



National Aeronautics and  
Space Administration

# FY23 Status on Responding to the PDE IRB Findings and Recommendations

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**Planetary Data Ecosystem Team**

Planetary Data Ecosystem Update to the PAC

November 14, 2023



# Acknowledgements

- Planetary Data Ecosystem Team
  - Megan Ansdell
  - Robin Fergason, Planetary Data Officer
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  - Kevin Murphy, Chief Science Data Officer
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# Planetary Data Ecosystem

NASA defined the PDE as the ad hoc connected framework of activities and products that are built upon and support the data collected by planetary space missions and research programs, which primarily are NASA funded.

Types of information in the PDE (not exhaustive):

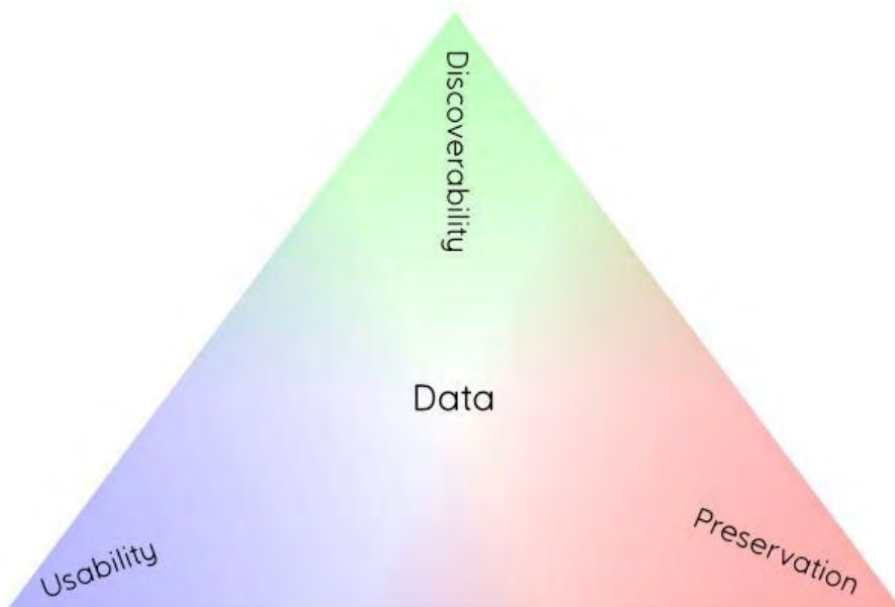
- Data returned from space missions and ground-based facilities, generated by research and analysis projects, and generated by citizen scientists.
  - In addition to observational and research data, this also includes laboratory results, physical samples (for PSD), Earth analog site field data, and contributions to collaborative citizen-science services.
- Standards for planetary science data and metadata
- Software and Tools
  - Data processing pipelines, mission support, analysis tools, search and browse tools, display tools, and simulation tools
- Publications
  - Articles, books, conference abstracts, reports, posters, and presentations
- Education and communication products

# Final Report

of the

## Planetary Data Ecosystem Independent Review Board

April 2021



# PDE IRB Background

## Planetary Data Ecosystem Independent Review Board (PDE IRB)

- Commissioned to conduct a holistic review of the Ecosystem with the goals of “defining the full environment, identifying missing or overly redundant elements, and providing findings and prioritized recommendations.”
  - The high-level goal was to help NASA to develop a seamlessly integrated Planetary Data Ecosystem that improves the planetary science community’s access to, and use of, high-quality data.
- Study convened from November 2020 to March 2021
- Findings and recommendations fall into three categories:
  - Continued strategic development of the overall Ecosystem
  - Barriers to data preservation
  - Barriers to access, usability and development

## PDE IRB Summary

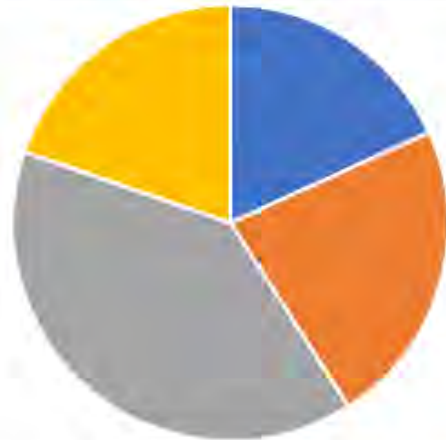
PDE IRB final report included 67 Findings and 65 Recommendations.

