



PDS TOOLS AND SERVICES: WHAT'S NEW

JORDAN PADAMS, GALEN HOLLINS, DAN CRICHTON, EMILY LAW,
STEVE HUGHES, MICHAEL CAYANAN, JAMES HOFMAN, SEAN KELLY

PDS ENGINEERING NODE
JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY

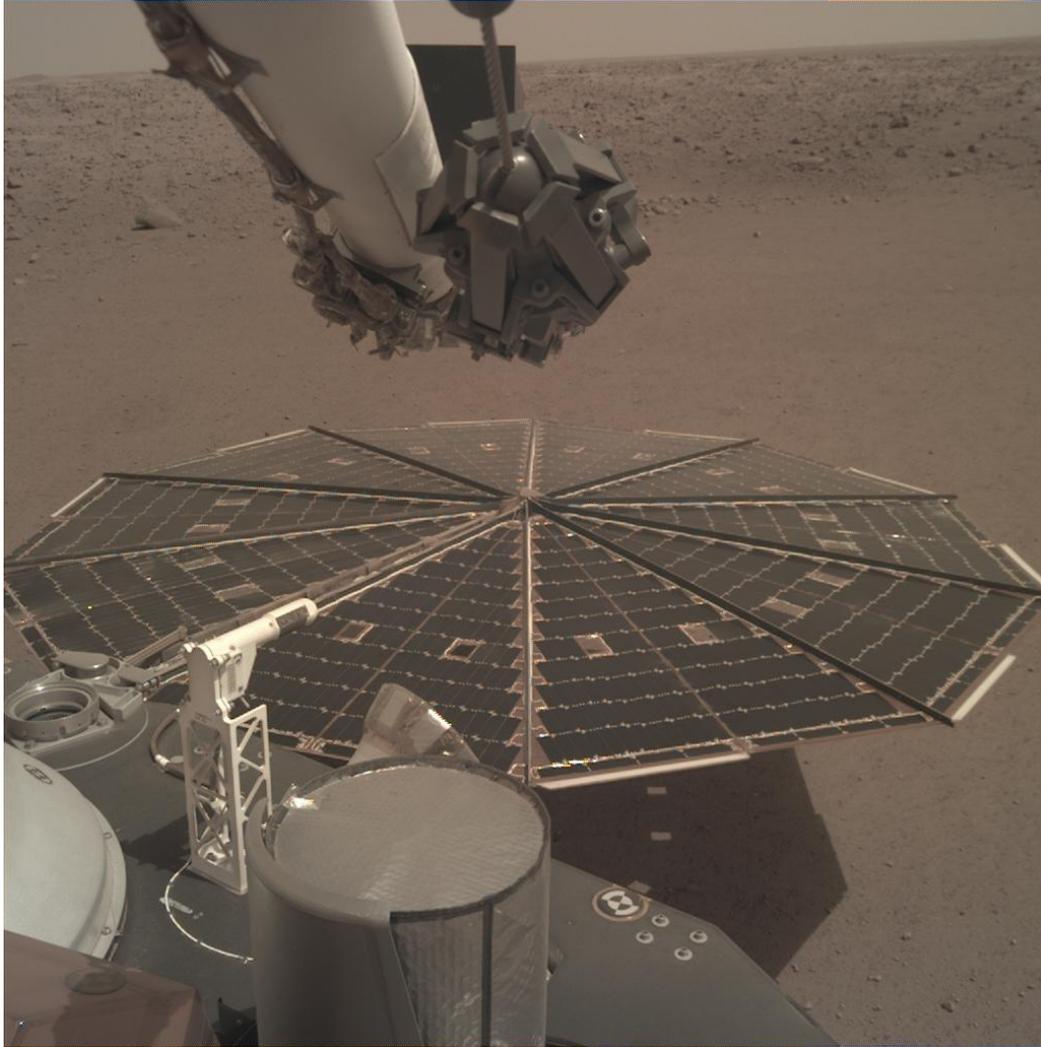
IMPROVING ACCESSIBILITY AND USABILITY OF DATA

Transform Tool

- Command-line tool with ability to *transform* PDS3 and PDS4 product labels and product data into common formats
- Supports >50 transformations
- Complete list of transformations, installation, and operations guides at:
 - <https://go.nasa.gov/2WCUWTs>
- Email pds_operator@jpl.nasa.gov with new transformation suggestions

