SCIENCE MISSION DIRECTORATE POLICY
Scientific Information policy for the Science Mission Directorate

SMD Policy Document SPD-41a

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Responsible SMD Official: Science Data Officer

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DRAFT

I. Background

The information produced as part of NASA's scientific research activities represent a significant public investment. NASA holds this information as a public trust to increase knowledge and serve the public good. This information includes publications, data, and software created in the pursuit of scientific knowledge. Results of federally funded research and development need to be shared openly in order to maximize the benefit and reach of the information. Data need not only to be archived but also to be curated – that is, the data are assured to have continued accessibility and usability for multiple decades. The availability of software enhances the discoverability, accessibility, sustainability, and reproducibility of NASA science while maximizing the benefit of NASA to society.

It is SMD policy, consistent with NASA and Federal policy, that information produced from SMD-funded scientific research activities be made publicly available.[1]

The policy describes how scientific information produced from SMD funding is shared. Scientific information includes publications, data, and software produced as part of scientific research activities. Publications includes scientific or technical documents released through print, electronic, or alternative media. Data includes any scientifically or technically relevant, electronically stored information. Software includes scientifically or technically relevant computer programs in both source and object code that provide users some degree of utility or produce a result or service. Full definitions of the terms used throughout this document are provided in Appendix B. The process for variances to the policy is described in Section VII.

The policy was created based on recommendations from SMD's Strategy for Data Management and Computing for Groundbreaking Science 2019-2024 and is based on existing Government directives, NASA policy, community best practices, studies by the national academies, and community-led studies (see references listed in Appendix A).

II. Applicability

A. This policy applies to all SMD-funded scientific activities regardless of the funding vehicle. This shall include, at a minimum:
   a. Information produced by NASA SMD-funded missions. Missions include strategic or flagship missions and investigations selected under Announcements of Opportunity (AOs), including those selected under the Stand-Alone Missions of Opportunity Notice (SALMON) and Cooperative Agreement Notices (CANs). This class of information will be referred to as 'Mission' information.
   b. Information produced by investigations funded via research awards. This includes funding from investigations selected under NASA Research Announcements (NRAs),

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[1] NASA Plan for Increasing Access to the Results of Scientific Research

including those selected under the Research Opportunities in Space and Earth Science (ROSES) NRA. This class will be referred to as 'Research' information.

      i. This also includes investigations funded via research sub-awards for research made as part of Mission-funded activities or cooperative agreements (e.g., Hubble Space Telescope observing awards).

     ii. Research awards can include grants, cooperative agreements, contracts, task orders, interagency transfers, direct internal NASA funding, and other applicable funding vehicles.

   c. Information produced by other SMD-funded activities such as, but not limited to, experiments, investigations using sub-orbital platforms, field campaigns, or citizen science projects.

B. This policy applies to scientific information produced from SMD-funded activities. This shall include:

   a. Publications: Scientific and technical documents released through print, electronic, or alternative media.

      i. This includes peer reviewed manuscripts, technical reports, conference materials, and books.

     ii. This does not include laboratory notebooks, preliminary analyses, drafts of scientific papers or preprints, plans for future research, peer review reports, or communications with colleagues.

   b. Data: scientific or technical information that can be stored digitally and accessed electronically.

      i. Information produced by missions include observations, calibrations, coefficients, documentation, algorithms, and any ancillary information.

     ii. Information needed to validate the scientific conclusions of peer-reviewed publications. This includes data underlying figures, maps, and tables.

    iii. This does not include laboratory notebooks, preliminary analyses, drafts of scientific papers, plans for future research, peer review reports, communications with colleagues, or physical objects, such as laboratory specimens.

   c. Software: computer programs in both source and object code that provide users some degree of scientific utility or produce a scientific result or service.

C. New missions and investigations shall follow all parts of this policy. Existing missions and investigations should adopt all parts of this policy consistent with available resources.

D. There are no requirements in this policy on information produced from activities which are not funded by SMD.

E. Information subject to specific laws or regulations that would prevent the release of this information are exempt from this policy. The relevant laws and regulations that generate exceptions include but are not limited to:

   a. patent or intellectual property law,

   b. the Export Asset Regulations (EAR),

   c. the Health Insurance Portability and Accountability Act (HIPAA),

   d. the International Traffic in Arms Regulation (ITAR),

   e. NASA STD 1006.1 Space System Protection Standard,

   f. NASA NPR2810.7 Controlled Unclassified Information and,

g. the Federal laws and regulations governing classified information or security requirements.

