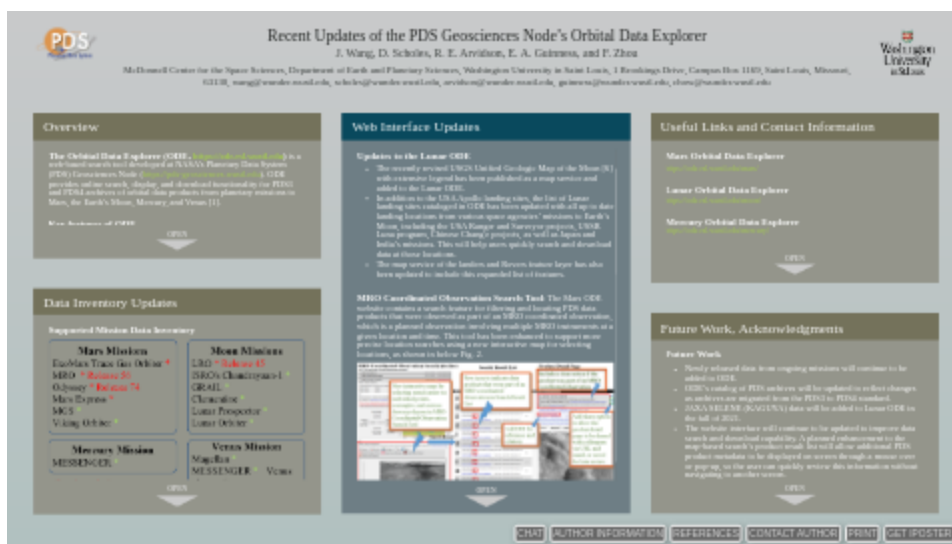


Recent Updates of the PDS Geosciences Node's Orbital Data Explorer



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PRESENTED AT:



OVERVIEW

The Orbital Data Explorer (ODE, <https://ode.rsl.wustl.edu> (<https://ode.rsl.wustl.edu>)) is a web-based search tool developed at NASA's Planetary Data System (PDS) Geosciences Node (<https://pds-geosciences.wustl.edu> (<https://pds-geosciences.wustl.edu>)). ODE provides online search, display, and download functionality for PDS3 and PDS4 archives of orbital data products from planetary missions to Mars, the Earth's Moon, Mercury, and Venus [1].

Key features of ODE

- provides form- and map-based searching across multiple missions and instruments [2], product browsing, and a cart system with a high-speed download option of using Aspera Connect ([3])
- supports specialized granular query tools for subsetting science data at specified regions using MGS (Mars Global Surveyor) MOLA (Mars Orbiter Laser Altimeter) PEDR, LRO (Lunar Reconnaissance Orbiter) LOLA (Lunar Orbiter Laser Altimeter) RDR, LRO DLRE (Diviner Lunar Radiometer Experiment) RDR, and MESSENGER MLA (Mercury Laser Altimeter) datasets [4]
- generates product type coverage KMZ (zipped file of Keyhole Markup Language, KML) files and shapefiles for use with GIS tools
- provides a Representational State Transfer (REST) interface (<https://oderest.rsl.wustl.edu/>, [5]) allowing external users, scripts, and applications to access the ODE metadata and data products without using ODE web interfaces
- provides a special tool for locating Mars Reconnaissance Orbiter (MRO) and Phoenix coordinated observations in Mars ODE [1]

DATA INVENTORY UPDATES

Supported Mission Data Inventory

Mars Missions

- ExoMars Trace Gas Orbiter *
- MRO * **Release 56**
- Odyssey * **Release 74**
- Mars Express *
- MGS *
- Viking Orbiter *

Moon Missions

- LRO * **Release 45**
- ISRO's Chandrayaan-1 *
- GRAIL *
- Clementine *
- Lunar Prospector *
- Lunar Orbiter *

Mercury Mission

- MESSENGER *

Venus Mission

- Magellan *
- MESSENGER * Venus observations

- * **active missions**
- * **completed missions**

The **ExoMars Trace Gas Orbiter (TGO)** is an ESA and Roscosmos mission to Mars. PDS4 bundles from NOMAD (Nadir and Occultation for MArs Discovery) and CaSSIS (Colour and Stereo Surface Imaging System) instruments of TGO missions have been loaded into ODE this February, including data released through February 17, 2021. Below is an example of searching the TGO NOMAD data in Mars ODE.

The screenshot displays the Mars ODE search interface. On the left, there is a sidebar with filters for 'ExoMars Trace Gas Orbiter' and 'NOMAD - Nadir and Occultation for MArs Discovery'. The main area shows search results for 'NOMAD Calibrated Science Data' with columns for 'Sort Order', 'Observation Time/Mission/In', and 'Sort'. A 'Search Result' arrow points to the first result. On the right, a detailed view of a product is shown, including a plot of 'Temperature (K)' versus 'Measurement (s)'.