EXAMPLE: PDS4 ARRAY 3D TO JPEG

```
./transform ../../D004L0010_597413863EDR_F0002_0080M2.xml -f jpg
```



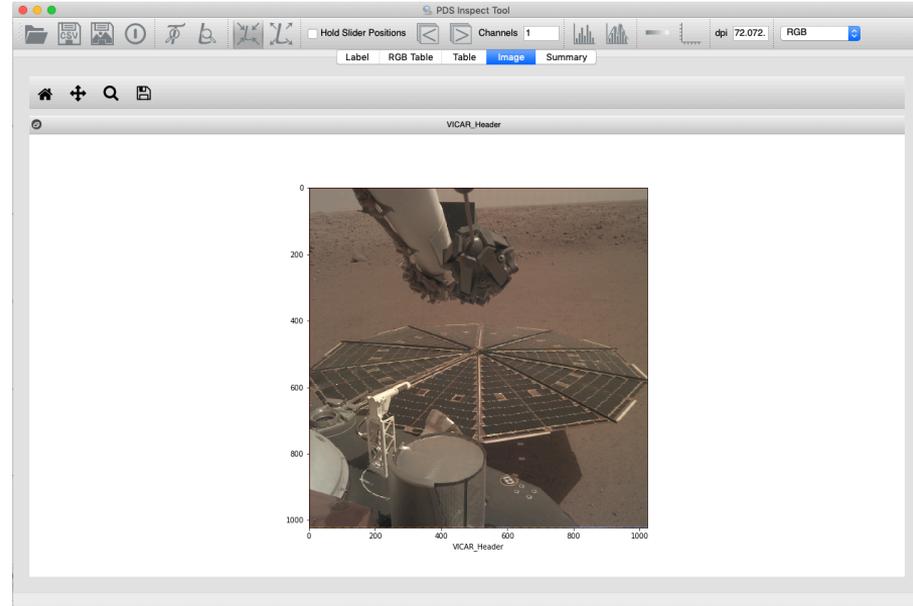
Data products used to generate these images
courtesy of Planetary Data System Cartography
and Imaging Sciences Node.

https://pds-imaging.jpl.nasa.gov/data/nsyt/insight_cameras/data/sol/0010/mipl/edr/idc/D004L0010_597413863EDR_F0002_0080M2.xml

https://pds-imaging.jpl.nasa.gov/data/nsyt/insight_cameras/data/sol/0010/mipl/edr/idc/D004L0010_597413863EDR_F0002_0080M2.VIC

PDS View

- Tool for visualizing PDS3 and PDS4 data products
 - Native application that works for:
 - Mac OS
 - Windows
 - Linux
- Eventual replacement for NASAView
- Beta release ready for use
 - <https://github.com/NASA-PDS-Incubator/pds-view/releases/latest>
- Open sourced and on Github
 - <https://github.com/NASA-PDS-Incubator/pds-view>
- Leverages SBN Python PDS4 Tools library
 - https://github.com/Small-Bodies-Node/pds4_tools



InSight IDC Raw Image

Inspect Tool

Hold Slider Positions

Band

Label RGB Table Table Image Summary

Data Structure Summary for /Users/padams/Downloads/D004L0010_597413863EDR_F0002_0080M2.xml

Name	Type	Dimension	Select
VICAR_Header	Header	---	View
d004i0010_597413863edr_f0002_0080m	Array_3D_Image	3 X 1024 X ...	View