F. This policy does not apply to information exempted by the Freedom of Information Act[2] such as pre-decision information collected or produced as part of a panel review.

G. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall." The terms: "may" or "can" denote discretionary privilege or permission, "should" denotes a good practice and is recommended, but not required, "will" denotes expected outcome, and "are/is" denotes descriptive material.

III.   General Policies

In furtherance of NASA's goal of widespread access to the results of NASA SMD-funded research, the following policies apply to all SMD-funded scientific activities.

A. All SMD-funded publications, that is publications funded by SMD or reporting on SMD-funded research, shall be made publicly accessible.
a. As-accepted, peer reviewed manuscripts shall be deposited in NASA's as-accepted manuscript repository and made publicly available no-later than 12-months after their publications date.[3]

B. The following policies are applicable to data that has been produced by SMD-funding when it is made publicly available:
a. SMD-funded data should follow the FAIR Guiding Principles for scientific data management and stewardship. This means data should be findable, accessible, interoperable, and reusable (FAIR).
b. SMD-funded data shall be made publicly available without fee or restriction of use.[4]
i. In rare circumstances where a variance has been granted to the free distribution of data, SMD will charge no more than the cost of dissemination for the distribution of data.[5]
c. Data formats shall be machine-readable (i.e., data are reasonably structured to allow automated processing). [6]
d. SMD-funded data shall be made available in convenient[7], modifiable, and open formats.
e. SMD-funded data shall be findable such that the data can be retrieved, downloaded, indexed, and searched.
f. SMD-funded data shall include robust, standards-compliant metadata that clearly and explicitly describe the data.

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[2] https://www.foia.gov/
[3] NPR 2200.2D
[4] OPEN Government Data Act
[5] OMB A-130

[6] OPEN Government Data Act
[7] Convenient means the data are accessible without requiring proprietary software.

      g. SMD-funded data shall be reusable with a clear, open, and accessible data license.[8]

      h. SMD-funded data collections shall be citable using a persistent identifier.

         i. SMD should encourage that data users to cite the sources of the information used to conduct peer-reviewed, published research.

      i. SMD-funded data collections shall be indexed as part of the NASA catalog of data. [9]

C. The following policies are applicable to software that has been developed using SMD-funding when it is made publicly available:

      a. When released, SMD-funded software should follow best practices in the relevant open source and research communities.

      b. SMD-funded software shall be released under a permissive license that has broad acceptance in the community.[10]

      c. SMD-funded software projects shall include a code of conduct and guidelines for how to make contributions.

      d. SMD-funded software shall be made available in a publicly accessible repository that is widely recognized by the community.

      e. SMD-funded software shall be reported by the developers of the software so that it can be indexed as part of the NASA catalog of software.[11]

         i. This does not include single use software or commercial software.

      f. SMD-funded software shall be citable using a persistent identifier.

         i. SMD should encourage users to cite the software if used to conduct peer-reviewed, published research.[12]

D. New technologies developed from SMD funding shall be reported to NASA.[13,14]

E. The repositories of SMD information (data, software, and publications) shall comply with standards for accessibility for all electronic and information technology to people with disabilities.[15]

F. The repositories of SMD information shall comply with a principle of non-discriminatory data access so that all users will be treated equally. Any variation in accessibility of SMD data will result solely from the capability, equipment, and connectivity of the user.[16]

G. All SMD-funded scientific activities shall include data management plans describing the management and release of data to facilitate the implementation of these information policies.[17]

      a. For some activities such as those focused on education, a data management plan may not be required. However, the policy is still applicable to any scientific information produced during those activities.

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[8] Government works are by default in the U.S. public domain and should be used if no other license applies.
[9] NPD 2200.1
[10] Open Source software policy options for Earth and Space Science
[11] NPR 2210.1C
[12] 12 Open Source software policy options for Earth and Space Science
[13] NPD 2091.1
[14] NASA FAR 1852.227
[15] Section 508 of the US Rehabilitation Act
[16] OMB A-130
[17] NPD 2230.1