FY23 status addressing recommendations (as of September 2023) and undergoing PSD review:

- 12 (18%): Completed
- 15 (23%): Ongoing/Maintenance; completed, but require ongoing efforts to maintain
- 26 (39%): In progress
- 13 (20%): Not yet started

This information will be presented to the Planetary Advisory Council (PAC) annually for feedback and accountability.

FY23 PDE IRB Response Status - September 2023



**Figure** – FY23 PDE IRB Response Status, as a percentage of completed, ongoing, in progress, and not yet started efforts.

# Ongoing Efforts (25% of recommendations)

- Developing the PDE (R01)
  - PDE IRB concurred that PSD should continue developing the concept of a Planetary Data Ecosystem.
- Community building - working across disciplines and agencies
  - Within SMD Office of the Chief Science Data Officer (OCSDO) and PSD (R26; R48)
  - Across National and international Agencies (R07)
    - Met with International Planetary Data Alliance (IPDA) in June 2023.
  - With the planetary community (R04; R08; R48)
    - PDE team members, such as the PDE Chief Scientist, Program Executive, and Planetary Data Officer, attend community conferences and AG meetings, including conferences attended by under-represented communities.
    - [Planetary Data website](#) provides NASA PSD with a mechanism to communicate plans, timelines, or developments of new or changed capabilities widely.
      - Undergoing modernization in FY24, as part of larger NASA and SMD efforts.
- Facilitating training in areas related to the PDE (R23)
  - Funding training-focused workshops and curriculum development aimed at addressing PDE-related training needs through F2. TWSC and F.14 TOPST
  - SMD OCSDO developed [TOPS Open Science-101 curriculum](#)

# Ongoing Efforts (continued)

- Supporting and continuing to develop the PDS (R12; R13)
  - Such as ensuring that PDS has adequate expertise and funding to maintain current standards and to support ongoing improvements.
- Policy guidance and supporting community compliance; with significant collaboration with OCSDO
  - Open Science Data Management Plan (OSDMP) templates and guidance for mission teams and in collaboration with OCSDO (R21)
  - Research OSDMP guidance and templates
  - Software policy development (R62; R63)
    - [SMD Information Policy SPD-41a](#) outlines policy and provides guidance, released in Dec 2022
    - [PSD Information and Data Management Policy](#) supplement to SPD-41a provides additional guidelines and information
- Expanding opportunities for tool research and development (R51; R58; R60)
  - Tool development is again a component of the [Planetary Data Archiving, Restoration, and Tools \(PDART\)](#) program, beginning in ROSES-23.
  - Three additional cross-divisional ROSES solicitations have been developed to increase funding available for open-source software and tool development:
    - [F.7 Support for Open-Source Tools Frameworks, and Libraries](#)
    - [F8 Supplemental Open Source Software Awards](#)
    - [F.15 High-Priority Open Source Science.](#)

# Completed Efforts (18% of recommendations)

- NASA should ensure that a sustained, community-led coordinating organization for the PDE exists that mirrors the other Planetary Assessment or Analysis Groups (AGs), reports to the Planetary Science Advisory Committee, and meets regularly (R04).
  - The existing AG structure can effectively support the maintenance and development of the Planetary Data Ecosystem.
    - The existing AG, [Mapping and Planetary Spatial Infrastructure Team](#) (MAPSIT), will help to advocate for cross-domain needs across the PDE and the planetary community.
    - Body- and domain-specific AGs may also independently or collaboratively advocate for the data, software, and infrastructural needs of specific communities they represent.
  - NASA PSD selected a PDE Chief Scientist, Moses Milazzo, in December 2021.
    - The PDE Chief Scientist provides an independent link between the larger PDE community, the Planetary Data System (PDS), and NASA Headquarters.
- CoreTrustSeal (or similar) certification (R09)
  - There are ongoing discussions with SMD and all Divisions on how NASA repositories and archives are assessed for Findability, Accessibility, Interoperability, and Reusability ([FAIR](#)).
  - CoreTrustSeal (or similar) certification is currently not required or mandated by SMD or PSD.
  - See also 2022 guidance from the White House National Science and Technology Council on [Desirable Characteristics of Data Repositories for Federally Funded Research](#) that states, “Federal agencies have elected not to adopt existing certification criteria, due in part to the cost and complexity of certification processes and of differences in needs and expectations of different agencies and their research communities.”



