NASA Planetary Data System and Data Object Identifiers (DOIs). J. Padams[1], A. Raugh[2], D. Crichton[1], E. Law[1], J. S. Hughes[1], R. Joyner[1]. [1]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA. [2]University of Maryland.

Introduction: The NASA Planetary Data System (PDS) captures, archives, and distributes data from robotic exploration of the solar system. In supporting this mission, it has developed an innovative architectural approach called "PDS4" to support the highly diverse set of heterogeneous data from over 600 instruments. The PDS is implemented as a set of distributed archives with different "nodes" managing repositories for this federated system [1]. To enable this federated approach, the PDS uses an information model to drive configuration of its archive and services, enabling it to evolve as data from the mission evolves, as well as the structure of the PDS. This approach has also enabled the PDS to work with and share its standards and architectures with the international community though the International Planetary Data Alliance (IPDA) [2].

The development of PDS4 has not only focused on the construction of compatible archives, but also on becoming a more FAIR system through improving access, (re)use, and interoperability of the data in the big data era. One primary method for enabling this has been the minting of Data Object Identifiers (DOIs) [3] for all PDS archival data as a standard mechanism:

- *To credit data creators:* PDS archived data sets are refereed publications.
- *To support reproducibility of published research:* This will sometimes involve citing subsets of a data set, or selected products from multiple data sets.

PDS DOI Policy: The PDS began investigating the use of Digital Object Identifiers (DOIs) in 2017 with the objective of assigning DOIs to various PDS data objects. To address the challenge of adopting and developing a consistent DOI solution applicable across the entire PDS and its international partners, the PDS Management Council (MC) approved a pilot project for creating and registering PDS4 data using DOIs. A working group, with members from each Discipline Node (DN) and international partners from the IPDA, was later formed in 2020 to establish the PDS DOI Policy [4], best practices for assigning DOIs to data sets, and improvements in the user documentation for citing PDS data [5].

NASA PDS has implemented an operational DOI system - where DOIs are assigned to PDS3 data sets, PDS4 data bundles, PDS4 data collections, and associated documents that are produced, archived, and distributed by the PDS Discipline Nodes (DNs). Each Discipline Node (DN) serves a different planetary science discipline user community and, accordingly, has a unique approach and process for generating and archiving a variety of data products. Such variation has brought about the need to establish DOI policies and processes, while still permitting enough flexibility to accommodate each DN's individual needs.

Future: NASA PDS will look to collaborate with the IPDA to adapt these policies and documents to provide a consistent approach for assigning and citing DOIs across all internationally-sponsored planetary science archives.

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References:

[1] About the PDS. https://pds.nasa.gov/home/about/.
[2] International Planetary Data Alliance. https://planetarydata.org/. [3] The DOI System. https://www.doi.org/. [4] PDS Data Object Identifier (DOI) Policy. https://pds.nasa.gov/datastandards/documents/policy/PolicyOnDOI10142020.pdf.
[5] Citing PDS Data. https://pds.nasa.gov/datastandards/citing/.