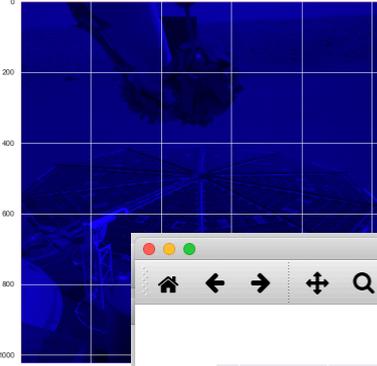
PDS Inspect Tool

Hold Slider Positions

Channels 2

Label RGB Table Table Image Summary

VICAR_Header



0
200
400
600
800
1000

PDS Inspect Tool

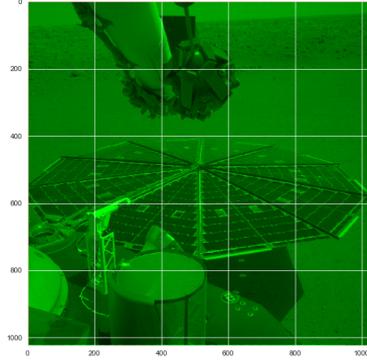
Hold Slider Positions

Channels 3

Label RGB Table Table Image Summary

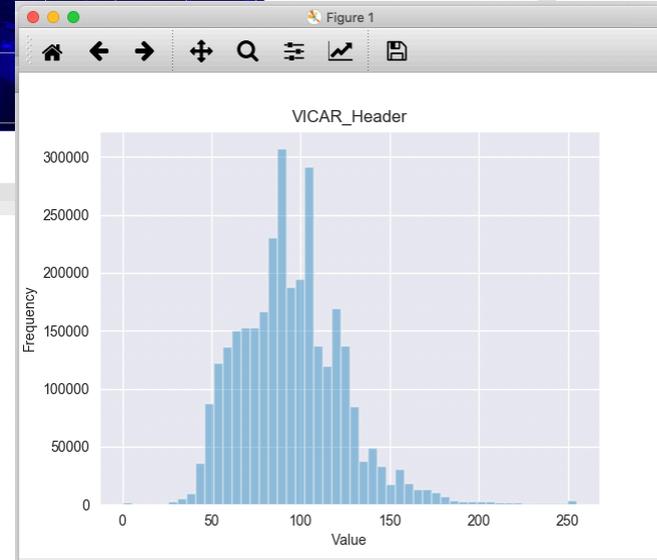
x=610.321 y=51.8298 [0, 159, 0]

VICAR_Header



0
200
400
600
800
1000

0 200 400 VICAR_Header 600 800 1000



Data products used to generate these images courtesy of Planetary Data System Cartography and Imaging Sciences Node.
https://pds-imaging.jpl.nasa.gov/data/nsyt/insight_cameras/data/sol/0010/mipl/edr/idc/D004L0010_597413863EDR_F0002_0080M2.xml
https://pds-imaging.jpl.nasa.gov/data/nsyt/insight_cameras/data/sol/0010/mipl/edr/idc/D004L0010_597413863EDR_F0002_0080M2.VIC

The image displays the PDS Inspect Tool interface. The top-left pane shows a 'Data Structure Summary for /Users/padams/Downloads/twins_rawevent_0092_01.xml'. It lists a 'TABLE' of type 'Table_Delimited' with 63 columns. The top-right pane shows the 'Table_Delimited' metadata, including the name 'APPS TWINS Raw Data', local identifier 'TABLE', offset '907', and parsing standard 'PDS DSV 1'. The bottom pane shows a detailed view of the table with 12 columns and 21 rows of data.

	1	2	3	4	5	6	7	8	9	10	11	12
1	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:11	2019-06TO...	-7007	-6952	-6816	-7503	0	0	-6945
2	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:12	2019-06TO...	-7016	-6947	-6816	-7506	0	0	-6944
3	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:13	2019-06TO...	-7036	-6963	-6823	-7512	0	0	-6959
4	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:14	2019-06TO...	-7031	-6954	-6830	-7504	0	0	-6942
5	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:15	2019-06TO...	-7025	-6961	-6827	-7508	0	0	-6950
6	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:16	2019-06TO...	-7029	-6954	-6823	-7479	0	0	-6944
7	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:17	2019-06TO...	-7019	-6958	-6820	-7483	0	0	-6951
8	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:18	2019-06TO...	-7013	-6949	-6808	-7467	0	0	-6937
9	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:18	2019-06TO...	-7023	-6969	-6820	-7473	0	0	-6946
10	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:19	2019-06TO...	-7032	-6962	-6822	-7484	0	0	-6945
11	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:20	2019-06TO...	-7029	-6963	-6815	-7473	0	0	-6948
12	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:21	2019-06TO...	-7015	-6948	-6823	-7472	0	0	-6959
13	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:22	2019-06TO...	-7024	-6957	-6812	-7472	0	0	-6942
14	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:23	2019-06TO...	-7015	-6926	-6798	-7452	0	0	-6934
15	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:24	2019-06TO...	-7013	-6942	-6817	-7471	0	0	-6942
16	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:25	2019-06TO...	-7029	-6943	-6798	-7442	0	0	-6954
17	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:26	2019-06TO...	-6992	-6920	-6775	-7432	0	0	-6932
18	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:27	2019-06TO...	-7002	-6922	-6785	-7431	0	0	-6910
19	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:28	2019-06TO...	-7004	-6940	-6809	-7435	0	0	-6938
20	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:29	2019-06TO...	-7014	-6934	-6814	-7449	0	0	-6933
21	6.04684e+08	6.04684e+08	00092M09.3...	00092 08:45:30	2019-06TO...	-6995	-6945	-6809	-7438	0	0	-6927