# Completed Efforts (continued)

- Policy development with significant contribution from SMD (R06; R47)
  - [SPD-41a](#) helps to address many policy-related recommendations
  - NASA-provided DOI infrastructure is available to SMD-funded repositories (R47)
- Repositories and archives
  - Radar data (R31)
    - Radar data analysis, publication, and archiving of Arecibo data is accepted at the PDS Small Bodies Node (SBN).
    - Creation of a Radio Science sub-Node of the PDS was established in collaboration with the Planetary Radar and Radio Sciences Group (PRRSG) at JPL.
  - Laboratory analyses of returned sample material (R33; R34)
    - [Astromat](#) is the official NASA archive for astromaterial sample data collected both from mission-supported and R&A funded efforts.
- Increased data release training support (R23; R49; R64; R65)
  - Analysis-ready data is available in the [NASA-AWS Open Data Registry \(ODR\)](#).
  - Funded TWSC (ROSES F2) and TOPST (ROSES F14) proposals focused on community training.
  - SMD OCSDO developed [TOPS Open Science-101 curriculum](#).

# Efforts In Progress (40% of recommendations)

- Refining the scope of the PDE through broad community engagement (R02; R03; R05; R08)
  - Working to build a community around the Planetary Data Ecosystem.
  - Active participant in SMD Open Source Science Initiative working groups, facilitated by OCSDO
    - Participate in cross-divisional sharing of knowledge and solutions regarding available data sets, software, and tools, and to identify core services and leverage assets across SMD Divisions.
  - Engaging with the [Mapping and Planetary Spatial Infrastructure Team](#) (MAPSIT), and all planetary AGs, to raise and discuss community recommended practices and lessons learned surrounding Open Science practices.
  - Engagement by the PDE Chief Scientist in communicating PDE and Open Science-related topics to the community, provides an additional means for communication with the community and to gather community feedback.
  - Targeted requests for community feedback are planned; could include actions such as Request for Information (RFI) or Comment (RFC), workshops, or Town Halls.
- Standards development and interoperability (R10, R15, R16; R25)
  - PDS4 metadata standard has been adopted by the International Planetary Data Alliance (IPDA).
    - Helps to facilitate interoperability and search capabilities across international agencies.
  - ExMAG-LEAG Specific Action Team will discuss and inform community standards and guidelines for astromaterial data analyses.

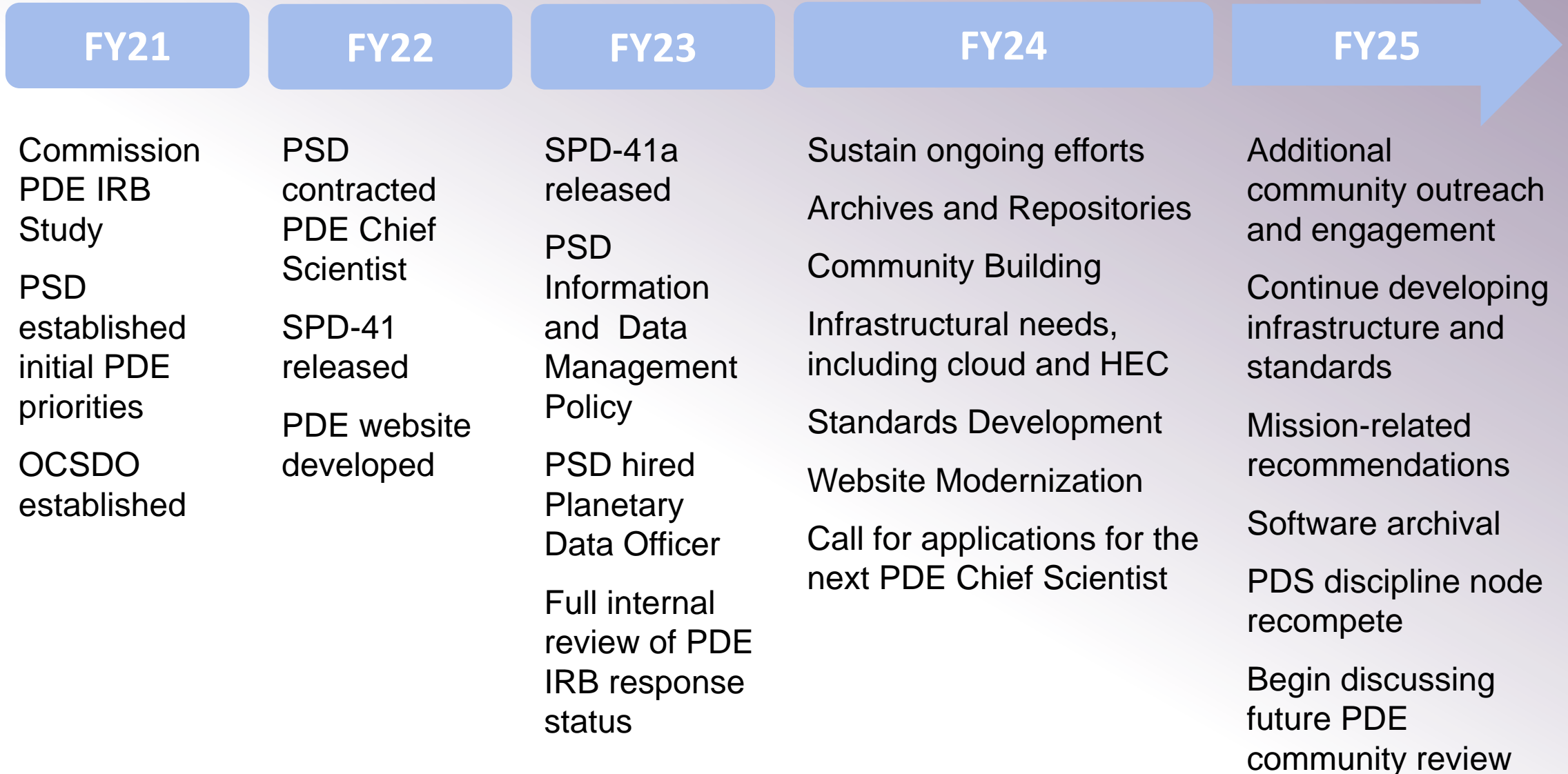
# Efforts In Progress (continued)

