>
<td>-22.5 to 22.5</td>
<td>0 to 72</td>
</tr>
<tr>
<td>H-11 Discovery</td>
<td>H11</td>
<td>-65 to -22.5</td>
<td>270 to 360</td>
</tr>
<tr>
<td>H-12 Michelangelo</td>
<td>H12</td>
<td>-65 to -22.5</td>
<td>180 to 270</td>
</tr>
<tr>
<td>H-13 Solitudo Persephones</td>
<td>H13</td>
<td>-65 to -22.5</td>
<td>90 to 180</td>
</tr>
<tr>
<td>H-14 Cyllene</td>
<td>H14</td>
<td>-65 to -22.5</td>
<td>0 to 90</td>
</tr>
<tr>
<td>H-15 Bach</td>
<td>H15</td>
<td>-90 to -65</td>
<td>0 to 360</td>
</tr>
</tbody>
</table>
PDS PLANETARY IMAGE ATLAS

http://pds-imaging.jpl.nasa.gov/search/
Product Search – Finding MDIS
PDS PLANETARY IMAGE ATLAS

Searching on Geometry Parameters

Planetary Image Atlas

Current Selection
- remove all
- ATLAS_MISSION_NAME=messenger
- ATLAS_INSTRUMENT_NAME=m01
- TARGET_NAME=mercury
- PRODUCT_TYPE=aw

Search
- Mission
- Instrument
- Target
- Product Type
- Lighting Geometry
- Filters
- Lat/Lon Bounding Box
- Time Constraints

Atmosphere Parameters
- Solar Azimuth (0 to 360 deg)
  - 250
- Solar Distance (0 to 1,000,000 km)
  - 1,000,000
- Solar Longitudes (< 0 to 360 deg)
  - -45
- Suncom Altitude (0 to 1,000,000 km)
  - 1,000,000

Results Per Page: 1 of 24 of 187509
PDS PLANETARY IMAGE ATLAS

Searching on Lighting Geometry
PDS PLANETARY IMAGE ATLAS

Searching on Time Parameters
PDS Planetary Image Atlas
Searching By File Name or Product ID
PDS PLANETARY IMAGE ATLAS

Create a Report or View Thumbnail
Getting Multiple Results: Download via Zip or Wget

```bash
```
Map-A-Planet provides access to the MESSENGER/Mariner 10 Global Mosaic

http://www.mapaplanet.org
PDS MAP-A-PLANET

Map-A-Planet allows Pan and Zoom, Ordering, and other functions.
PDS MAP-A-PLANET
Order your area of interest

Map-a-Planet Explorer: Mercury - Messenger MDIS/Mariner10 Mosaic

Navigation Toolbar

Image Information

Advanced Options

Make changes to image parameters below and click the Submit Changes button below.

Image size: 361 x 360
Resolution: 615384 x 517161 pixels
Scale: 9.22697 km/px
Projection: Simple Cylindrical
Grid: No Grid
Stretch: Auto

Longitude: --
Latitude: --

Move mouse cursor over the image to view coordinates

View and Save: Image | GIS World file

Preserve science integrity? See FAQ or Order page note regarding stretch options.
PDS MAP-A-PLANET

Orders can be placed in multiple formats, and options

Note: If you wish to preserve the scientific integrity of the data pixel values (PDS, ISIS, or RAW formats only), select Stretch="None" under "Advanced Options" when ordering.
PDS MAP-A-PLANET

Confirm and Order your data product. Email notification will be sent to you.

**MAP-A-PLANET ORDER CONFIRMATION**

Your custom image map order is shown below, please review and confirm your information. You MUST click on "SEND ORDER" if you wish to complete your order.

<table>
<thead>
<tr>
<th>REQUESTER TIME</th>
<th>&quot;2013-03-14T13:51:42&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQUESTER NAME</td>
<td>&quot;Lisa Goddi&quot;</td>
</tr>
<tr>
<td>REQUESTER AFFILIATION</td>
<td>&quot;USGS&quot;</td>
</tr>
<tr>
<td>REQUESTER EMAIL</td>
<td>&quot;<a href="mailto:lgoddi@usgs.gov">lgoddi@usgs.gov</a>&quot;</td>
</tr>
</tbody>
</table>

| Data Set Requested   | "m03_m123m10"          |
| Bands Selected       | "1,1,1"                |
| Custom Equation      | "NONE"                 |
| Function Type Requested| ""                    |
| Pixel type           | "DEFAULT"              |
| Resolution (pixels/degree) | "461598461598461" |
| Positive longitude   | "0.0"                  |
| Format               | "PNG"                  |
| Projections          | "SIMPLE_CYLINDRICAL"   |
| West longitude       | "266"                  |
| East longitude       | "-266"                 |
| North latitude       | "31.96"                |
| South latitude       | "46.86"                |
| Center longitude     | "0.0"                  |
| Grid Line Frequency  | "None"                 |
| Resample Method      | "nearest_neighbor"     |
| Tension Stretch Type | "auto"                 |
| World File Created   | "NO"                   |