H. All SMD-funded scientific activities shall include a software management plan describing the management and release of software to facilitate the implementation of these information policies.
   a. For some activities such as those focused on education, a software management plan may not be required. However, the policy is still applicable to any scientifically relevant software produced during those activities.
I. SMD shall require that all investigators supported by SMD funding have a persistent identifier such as ORCID.[18]
J. SMD shall provide a persistent identifier for all funding mechanisms and missions.
K. SMD's policies should remain consistent with best practices to maximize access to information and to keep costs as low as possible. [19]
L. SMD shall provide information for how best to meet these policies. Where possible, SMD should provide additional information and tools to support meeting these policies.[20]
M. In external agreements, SMD should encourage the adoption of similar policies by its partners to ensure the usability of the data to the scientific community.[21]
   a. SMD should engage in ongoing partnerships with other Federal agencies to increase the effectiveness and reduce the cost of its science program. Interagency cooperation should include sharing of data from satellites and other sources, mutual validation and calibration data, and consolidation of duplicative capabilities and functions.
   b. SMD should require that all information for scientific research is accessible when negotiating agreements with an international partner, another agency, a private entity, a commercial interest, or industry.
      i. SMD shall restrict access to information only to the extent required by the governing Memorandum of Understanding (MOU).
N. SMD should encourage the adoption of similar open software policies with external partners, contractors, and grantees to ensure the usability of software to the scientific community. SMD shall foster and encourage contributions and engagement with the open source community from all Federal employees, contractors, and grantees. This includes leveraging existing open source software and communities. [22]
O. SMD shall foster and encourage contributions and engagement with communities and organizations setting standards and best practices. [23,24]
P. Information shall be archived in repositories that can maintain the information for a period of at least 25 years.

IV.   Additional Policies for Missions

In furtherance of NASA's goal of widespread access to the results of SMD-funded research, the following policies shall apply to all information produced from SMD missions in addition to the policies in Section III General Policies:

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[18] National Security Presidential Memorandum 33
[19] OMB A-130
[20] Strategy for Data Management and Computing for Ground-Breaking Science 2019-2024
[21] NASA Plan for Increasing Access to the Results of Scientific Research
[22] OMB M-16-21
[23] Strategy for Data Management and Computing for Ground Breaking Science 2019-2024
[24] OMB M-16-21

A. Publications produced on all aspects of the Mission[25] shall be made publicly accessible via a NASA designated repository at the time of their publication. This includes peer-reviewed publications, conference proceedings, technical reports, dissertations, and books.
  a. Publications produced from investigations funded by research grants, sub-awards, or cooperative agreements made as part of Mission-funded activities will follow the General policies and Additional Policies for Research.
B. In order to support reproducibility, SMD shall commit to the full and open sharing of information produced by NASA SMD Missions. This includes observations, calibrations, coefficients, documentation, algorithms, software, technical reports, and any ancillary information or work product related to the Mission.
C. There shall be no period of exclusive access to Mission data. A period after the data have been obtained may be allowed for activities such as calibration and validation of the data. This period shall be as short as possible and shall not exceed six months.
D. SMD shall commit to the full and open sharing of data produced by partner-led missions in which NASA participates.
E. Mission software[26] shall be developed openly in a publicly accessible, version-controlled platform that allows for contributions and engagement from the community.
F. Mission software shall be released through the NASA software release authority. [27]

V. Additional Policies for Research

In furtherance of NASA's goal of widespread access to the results of SMD-funded research, the following policies shall apply to all information produced from SMD-funded research in addition to the policies in Section III General Policies:

A. Research data shall become publicly available no later than the publication of the peer-reviewed article that describes it.[28]
  a. This includes any information needed to validate the scientific conclusions of peer-reviewed publications that result from an award. This includes data and software required to derive the findings communicated in figures, maps, and tables.
  b. This does not include laboratory notebooks, preliminary analyses, drafts of scientific papers, plans for future research, peer review reports, communications with colleagues, or physical objects, such as laboratory specimens.
  c. This includes scientifically useful outputs from models and simulations.
B. At the end of a research award, scientifically useful data associated with the award that has not already been made public shall be made publicly available.

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[25] Mission data are released into the public domain and non-SMD-funded activities have no requirements with respect to the usage of that data.

[26] Mission software includes all unrestricted software for a mission including software developed for operations, the ground system, science data processing, or scientific analysis. Restricted software is defined in Appendix B and includes systems as defined in NASA STD 1006.1.

[27] NPR 2210.1 Release of NASA Software

[28] NASA Plan for Increasing Access to the Results of Scientific Research

a. Extensions, variances, and exceptions of up to one year may be requested from the program officer. Any period longer than one year will follow the process in Section VII Variances.

