# Browsing PDS

SBN-PSI's Context Browser and APIs

Assist in data discovery for everything PDS

Our goals for this project:

1. Present and navigate the entire PDS archive in a way where users don't need to know PDS4
2. Use what we have now, rather than wait for a brighter future
3. We're here to solve the Browse Problem, not Search (Search needs something to search for!)
4. Optimize for the 90%, not the edge cases (space missions + big targets first)
5. Use the PDS registry to avoid metadata duplication/fragmentation
6. Streamline the process of actually loading datasets into the registry
7. Allow for archive curation and augmentation, to override or supplement what comes from the raw labels where needed

Data discovery puzzle

PDS-wide Search

PDS-wide Browse

Domain-Specific Tools
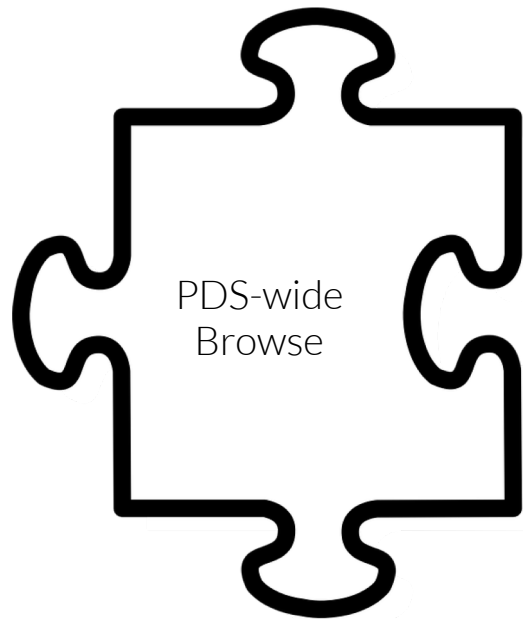
The challenges we're overcoming

Three main issues:

1. **The registry**: it's just a search-efficient database that's as good as the data that goes into it. You still need semantic and structural understanding of how the data was ingested, since there's technically not much of a defined schema
2. **The metadata**: it's ugly
3. **The model**: it doesn't cover everything we knew we'd need to adequately navigate and present the context objects and datasets

Mars Data Archive

Relevant Tags: Terrestrial Planet | Planetary Magnetosphere | Spheroid Body | Planetary Ion

Mars is the fourth planet from the Sun and the second-smallest planet in the Solar System after Mercury. Mars carries a name of the Roman god of war, and is often referred to as the "Red Planet" because the iron oxide prevalent on its surface gives it a reddish appearance that is distinctive among the astronomical bodies visible to the naked eye. Mars is a terrestrial planet with a thin atmosphere, having surface features reminiscent both of the impact craters of the Moon and the valleys, deserts, and polar ice caps of Earth.

Useful tools for this data:

Pilot
Planetary Image Locator Tool

Atlas
PDS Image Atlas

AN
Analyst's Notebook

ODE
Orbital Data Explorer

Primary Spacecraft

Mariner 6

Mariner 7

Mariner 9

Mars Exploration Rover - Opportunity

Mars Exploration Rover - Spirit

MARS EXPRESS

Cassini-Huygens Data Archive

Relevant Tags: Orbiter

Orbiting the ringed planet Saturn and its numerous moons, the Cassini spacecraft was a keystone of exploration of the Saturnian system and the properties of gaseous planets in our solar system.

A joint endeavor of NASA, the European Space Agency, or ESA, and the Italian Space Agency, Cassini launched in 1997 along with ESA's Huygens probe. The spacecraft contributed to studies of Jupiter for six months in 2000 before reaching its destination, Saturn, in 2004 and starting a string of flybys of Saturn's moons. That same year it released the Huygens probe on Saturn's moon Titan to conduct a study of the moon's atmosphere and surface composition. In its second extended mission, Cassini made the first observations of a complete seasonal period for Saturn and its moons, flew between the rings and descended into the planet's atmosphere.

Cassini Orbiter

More Info: Cassini Mission Details at PDS Atmospheres node

Useful tools for this data:

Pilot
Planetary Image Locator Tool

Atlas
PDS Image Atlas

OPUS
Outer Planets Unified Search

Visit Mission Page

Targets (65)

PRIMARY

Saturn - *Gas Giant*

SECONDARY

Dione - *Inner Large Satellite*
Enceladus - *Inner Large Satellite*
Hyperion - *Outer Large Satellite*
Iapetus - *Outer Large Satellite*
Mimas - *Inner Large Satellite*
Phoebe - *Norse Group*
Rhea - *Outer Large Satellite*
Tethys - *Inner Large Satellite*
Titan - *Outer Large Satellite*

⌄ MINOR
⌄ SERENDIPITOUS
⌄ CALIBRATION
⌄ SPURIOUS

Science Instruments

Dust Detector	Cosmic Dust Analyzer
Imager	Imaging Science Subsystem
	Visible and Infrared Mapping Spectrometer
Ion Detector	Ion and Neutral Mass Spectrometer
Magnetometer	Magnetospheric Imaging Instrument
Radar Transceiver	RADAR
Spectrometer	Composite Infrared Spectrometer
	Ultraviolet Imaging Spectrograph
Other	IMAGING SCIENCE SUBSYSTEM - WIDE ANGLE for CO