InSight APPS TWINS Raw Event Data

Other PDS Tools and Services

- Tools

- Ingest
 - Harvest Tool
 - Catalog Tool
- Preparation
 - LDD Tool
 - Generate Tool
 - Transform Tool
 - Validate Tool
 - PDS View
 - PLAID
 - Core and PDS4 Tools Libraries

- Services

- Registry/Search
 - Includes support for Tool and Data Dictionary content
- Transport
 - Backward compatible with the PDS-D Product Server

Latest Release Online:
<https://go.nasa.gov/2WKBsft>



ENGINEERING NODE OPEN SOURCE INITIATIVE

Renewed focus on open sourcing software for the community

- Some of the Tools / Services available on Github:
 - PDS View
 - Validate Tool
 - Registry Service
 - PDS Label Assistant for Interactive Design (PLAID)
 - OPUS
 - Archive Manager And Processor (AMP) Environment
 - PDS4 Migration Helper Tools
 - PDS4 Tools (Python)
 - PDS4 Tools (Java)
- Github Orgs:
 - All PDS
 - Operational - <https://github.com/NASA-PDS>
 - In Dev - <https://github.com/NASA-PDS-Incubator>
 - Small Bodies Node
 - <https://github.com/sbn-psi>
 - <https://github.com/Small-Bodies-Node>
 - Rings Node - <https://github.com/SETI>
 - AMP - <https://github.com/archive-manager-and-processor/>

COMING SOON...

ENABLING DATA DISCOVERY

What is the Registry?

- **Registry Service** provides capability for *tracking, auditing, locating, and maintaining artifacts* within the system.
- **Registry Search** provides functionality to *search* for and *retrieve* registered products through defined search APIs
- Artifacts - can range from data files and label files, schemas, dictionary definitions for objects and elements, services, etc.

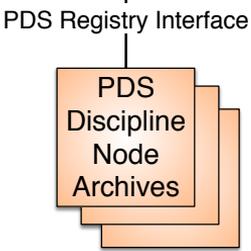
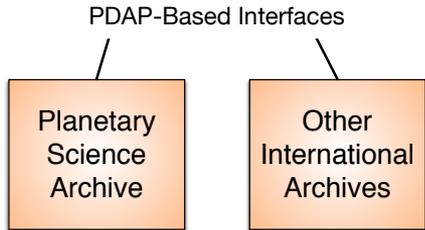
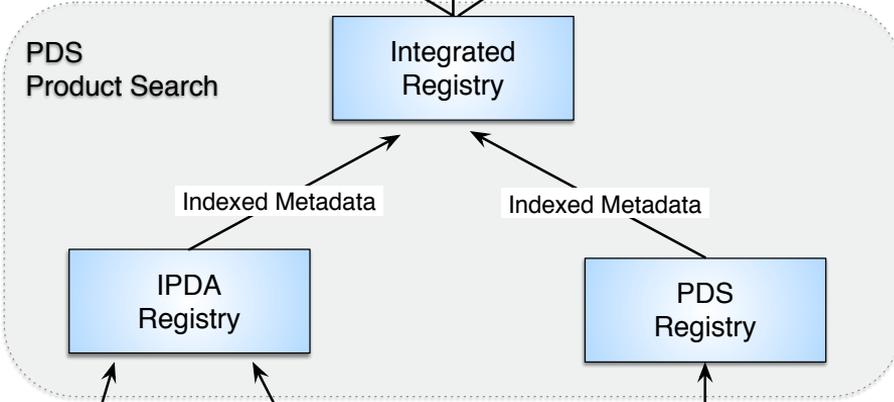
A searchable inventory of archive products.