C. In order to achieve reproducibility, research software developed using NASA SMD funding and used in support of a scientific, peer-reviewed publication shall be released as open source software no later than the publication date.
   a. This does not include commercial software.
   b. Software that was developed as part of a previous work is only required to be included if enhancements were made as part of the SMD-funded work.

D. At the end of a research award, scientifically useful software developed or enhanced as part of the award shall be released as open source software.
   a. Extensions, variances, and exceptions of up to one year may be requested from the program officer. Any period longer than one year will follow the process in Section VII Variances.

E. During SMD reviews, peer reviewed data and software shall be recognized as having the commensurate value as peer reviewed manuscripts.[29]

F. Lack of compliance with this policy by SMD-funded Principal Investigators will reduce the likelihood of selection of future proposals submitted to SMD programs by that individual as Principal Investigator.

VI. Additional Policies for other SMD-funded Activities

A. Unless otherwise stated, other SMD-funded activities shall follow the same policies as for Research (see Section V Additional Policies for Research) in terms of release of data, software, and publications.

B. Data collected as part of crowdsourcing projects or citizen science projects shall be made public.[30]

C. The policy will apply to conferences, workshops, and symposia in the following way:
   a. Conferences, workshops, and symposia for which SMD is the primary sponsor shall follow this policy and make any information produced during the conference publicly accessible. Publications, presentations, data, software, media or other materials produced as part of the conference shall be deposited in the appropriate NASA repository.
   b. Participants sponsored to attend conferences, workshops, and symposia with SMD funding shall deposit their contributions in the appropriate NASA repository.
   c. Conference, workshops, or symposia for which SMD is not the primary sponsor shall be encouraged to adopt this policy for the information produced as part of the event.

VII. Variances

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[29] Open Source Software policy for NASA Earth and Space Science
[30] American Innovation and Competitiveness Act

A. The SMD Associate Administrator (AA) is the final authority on this policy and shall determine the reasonableness of any variances to it.
   a. The SMD Data Officer shall have authority to grant any variances to this policy.
   b. Requests for variances to the policy may be submitted by the program or project manager, or by the SMD program scientists or program officer, shall receive concurrence from the SMD division director, and approval from the SMD Data Officer.
   c. Appeals to the decision of the SMD Data Officer may be submitted to the SMD AA, who has final approval authority for variances or deviations with dissent.
   d. Each of these named individuals (program or project manager, SMD program scientist or program officer, SMD division director, SMD data officer, SMD AA) may delegate their responsibility as needed.
   e. Variances may be requested for an entire program or for an individual project.
B. If available, the recommendations of any peer review panels will be considered as part of assessing the reasonableness of a variance.
C. The individual science divisions of SMD may implement additional policies that build upon this policy to make information more accessible. This may extend this policy in a variety of ways, including but not limited to, adding characteristics to the definition of an acceptable data repository, specifying specific repositories that meet the requirements, or specifying a particular data format or file type.

VIII. Measurement and Verification

A. SMD will collect a variety of metrics intended to measure or assess the efficacy of its data systems and services to assess user satisfaction. Consistent with applicable laws, SMD will make those metrics available for review and will conduct independent reviews on SMD compliance with this policy at least once every five years.
B. The policy will be reviewed at least once every five years.

IX. Appendix

Appendix A. References

- NASA Policies
  - NPD 20911.C Inventions Made by Government Employees
  - NPD 2200.1 Management of NASA Scientific and Technical Information
  - NPR 2200.2 Requirements for Documentation, Approval and Dissemination of Scientific and Technical Information
  - NPR 2210.1 Release of NASA Software
  - NPD 2230.1 Research Data and Publication Access
  - NPR 2810.7 Controlled Unclassified Information
  - NPD 7100.1 Curation of Institutional Scientific Collections
  - NASA STD 1006.1 Space System Protection Standard
  - NASA FAR Supplement 1852.227
  - NASA Plan for Increasing Access to the Results of Scientific Research

- - o Regulations and Guidance | NASA
    - NASA Grants and Cooperative Agreements Manual
    - NASA Guidebook for Proposers

- Acts
  - o OPEN Government Data Act, as part of the Foundations for Evidence Based Policymaking Act
  - o American Innovation and Competitiveness Act

- Memorandum and Government Directives
  - o M-13-13: Open Data Policy-Managing Information as an Asset
  - o OSTP Increasing Access to the Results of Federally Funded Research
  - o Executive Order 13642: Making Open and Machine Readable the New Default for Government Information,
  - o OMB M-16-21: Federal Source Code Policy: Achieving Efficiency, Transparency, and Innovation through Reusable and Open Source Software
  - o OMB A-130: Managing Information as a Strategic Resource
  - o Section 508 IT Accessibility
  - o Resources for open data: https://resources.data.gov
  - o Nation Security Presidential Memorandum 33: Supported Research and Development National Security Policy