Support Instruments

Dust Detector	High Rate Detector
Ion Detector	Cassini Plasma Spectrometer
Magnetometer	Dual Technique Magnetometer
Radio Transceiver	Radio Science Subsystem

See more

OSIRIS-REx Camera Suite (OCAMS) Data Archive

Relevant Tags: Imager

The OSIRIS-REX Camera Suite (OCAMS) is a set of three cameras designed to image asteroid Bennu from different distances at different resolutions. PolyCam is a long-range camera designed to image the asteroid from a distance up to two million km. MapCam provides high-resolution maps of the asteroid's surface, and SamCam documents the maneuvers and acquisition by the TAGSAM sampling system. All cameras use identical detector arrays but have focal lengths separated by a factor of 5. The detector is a 1024 x 1024 active pixel CCD array with 6.5 x 8.5 micron pixels.

Datasets (2)

OSIRIS-REx OCAMS Bundle - *asteroid*

OSIRIS-REx: Mission Bundle - *asteroid*

Spacecraft

OSIRIS-REx

Instruments (5)

SCIENCE

OSIRIS-REx Laser Altimeter (OLA) - *Altimeter*

OSIRIS-REx Thermal Emission Spectrometer (OTES) - *Spectrometer*

OSIRIS-REx Visible and Near Infrared Spectrometer (OVIRS) - *Spectrometer*

REgolith X-Ray Imaging Spectrometer (REXIS) - *Spectrometer*

Touch-and-Go Camera Suite (TAGCAMS) - *Imager*

No Support Instruments

OSIRIS-REx OCAMS Bundle

The latest release includes data from the Cruise 1, Earth Gravity Assist, and Cruise 2 mission phases.

Latest release date: Feb. 15, 2019

Relevant Tags: asteroid   image

This bundle collects all the operational data products produced by the OSIRIS-REx Camera Suite (OCAMS). OCAMS is a suite of scientific cameras used for the characterization of the surface of (101955) Bennu.

In this dataset...

📁 OSIRIS-REx OCAMS Document collection
Key Document: Software Interface Specification

📁 OSIRIS-REx OCAMS converted housekeeping data products

📁 OSIRIS-REx OCAMS raw housekeeping data products

📁 OSIRIS-REx OCAMS ancillary image information data products.

📁 OSIRIS-REx OCAMS raw science image data products

📁 OSIRIS-REx OCAMS calibration file collection

📁 OSIRIS-REx OCAMS reduced science image data products

📁 OSIRIS-REx OCAMS calibrated science image data products
Example File: 20170922T231714S379_pol_iofL2pan_V017.fits

❝ *Use the following citation to reference this data set:*

"Rizk, B., C. Drouet d'Aubigny, D. Golish, D.N. DellaGiustina, and D.S. Lauretta, Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx): OSIRIS-REx Camera Suite (OCAMS) Bundle, urn:nasa:pds:orex.ocams, NASA Planetary Data System, 2019." ❞

PDS4 Bundle

Status:
Archived

Date Published:
Feb. 15, 2019

Publisher:
NASA Planetary Data System

PDS4 ID:
urn:nasa:pds:orex.ocams

Author(s):
Rizk, B.
Drouet d'Aubigny, C.
Golish, D.
DellaGiustina, D.N.
Lauretta, D.S.

Editor(s):
Crombie, M.K.
Selznick, S.

Target

101955 Bennu - *Near-Earth Asteroid*

Spacecraft

OSIRIS-REx

Instrument

OSIRIS-REx Camera Suite (OCAMS)
- *Imager*

📁 **Browse All**

⬇ **Download All** (66 GB)

◎ **View Checksums**

↗ **View Resource**

OSIRIS-REx OCAMS calibrated science image data products

The latest release includes data from the Cruise 1, Earth Gravity Assist, and Cruise 2 mission phases.

Latest release date: Feb. 15, 2019

Relevant Tags: asteroid image

This collection contains the calibrated (processing level 2 radiometrically calibrated and reflectance) science image data products produced by the OCAMS instrument onboard the OSIRIS-REx spacecraft.

Example File

" *Use the following citation to reference this data set:*

"Rizk, B., C. Drouet d'Aubigny, D. Golish, D.N. DellaGiustina, and D.S. Lauretta, Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx): OSIRIS-REx Camera Suite (OCAMS) calibrated science image data products, urn:nasa:pds:orex.ocams:data_calibrated, NASA Planetary Data System, 2019." "

PDS4 Collection

Status:
Archived

Date Published:
Feb. 15, 2019

Publisher:
NASA Planetary Data System

PDS4 ID:
urn:nasa:pds:orex.ocams:data_calibrated

Author(s):
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Editor(s):
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Selznick, S.