Return to the Map-a-Planet Homepage

Map-a-Planet Version 1.0
Web Page Curator: Patty Garcia
Development Team
Choose Mercury (for EDRs Only):
PLANEETARY IMAGE LOCATOR TOOL

Select MESSENGER Images (NAC, WAC or Both)

<table>
<thead>
<tr>
<th>Image Source</th>
<th>Data Set</th>
<th>Mapped</th>
<th>Unmapped</th>
</tr>
</thead>
<tbody>
<tr>
<td>MESSENGER</td>
<td>NAC</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>MESSENGER</td>
<td>WAC</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

**SEARCH TIPS**

1. Enable the search button by selecting one or more image sets on the Missions tab.
2. Mapped images have latitude coordinates and photometric keywords.
3. Unmapped images have incomplete data. The images may be processed because of improper labels or spacecraft information. LatLon and photometric keywords may not be available. NOTE: although the sets cannot be unmapped, they still may contain quality imagery.
4. Use the Map tab to limit your search by creating a bounding box (optional). After you perform a search, the map tab will allow you to view footprints for mapped imagery.
5. Use the Advanced tab to limit your search by setting ranges for dates and photometric keywords (optional).
6. When you are ready to search, click the search button. If you refine your search, you must re-click the search button.
7. The Total will show up above. Results will show up in this panel. If your result set is greater than 50,000 images, you will only receive a total.
8. Click on action buttons to investigate images. Use checkboxes to select images.
9. To download selected images, check the arrow button in the Select box (upper right).
PLANETARY IMAGE LOCATOR TOOL

Initiate the search:
Planetary Image Locator Tool
Identify your area of interest
PLANETARY IMAGE LOCATOR TOOL

Use individual controls to display footprint, info, or to download:
PLANETARY IMAGE LOCATOR TOOL

Advanced Search Options are also available:
PLANETARY IMAGE LOCATOR TOOL

Select Images and Download Options

PILOT

Download or Process
- Download GIF file
- Download BASH script with usage calls
- Projection on the Web (POW)

Gal
The PILOT WGET Script can be used to download your selected images.

```bash
USAGE="USAGE: upgrsh -t TARGET_DIR"
while [ $# -ge 1 ]; do
case $1 in
t) shift; $TARGET=$1 ;;
=) echo $USAGE; exit 1 ;;
esac
shift
done

CURRENTDIR=`pwd`
if [ "$TARGET" != "" ]; then
cd $TARGET
fi

wget -nd http://pdsimage.wr.usgs.gov/Missions/MESSENGER/MSGRMDS_1001/DATA/2012_102/EN0242632883M.IMG
wget -nd http://pdsimage.wr.usgs.gov/Missions/MESSENGER/MSGRMDS_1001/DATA/2012_199/EN0250966598M.IMG
wget -nd http://pdsimage.wr.usgs.gov/Missions/MESSENGER/MSGRMDS_1001/DATA/2012_201/EN0251116759M.IMG
wget -nd http://pdsimage.wr.usgs.gov/Missions/MESSENGER/MSGRMDS_1001/DATA/2012_221/EN0252928369M.IMG
wget -nd http://pdsimage.wr.usgs.gov/Missions/MESSENGER/MSGRMDS_1001/DATA/2012_222/EN0252985836M.IMG
wget -nd http://pdsimage.wr.usgs.gov/Missions/MESSENGER/MSGRMDS_1001/DATA/2012_222/EN0252985892M.IMG
wget -nd http://pdsimage.wr.usgs.gov/Missions/MESSENGER/MSGRMDS_1001/DATA/2012_222/EN0253014691M.IMG
wget -nd http://pdsimage.wr.usgs.gov/Missions/MESSENGER/MSGRMDS_1001/DATA/2012_222/EN0253014695M.IMG
```
Beginning Your Search: Select Data Product Search, Data Set Browser, Map Search, etc.

http://ode.rsl.wustl.edu/mercury/index.aspx
Beginning Your Search: Select Data Set, Location, Feature, etc.
MERCURY ORBITAL DATA EXPLORER

Preview Your Results or Submit Query

STEP 1. SELECT DATA SETS TO SEARCH (A SELECTION IS REQUIRED)
- Select One or More Desired Data Sets (Released PDS Archives)
  (Show Options - 1 Parameter Set)

STEP 2. SET ADDITIONAL FILTERING PARAMETERS (OPTIONAL)
- Select a Product ID or filter by a partial Product ID
  (Show Options - 0 Parameters Set)
- Find by Product Location
  (Show Options - 0 Parameters Set)
- Filter by Time Range
  (Hide Options - 2 Parameters Set)