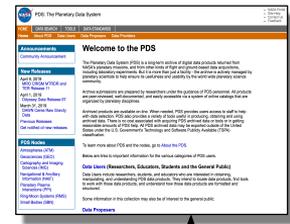
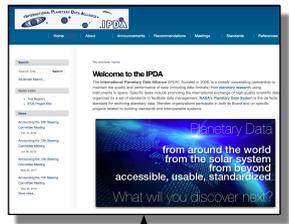
- Enhanced APIs and documentation for accessing PDS4 data across ***entire PDS and international archives***
- Enables ***simplified programmatic access*** to all PDS4 archival data
 - PDS Search Protocol
 - Protocol Docs: <https://planetarydata.org/projects/active-projects/registration-and-search/pds-search-protocol/pds-search-protocol/view>
 - REST endpoint: <https://pds.nasa.gov/services/search/search/>
 - PDAP Search Protocol
 - Protocol Docs: <https://planetarydata.org/projects/active-projects/registration-and-search/pds-search-protocol/pds-pdap-search-protocol/view>
 - REST endpoint: <https://pds.nasa.gov/services/search/pdap/>



Other Search
Portals /
Applications

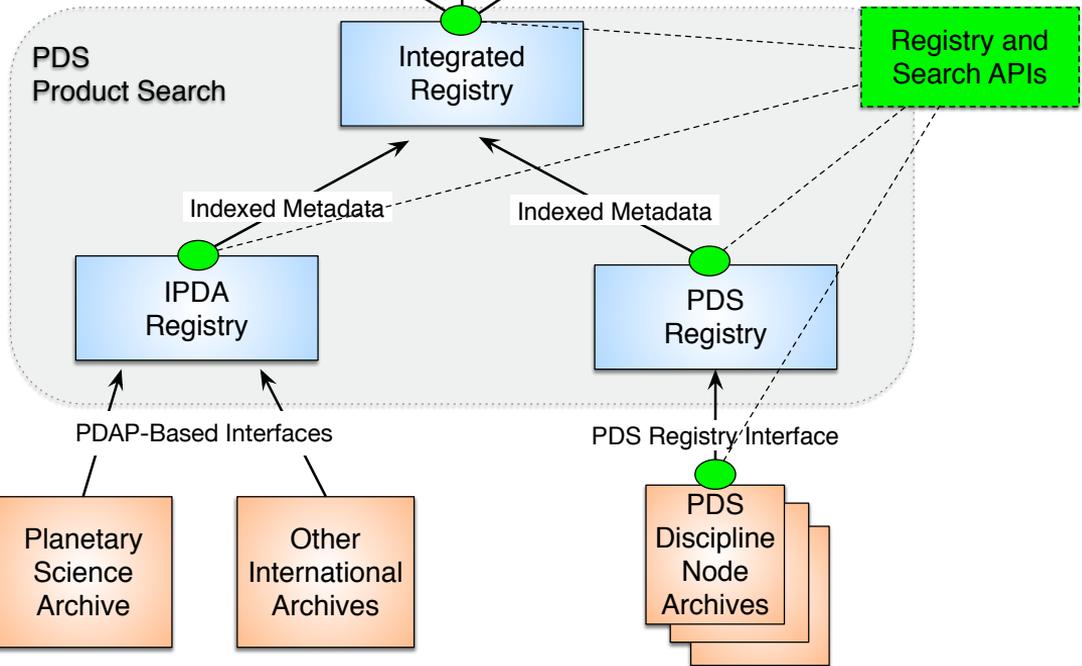
Common PDS and IPDA Protocols





Other Search Portals / Applications

Common PDS and IPDA Protocols



PDS Incubator and Tools Catalog

- A centralized catalog of PDS tool projects
- A framework for managing what makes it into this catalog (Incubator)
- Based upon Apache Software Foundation
- Follow along at <https://nasa-pds.github.io/>



PDS USER ALLIANCE

- PDS is looking for help in improving overall:
 - Accessibility
 - Discoverability
 - Usability
- **We need users** who are willing to provide:
 - Honest *feedback* on PDS tools and services
 - *Beta test* new tools
 - Provide basic *use cases* for how they use PDS
- Will include periodic emails:
 - Info on use cases
 - Beta testing new tools / services / search capabilities

- ***Users:*** Anyone interested in planetary science data
 - Newb PDS Users
 - Veteran PDS users
 - PDS staff
 - PDS Lovers and haters
 - ***Anyone with an interest in helping improve PDS***



- NASA Portal
- Site Help
- Contact Us
- Feedback

Announcements

[Community Announcement](#)

