

THE PLANETARY SCIENCE ARCHIVE (PSA): EXPLORATION AND DISCOVERY OF SCIENTIFIC DATASETS FROM ESA'S PLANETARY MISSIONS.

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Abstract

The Planetary Science Archive (PSA) is the European Space Agency's (ESA) repository of science data from all planetary science and exploration missions. The PSA provides access to scientific datasets through various interfaces at <http://psa.esa.int>. All datasets are scientifically peer-reviewed by independent scientists, and are compliant with the Planetary Data System (PDS) standards. The PSA has started to implement a number of significant improvements, mostly driven by the evolution of the PDS standards, and the growing need for better interfaces and advanced applications to support science exploitation.

1. Introduction

The PSA is hosting data from all of ESA's missions that explored the Solar System, apart from the Sun and the Sun-Earth interactions addressed by the Heliospheric archive of ESA. This includes ESA's first planetary mission Giotto, which explored the nucleus of comet 1P/Halley. Science data from the Venus Express spacecraft that orbited Venus for several years, the Mars Express mission that is still orbiting Mars and observing its moons Phobos and Deimos, and the SMART-1 mission that explored the Moon are available at the PSA. Data products from the descent module Huygens that explored the surface of Titan for the first time are accessible through the PSA as well. The PSA also contains all science data from Rosetta, the ambitious mission of ESA's Solar System exploration programme that accompanied comet 67P/Churyumov-Gerasimenko and flew by asteroids Steins and Lutetia on its way. Last year has seen the arrival of a new ESA mission with the ExoMars 2016 data being ingested into the PSA. In the upcoming years, at least three new projects are foreseen to be fully archived at the PSA. The first datasets from the BepiColombo mission to Mercury will be ingested after the launch scheduled in 2018. Following BepiColombo will be the ExoMars Rover Surface

Platform (RSP) that is expected to navigate on the surface of Mars in 2020. The upcoming Jupiter ICy moon Explorer (JUICE), scheduled to launch in 2022, will also archive its observations of Jupiter, the Galilean satellites and the numerous objects of the Jupiter system in the PSA.

The PSA is also open to add to its database scientific observations of various ground-based observatories (i.e., professional or amateur), and space-based observatories; a few ground-based support programmes (for Venus Express and Rosetta), as well as data from the Hubble Space Telescope are already available in the PSA.

2. Development

The PSA released its new interface in January 2017. The newly designed PSA enhances the user experience and significantly reduces the complexity for users to find their data by promoting one-click access to the scientific datasets with more specialized views when needed. It is also up-to-date with versions 3 and 4 of the PDS standards, as PDS4 is used for ESA's ExoMars and upcoming BepiColombo missions.

The PSA home page (Figure 1) provides a direct and simple access to the scientific data, aiming to help scientists to discover and explore their content while facilitating cross-mission and cross-instrument data searches. The archive can be explored through a set of parameters that allow the selection of products through space and time (Figure 2). Quick views provide information needed for the selection of appropriate scientific products.

To support larger data search and retrieval, planetary interoperability services have been implemented; e.g. this supports the PDAP (Planetary Data Access Protocol) and the EPN-TAP (EuroPlanet-Table Access Protocol) protocols.

Users also have direct access to documentation, information and tools that are relevant to the scientific use of the dataset, including ancillary

datasets, Experiment-to-Archive ICD (EAICD) or Software Interface Specification (SIS) documents, and any tools/help that the PSA team can provide.

3. Roadmap

The PSA team is now focusing on developing a map search interface using GIS (Geographic Information System) technologies to display ESA planetary datasets. This will include 2D (e.g. for Mars) and 3D (for small bodies, e.g. 67P/Churyumov-Gerasimenko) functionalities. An image gallery will also provide navigation through images to explore the datasets (Figure 3), while search of products by metadata will be expanded, allowing product selection by wavelength, instrument types or geometrical parameters. A login mechanism will also provide additional functionalities to the users to help their searches (e.g. saving queries, managing default views, etc).

4. Figures

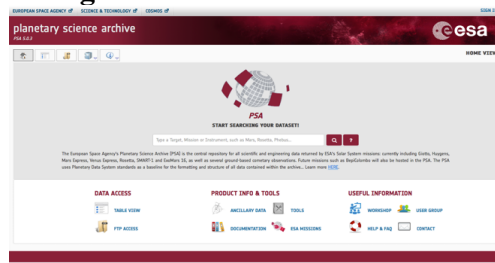


Figure 1. Home page of the Planetary Science Archive. Icons at the bottom link to various services that the PSA offers such as access to important documentation, contact form, etc. At the center, the search bar provides rapid access to data products from a mission, a target, or a specific instrument.

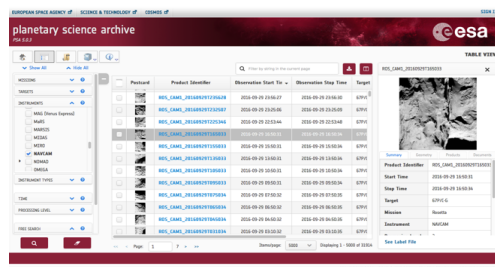


Figure 2. Display of the results after an initial query on the instrument NAVCAM. On the left side, the filter menu offers parameters to refine the query (Time, Targets, etc.). On the right side, the detail panel displays additional information as well as a visualisation of the browse products if available.

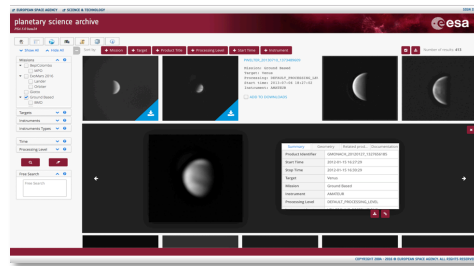


Figure 3. Example of image gallery display of the results after an initial query on the ground based observations for Venus.

5. Summary and Conclusions

The PSA new interface was released in January 2017. The home page provides a direct and simple access to the scientific data, aiming to help scientists to discover and explore its content. The archive can be explored through a set of parameters that allow the selection of products through space and time. Quick views provide information needed for the selection of appropriate scientific products. The PSA team is now focusing on developing a map search interface using GIS technologies to display ESA planetary datasets, and interoperability with international partners. This will be done in parallel with additional metadata searchable through the interface (i.e., geometrical parameters), and with a dedication to improve the content of 20 years of space exploration.

References

- [1] Besse, S. et al., (2017) Planetary and Space Science (submitted);
- [2] Macfarlane, A. et al., (2017) Planetary and Space Science (submitted).