Select Desired Time Range: Enter a single value or a range.
Example Range:
- Observation Time (UTC): 2012-03-01 to 2012-03-02
- Observation Time (UTC): 1999-02-28T00:00:00.000 to 2012-05-21T17:03:36.000
- Creation Date (UTC): 2007-05-24T12:59:59

STEP 3. PREVIEW SEARCH RESULTS SUMMARY (OPTIONAL)
- Preview Search Results Summary

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Search Results Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>MESSENGER MDIS-NAC CDRNAC</td>
<td>874</td>
</tr>
<tr>
<td>Total Products Found</td>
<td>874</td>
</tr>
</tbody>
</table>

STEP 4. SUBMIT QUERY
- View Results in Table
- Select Results on Map Display
- Display Product Thumbnails on search results page

PDS Imaging Node
U.S. Geological Survey Jet Propulsion Laboratory

46th LPSC MESSENGER Data Workshop 34
MERCURY ORBITAL DATA EXPLORER

Viewing Your Results, More Information
MERCURY ORBITAL DATA EXPLORER

Results can be viewed on Map
Data Set Browser: Find data by Data Set ID and Volume

MERCURY DATA SET BROWSER

Planetary science data stored in PDS is organized by data sets. A data set is a collection of related data products, usually products acquired by a particular instrument and processed in a certain way. The data set also includes all documentation and supporting materials needed to understand and use the data products.

The Data Set Browser allows the user to view data set contents that are currently cataloged in the ODE system. Expand the data set tree to view the contents of the available data sets.

Top Level Mission
Start MESSENGER

- Instrument
  - GRS
  - MASCS
  - MDIS-NAC
  - MDIS-WAC
  - MDIS-WAC/NAC
  - MLA
  - NS
  - RSS
  - XRS
Requesting Your Files, Creating a Mini-Archive

**STEP 2. DO YOU WISH TO ADD ADDITIONAL DATA SET FILES TO THE CART? - CREATE MINI-ARCHIVE**

The Mini-Archive option will add all related files from the PDS Archive including: documentation, software, errata, extras, catalogs, indexes, and the browse images of any products selected for download.

<table>
<thead>
<tr>
<th>Download Options:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected Products (label, data product, and browse images)</td>
</tr>
<tr>
<td>Selected Products’ Derived Files (map projected, etc.)</td>
</tr>
<tr>
<td>Mini-Archive Files (related files from the PDS Archive including: documentation, software, errata, extras, catalogs, and indexes)</td>
</tr>
</tbody>
</table>

* Your cart selections include externally hosted files, which may take the Geosciences Node longer to acquire and organize for your download.

**IF YOU REQUIRE THE FILES IMMEDIATELY:** Expand the product list above, and check “Display Individual Files of the Products.” Then click the individual product files to directly download them from the source.

**STEP 3. REVIEW SELECTIONS AND PROCEED TO CHECKOUT**

When you are content with your selection of products and individual files, proceed by clicking the continue button.

*Continue >*
Choose a Format, Enter E-mail Address, Submit Request

Details for acquiring the selected data files:
1. The Geosciences Node will retrieve the files you have requested and place them in a user specific FTP folder for your download. After the completion and submission of this form, an automated system will prepare the FTP site for you to download the selected files from. You will receive an email when the files are ready for download. The email will include the FTP address and username.

Select formats:
- Zip
- Tar
- Tar.Gz
- No Compression

Terms and Conditions
PDS data products and data set files are freely available to the public.

Policy for Citations of PDS Data [click here for a new window]

Your email: lgaddis@usgs.gov
(You will be notified at this email address when the files are ready for download.)

Submit Request
Please only click this button once. Multiple clicks may result in problems with your request.
MERCURY ORBITAL DATA EXPLORER

You will receive email with instructions for accessing your data:

The files that you have requested from the PDS Geosciences Node have been placed in an FTP folder for you.

Your requested files are located at the following FTP address:  
ftp://geoftp.wustl.edu/20130308T154642942  
Username: geoftp  
Password: Odeuser1

The files will remain on the FTP site for 7 days. If you experience problems with our FTP site, contact  
odewebmaster@wunder.wustl.edu

PDS Geosciences Node  
Washington University in St. Louis
QUESTIONS?
Important URLs

PDS Imaging Node:  http://img.pds.nasa.gov/
PDS Data Portal:   http://img.pds.nasa.gov/portal/
PDS IN Online Volumes:  http://img.pds.nasa.gov/volumes/mess.html
PDS Planetary Image Atlas:
  http://pds-imaging.jpl.nasa.gov/search/
PDS PILOT:      http://pilot.wr.usgs.gov/
Geosciences Orbital Data Explorer:
  http://ode.rsl.wustl.edu/mercury/index.aspx
PDS Map-A-Planet: http://www.mapaplanet.org
For More Information, Contact Us

Lisa Gaddis – lgaddis@usgs.gov
Patty Garcia – pgarcia@usgs.gov

Thank You!