New Releases

- June 15, 2019
[Lunar Reconnaissance Orbiter Data Release 38](#)
- June 1, 2019
[Mars Reconnaissance Orbiter Data Release 49](#)
- May 25, 2019
[JUNO Data Release 8](#)
- [Previous Releases](#)
- [Get notified of new releases](#)

PDS Nodes

- [Atmospheres \(ATM\)](#)
- [Geosciences \(GEO\)](#)
- [Cartography](#)
- [Sciences](#)
- [Navigation](#)
- [Information](#)
- [Planetary Interactions](#)
- [Ring-Moon Systems](#)
- [Small Bodies](#)

Welcome to the PDS

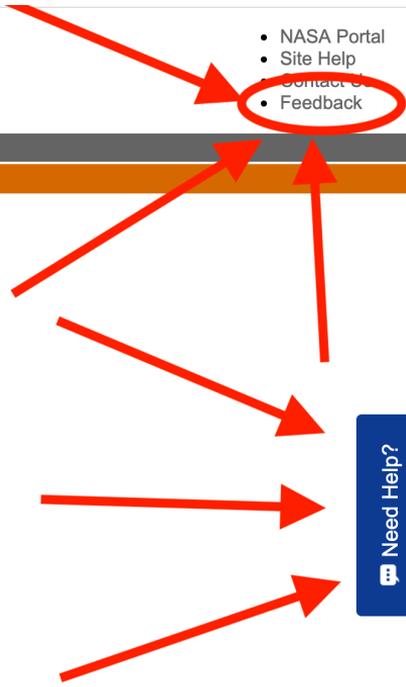
The Planetary Data System (PDS) is a long-term archive of digital data products returned from NASA's planetary missions, and from other kinds of flight and ground-based data acquisitions, including laboratory experiments. But it is more than just a facility - the archive is actively managed by planetary scientists to help ensure its usefulness and usability by the world wide planetary science community.

Archive submissions are prepared by researchers under the guidance of PDS personnel. All products are peer-reviewed, well-documented, and easily accessible via a system of online catalogs that are organized by planetary disciplines.

Archived products are available on-line. When needed, PDS provides users access to staff to help with data selection. PDS also provides a variety of tools useful in producing, obtaining and using archived data. There is no cost associated with acquiring PDS archived data or tools or in getting reasonable amounts of PDS help. All PDS archived data may be exported outside of the United States under the U.S. Government's Technology and Software Publicly Available (TSPA) classification.

To learn more about PDS and the nodes, go to [About the PDS](#).

Below are links to important information for the various categories of PDS users.



Need Help?

Interested?
 Go to <https://pds.nasa.gov>

THANKS

BACKUP

TRANSFORM TOOL: SUPPORTED TRANSFORMATIONS

<u>Input</u>	<u>Output</u>	<u>Comment</u>
PDS3 Image (8-bit Image) (16-bit Image)	GIF, JPEG, JPEG 2000, PNG, PNM, TIFF	Known limitations: - Does not yet support product labels referencing multiple images, including explicit FILE objects - Does not yet support Qube objects
PDS3 Table	CSV PDS4 Labeled Table	The resulting product label contains the minimum set of elements in order to be compliant with the PDS4 standards.
PDS3 Label	PDS4 Label	The resulting product label contains the minimum set of elements in order to be compliant with the PDS4 standards.
PDS4 Table (Table_Binary) (Table_Character) (Table_Delimited)	CSV PDS4 Labeled Table	The resulting product label contains the minimum set of elements in order to be compliant with the PDS4 standards.
PDS4 2D Image (Array_2D_Image)	GIF, JPEG, JPEG 2000, PNG, PNM, TIFF, FITS	
PDS4 3D Image (Array_3D_Image)	GIF, JPEG, JPEG 2000, PNG, PNM, TIFF	The current implementation defaults to transforming band 1. Will add support for selecting bands in the future.
PDS4 3D Hyper-Spectral Cube (Array_3D_Spectrum)	GIF, JPEG, JPEG 2000, PNG, PNM, TIFF	The current implementation defaults to transforming band 1. Will add support for selecting bands in the future.
PDS4 Label	PDS3 Label	The resulting product label contains the minimum set of elements in order to be compliant with the PDS3 standards. Known limitations: - Does not yet support a PDS4 label containing multiple File_Area_Observational elements. - Does not yet support a PDS4 label containing Group_Field_Delimited elements - Does not yet support a PDS4 label describing a Qube data object
PDS4 Label	ODL PVL, HTML	