Reports
- SMD's Strategy for Data Management and Computing for Groundbreaking Science 2019-2024
- NASA SMD Archives Processing and Data Exploitation Summary Report
- NASA SMD Maximizing the Scientific Return of NASA Data Workshop Report
- Open source software policy options for NASA Earth and Space Sciences
- Open Science by Design

Community Standards
- FAIR
- Open Source Initiative
- *Science Journal* open source policy
- *Nature* open source policy
- AGU Data policy
- American Astronomical Society
  - o Data Guidelines
  - o AAS Software policy

Existing SMD policies and Guides
- Earth Science
  - o https://science.nasa.gov/earth-science/earth-science-data/data-information-policy

- o https://earthdata.nasa.gov/collaborate/open-data-services-and-software/esds-open-source-policy
- Heliophysics
    - o https://hpde.gsfc.nasa.gov/Heliophysics_Data_Policy_v1.2_2016Oct04_signed.pdf
- Planetary Data:
    - o https://pds.nasa.gov/datastandards/about/
- Citizen Science
    - o https://science.nasa.gov/science-red/s3fs-public/atoms/files/SPD-33-Signed.pdf

Appendix B. Definitions

Archive: The process of storing data to ensure long term retention.

Accessible: As per the definition in the FAIR principles, data are retrievable by their identifier their identifier using standardized communications protocols.

Commercial Software: Software produced for the purposes of sale. This includes software that would be classified as commercial-off-the-shelf (CoTS) and software that NASA does not have a license to distribute.

Data: Any electronically stored information. This includes:
- Information produced by missions include observations, calibrations, coefficients, documentation, algorithms, and any ancillary information.
- Information needed to validate the scientific conclusions of peer-reviewed publications. This includes data underlying figures, maps, and tables.
- This does not include laboratory notebooks, preliminary analyses, drafts of scientific papers, plans for future research, peer review reports, communications with colleagues, or physical objects, such as laboratory specimens.

Data Management Plan (DMP): A document that describes whether and how data will be shared and preserved. A DMP should be compliant with NASA policies.

Findable: As per the definition in the FAIR principles, metadata and data should be easy to find for both humans and computers.

Information: Scientific knowledge produced as part of a research activity. This can include, but is not limited to, publications, data, and software.

Interoperable: As per the definition in the FAIR principles, data are able to work with other applications or workflows for analysis, storage, and processing.

Open Source Software (OSS): Software that can be accessed, used, modified, and shared by anyone. OSS is often distributed under licenses that comply with the definition of "Open Source"

provided by the Open Source Initiative or meet the definition of "Free Software" provided by the Free Software Foundation.

Persistent identifier: A long-lasting reference to a digital source. The digital object identifier (DOI) system is an example of a persistent identifier.

Permissive license: Guarantee the free use, modification, and redistribution of software while still permitting proprietary derivative works. Examples include the Apache License 2.0, the BSD 3-Clause "Revised" License, and the MIT License.

Publication: Documents released through print, electronic, or alternative media. This included peer reviewed manuscripts, technical reports, conference materials, and books. This does not include laboratory notebooks, preliminary analyses, drafts of scientific papers or preprints, plans for future research, peer review reports, or communications with colleagues.

Report: Documents produced through print, electronic, or alternative media containing Scientific and Technical information. These documents are usually not peer reviewed. This includes Technical Publication, Technical Memorandum, Contractor Report, Conference Publication, Special Publication, and Technical Translation. This does not include interim research Grant Reports.

Repository: An organized store of the data that makes data findable and accessible.

Restricted Software: Software that shall not be released due to an existing Federal law or guidance, NASA policy, or security concern. This includes software supporting security requirements described in STD-1006. For Mission software, projects should engage with the software release authority to determine their status. Examples of software that may be restricted are command related software, instrument control, authentication, or communication software.

Review: Assessment of SMD-funded activities by an individual or group. This may include a panel, standing review board, or senior review.

Reusable: As per the definition in the FAIR principles, metadata and data should be well-described so that they can be replicated and/or combined in different settings. This includes releasing the data with a clear and accessible data usage policy.

Single use software: Software written for use in unique instances, such as making a plot for a paper, or manipulating data in a specific way.