- Archive and repository development (multi-year effort)
  - PDE team is investigating data archiving tools available within SMD, PSD, and PDS and determining the infrastructural needs of the planetary data community to support compliance with [SPD-41a](#).
    - Community input will be solicited and considered; this will be an ongoing and iterative process to help ensure the implementation of a wise and community-driven solution. (R14)
    - Will include an initial and informal evaluation of the Findability, Accessibility, Interoperability, and Reusability ([FAIR](#)) of data across each PDE element. (R11; R29)
  - Developing clear criteria for PSD-funded repositories. (R11)
  - Identify, and if needed develop, archiving avenues for data preservation needs of the planetary science community that are not currently being addressed. (R28; R37; R38; R39)
    - Completed - Radar data (R31); Laboratory analyses of returned sample material (R33; R34)
    - In progress - ARD (R32; R52), planetary analog data (R36), higher-level data products (R40; R41; R52), software tools and data processing pipelines (R42; R43; R59); modeling data (R44); AI/ML/AA (R55; R56; R57)

# Efforts In Progress (continued)

- Websites – data, software, and information availability, and communication efforts (R45; R46)
  - PDS is implementing significant improvements to the PDS website search capabilities aimed at improving the findability of data archived in the PDS across nodes.
  - SMD is developing the [SMD Science Data Portal](#), which is a data website for public access to SMD-funded science data. The planetary data sites are currently under development.
  - The [SMD Science Discovery Engine](#) is a cross-Discipline search capability where all data in the PDS will be indexed, and alongside data from other curated planetary sources within the PSD and SMD Divisions.
- Technical infrastructure development, including cloud and High-End Computing (HEC) (R25; R27)
  - Currently focused on supporting the PDS and Astromat in transitioning to a cloud environment, as it makes sense technically and fiscally.
  - SMD led a [Data and Computing Architecture study](#) to investigate how a coordinated cloud-HEC infrastructure can meet the data and computing needs of SMD, enable efficiencies, and support SMD's transition to Open-Source Science.
  - PDS is working on a multi-year cloud infusion effort in the establishment of a Planetary Data Cloud (PDC) Platform.
    - Includes pilot projects to migrate data sets and services to the cloud, providing a more consistent data management strategy for the overall PDS.
    - Help provide a more consistent user experience for users accessing the data, including a centralized Registry database of all archive metadata and information across the system.
    - Will lead to the ability for users to perform computation alongside the data, without the need to download, streamlining analysis and discovery.

# Notional PDE Roadmap



# FY24 PDE Goals

- Archives and Repositories
  - Measured by: Completed inventory of existing infrastructure; documented community needs, Identify gaps; developed initial plan to address gaps; solicited community feedback
- Community Building - Continue to collaborate within SMD, PSD, PDS, and the broader community
  - Measured by: Increased engagement from the community, PSD PO/PS/PE; demonstrated knowledge of existing policies and data management paradigms across SMD
- Standards Development
  - Measured by: Identified existing community standards for planetary data domains; documented standards commonly in use; discussed and developed standards for the sample curation community and developed lessons learned document
- Website Modernization and Development
  - Measured by: PDS website public release; Planetary Data website beta public release and development and execution of project plan

Thank You!



Image Credit: Getty Images