Fig. 1 Search NOMAD Calibrated Science Data through Mars ODE

ODE is continually updated for

- active missions as new and accumulating datasets are released by PDS

- PDS4 migrated data
- derived data from individual data providers, including

Mercury space weathering maps,
Magellan stereo-derived topography mosaics,
MESSENGER advanced products from MASCS, GRS, and NS

WEB INTERFACE UPDATES

Updates to the Lunar ODE

- The recently revised USGS Unified Geologic Map of the Moon [6] with extensive legend has been published as a map service and added to the Lunar ODE.
- In addition to the USA Apollo landing sites, the list of Lunar landing sites cataloged in ODE has been updated with all up to date landing locations from various space agencies' missions to Earth's Moon, including the USA Ranger and Surveyor projects, USSR Luna program, Chinese Chang'e projects, as well as Japan and India's missions. This will help users quickly search and download data at those locations.
- The map service of the landers and Rovers feature layer has also been updated to include this expanded list of features.

MRO Coordinated Observation Search Tool: The Mars ODE website contains a search feature for filtering and locating PDS data products that were observed as part of an MRO coordinated observation, which is a planned observation involving multiple MRO instruments at a given location and time. This tool has been enhanced to support more precise location searches using a new interactive map for selecting locations, as shown in below Fig. 2.



Figure 2. Enhanced MRO Coordinated Observation Search Tool, displaying an example MRO CTX EDR product.

Product Search: Both the form-based and map-based product search have been updated to include individual point search as an addition to the existing interactive map search options of rectangles and custom polygons. Fig. 3 is an example of point search in Jezero Crater near the Mars 2020 Perseverance Rover landing site.

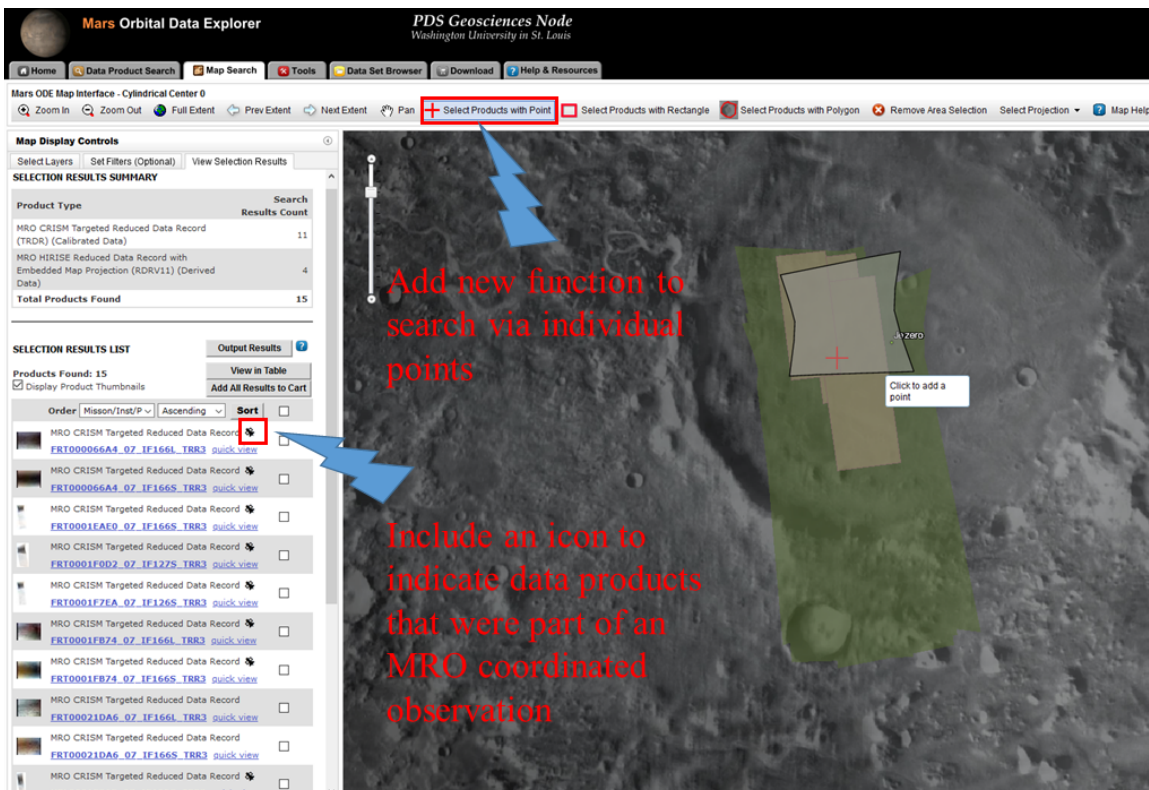


Figure 3. Point search in Jezero Crater near the Mars 2020 Perseverance Rover landing site, displaying CRISM Map-Projected TRDR and HiRISE RDR search results.

ODE Footprint Coverage Explorer: ODE generates product type coverage files in shapefile and KMZ formats for map projected PDS data products that are cataloged in ODE. A new footprint coverage explorer page (e.g., Fig. 4) has been created to better assist users in locating desired coverage shapefiles and KMZs grouped by mission, instrument, processing level, and product type, similar to the form-based product search. The new page provides access to coverage files, along with descriptive content information, file details, product type information, and general help for using the files.