Target

101955 Bennu - *Near-Earth Asteroid*

Spacecraft

OSIRIS-REx

Instrument

OSIRIS-REx Camera Suite (OCAMS)
- *Imager*

Manage Targets

There are 129 targets saved:

Moon	Terrestrial Satellite	urn:nasa:pds:context:target:satellite.earth.moon	Edit
Mars	Terrestrial Planet	urn:nasa:pds:context:target:planet.mars	Edit
Saturn	Gas Giant	urn:nasa:pds:context:target:planet.saturn	Edit
Mimas	Inner Large Satellite	urn:nasa:pds:context:target:satellite.saturn.mimas	Edit
Enceladus	Inner Large Satellite	urn:nasa:pds:context:target:satellite.saturn.enceladus	Edit
Dione	Inner Large Satellite	urn:nasa:pds:context:target:satellite.saturn.dione	Edit
Tethys	Inner Large Satellite	urn:nasa:pds:context:target:satellite.saturn.tethys	Edit

LID:

urn:nasa:pds:context:instrument_host:spacecraft.co

Display Name:

Cassini Orbiter

Display Description:

The Cassini Orbiter's mission consists of delivering a probe, called Huygens, to Titan, and then remaining in orbit around Saturn for detailed studies of the planet and its rings and satellites.

Spacecraft Image:

Select File
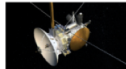
Tags

Orbiter

Additional Content

Supplemental HTML - Top

H1　H2　H3　H4　H5　H6　P　pre　"　**B**　*I*　U̲　S̶　☰　☰　↻　↺　⊘　☰　☰　☰　☰　☰　☰

</>　🖼　🔗　☐　Words: 8　Characters: 58

More Info: Cassini Mission Details at PDS Atmospheres node

Daphnis	Minor
Venus	Serendipitous
Janus	Minor
Titan	Secondary
Dione	Secondary
Spica	Serendipitous

Instruments

COSMIC DUST ANALYZER for CO	Science
ULTRAVIOLET IMAGING SPECTROGRAPH for CO	Science
DUAL TECHNIQUE MAGNETOMETER for CO	Support
VISUAL AND INFRARED MAPPING SPECTROMETER for CO	Science
RADIO AND PLASMA WAVE SCIENCE for CO	Derived

Solving the registry challenges

Brute force!

Several queries are required to join all the documents necessary to display a web page

Built a separate internal API layer into the application to perform groups of related requests

Fixing metadata

All by hand baby

Built an intermediate database full of curated, contextual and human-friendly "display" metadata

Paid people to fill it up, and paid other people to give us feedback on it

Origins, Spectral Interpreation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx) Mission Data Archive

The primary objective of the Origins, Spectral Interpretation, Resource Identification, and Security-Regolith Explorer (OSIRIS-REx) mission is to return pristine samples of carbonaceous material from the surface of a primitive asteroid. The target asteroid, near-Earth object (101955) Bennu, is the most exciting, accessible, and volatile- and organic-rich remnant from the early Solar System. OSIRIS-REx returns a minimum of 60 g of bulk regolith and a separate 26 cm2 of fine-grained surface material from this body. Analyses of these samples provide unprecedented knowledge about presolar history, from the initial stages of planet formation to the origin of life. Prior to sample ac... Show Description

Datasets (36)

⌄ The OSIRIS-REx Camera Suite Suite (OCAMS) aboard the OSIRIS-REx spacecraft

- Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx): Context
- Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx): Document
- Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx): Document

Target

101955 Bennu

Instruments (6)

- The OSIRIS-REx Camera Suite Suite (OCAMS) aboard the OSIRIS-REx spacecraft
- The OSIRIS-REx Laser Altimeter (OLA) aboard the OSIRIS-REx spacecraft
- The OSIRIS-REx Thermal Emission Spectrometer (OTES) aboard the OSIRIS-REx spacecraft
- The OSIRIS-REx Visible and Near InfraRed Spectrometer (OVIRS) aboard the OSIRIS-REx spacecraft
- The Regolith X-Ray Imaging Spectrometer (REXIS) onboard the OSIRIS-REx spacecraft
- The Touch-and-Go Camera Suite (TAGCAMS) aboard the OSIRIS-REx spacecraft

Expanding the model

How to fix an insufficient model? More model!

Needed the ability to quickly iterate and expand to support fields that would largely be irrelevant for any other data-driven services

Eventually migrate the more broadly useful data into the core IM

Registry as a software-driven model

Providing an API layer around the registry would jump-start a lot of applications

1. Teach the registry PDS4— that knowledge currently only exists in Harvest and config files
2. Simple encapsulation of queries into more model-aware API: "Give me all the Bundles for Cassini between these dates" "What instruments were on this mission?". Solr should be an implementation detail.
3. Allow for custom supplemental metadata to be stored alongside context objects or datasets natively (a la mission dictionaries, but for software)

Baton-pass protocol

As domain-specific tools for product search or data transformations become updated or created, a protocol for deep-linking to relevant searches.

However, in the short term: We can actually just write specific integrations. There aren't that many tools!

Crazy ideas

Web services for standard archiving needs, useful on this browser or in other data tools

1. Dynamic downloads of specific subsets of data products
2. On-the-fly transformations for standard data types (Transform tool, but for the web)
3. Standardized dataset/label viewer (PDS4 Viewer, but for the web)