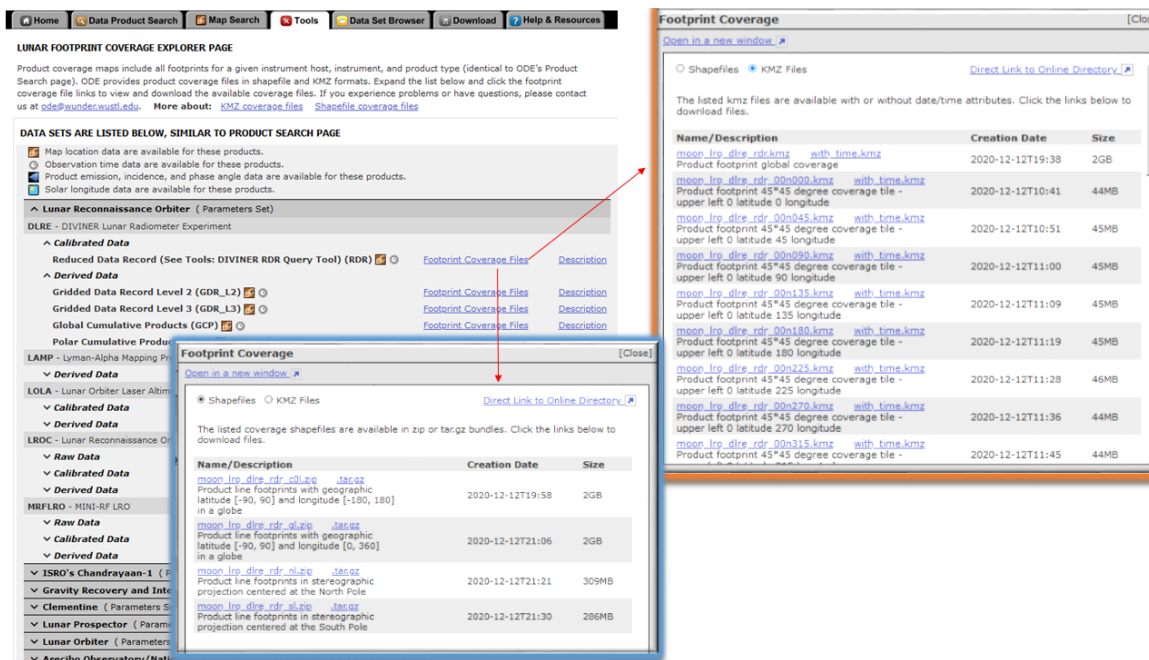


Figure 4. The new footprint coverage explorer page, displaying available LRO DIVINER GDR coverage files.

USEFUL LINKS AND CONTACT INFORMATION

Mars Orbital Data Explorer

<https://ode.rsl.wustl.edu/mars/> (<https://ode.rsl.wustl.edu/mars/>)

Lunar Orbital Data Explorer

<https://ode.rsl.wustl.edu/moon/> (<https://ode.rsl.wustl.edu/moon/>)

Mercury Orbital Data Explorer

<https://ode.rsl.wustl.edu/mercury/> (<https://ode.rsl.wustl.edu/mercury/>)

Venus Orbital Data Explorer

<https://ode.rsl.wustl.edu/Venus/> (<https://ode.rsl.wustl.edu/Venus/>)

ODE User's Manual

<https://ode.rsl.wustl.edu/mars/pagehelp/quickstartguide/index.html> (<https://ode.rsl.wustl.edu/mars/pagehelp/quickstartguide/index.html>)

PDS Geosciences Node

<https://pds-geosciences.wustl.edu/> (<https://pds-geosciences.wustl.edu/>)

PDS Geosciences Node forum

<https://geoweb.rsl.wustl.edu/community/> (<https://geoweb.rsl.wustl.edu/community/>)

User feedback is welcomed to help plan additional enhancements. Specific questions and comments about ODE can be sent to ode@wunder.wustl.edu.

FUTURE WORK, ACKNOWLEDGMENTS

Future Work

- Newly released data from ongoing missions will continue to be added to ODE.
- ODE's catalog of PDS archives will be updated to reflect changes as archives are migrated from the PDS3 to PDS4 standard.
- JAXA SELENE (KAGUYA) data will be added to Lunar ODE in the fall of 2021.
- The website interface will continue to be updated to improve data search and download capability. A planned enhancement to the map-based search's product result list will allow additional PDS product metadata to be displayed on screen through a mouse over or pop-up, so the user can quickly review this information without navigating to another screen.
- Feedback from the community is valued and always encouraged; comments from users can help identify useful future improvements and feature additions.

Acknowledgments

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- [5] Bennett, K. et al. (2014), 45th LPS, Abstract #1026.
- [6] Fortezzo, C.M., et al. (2020), 51st LPS, Abstract #2760.