Software: computer programs in both source and object code that provide users some degree of utility or produce a result or service.

Software project: An activity to develop software. A software project typically has a version control platform on which develop can occur collaboratively.

Source code: Human-readable set of statements written in a programming language that together compose software. Programmers write software in source code, often saved as a text file on a computer. The terms code and source code are often used interchangeably.

Appendix C. Acronym List

AA: Associate Administrator

AAS: American Astronomical Society

AGU: American Geophysical Union

AO: Announcement of Opportunity

BSD: Berkeley Software Distribution

CAN: Cooperative Agreement Notice

DMP: Data Management Plan

DOI: Digital Object Identifier

EAR: Export Asset Regulations

FAIR: Findable, Accessible, Interoperable, and Reusable

HIPAA: Health Insurance Portability and Accountability Act

ITAR: International Traffic in Arms Regulation

MIT: Massachusetts Institute of Technology

MOU: Memorandum of Understanding

NPD: NASA Policy Directive

NPR: NASA Procedural Requirements

NRA: NASA Research Announcement

OMB: Office of Management and Budget

OPEN: Open, Public, Electronic, and Necessary

ORCID: Open Researcher and Contributor ID

OSS: Open Source Software

OSTP: Office of Science and Technology Policy

ROSES: Research Opportunities in Space and Earth Science

SALMON: Stand-Alone Missions of Opportunity Notice

SMD: Science Mission Directorate

Appendix D. Guidelines of SMD-acceptable data repository

SMD-acceptable data repositories share the following characteristics:
1. Independence: The repository should be managed separately from than the individual laboratory/mission that is the major data provider.
2. Sustainability: The repository should be managed for the long-term (25 years at least).
3. Open Accessibility: The repository will be accessible to the public (lay and scientific) without preapproval.
4. Searchability: The repository will ensure that data are searchable.
5. Citable: The repository will ensure that data are citable.
6. Preeminence: The repository should be considered by its user community as the "standard" repository for the subfield.
7. Standardization: The repository will require that data products be submitted in standardized, discipline appropriate formats and file types.
8. Provenance: The repository will ensure that data have configuration control and traceability of changes.
9. Documentation: The repository will include documentation for its holdings such as a description of the data, user guides, and descriptions of any calibrations. Documentation will aspire to be broadly accessible, and to be comprehensible to any member of the public with a college degree.
10. Certified: The properties of the repository should be certified by a recognized, independent group to attest the qualities of the repository.

Furthermore, repositories are preferred (but not required) to have the following features:
1. Peer Review: The repository should conduct independent peer reviews of data to assess usability and completeness of data packages.
2. Public Review: The repository should provide quality control metrics for completeness and quality. To bring in the human validations, social ranking/usage of the data could substitute for peer review.

Appendix E. Levels of Mission Data

The following table provides a description of levels of data for SMD Missions. Missions may only have a subset of these levels of data available or might have further sub-divisions of these levels that should be indicated by a letter (e.g. Level 1b data that would represent a stage of processing between Level 1 to Level 2).

Data Level	Description
0	Unprocessed instrument and payload data at full resolution, with any and all communications artifacts (e.g., synchronization frames, communications headers, duplicate data) removed. This level of data may only be available upon request.
1	Reconstructed, unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information. This level of data will be in a standard format that is accessible.
2	Data that has been processed to remove instrument or sensor effects.
3	Data that has been mapped on to a uniform space-time grid, resampled, or combined to produce a set of data with greater completeness and consistency.
4	Products delivered as part of a Mission derived from data. This could include model outputs, analysis of results, catalogs, or databases derived from Mission data.
5	Products contributed from the community derived from Mission data.
Auxiliary	Technical data generated by support or other systems as part of the Mission. This could include environmental sensors, spacecraft telemetry, or other technical information. When not excepted, scientifically useful data that is produced as part of auxiliary systems should be made accessible in accordance with available resources. This level of data may only be available upon request.
Ground Test	Data that are produced on the ground for testing the Mission either prior to launch or during operations. When not excepted, scientifically useful data that is produced as part of ground testing should be made accessible in accordance with available resources. This level of data may only be available upon request.

Change Log

2.1 Proposed Changes and Additions to the SMD Information Policy

Applicability

These policy changes are applicable to scientific activity funded by SMD. New missions and investigations shall follow all parts of the updated information policy. Existing missions and investigations should adopt all parts of this policy consistent with available resources.

The policy will be effective once adopted with all aspects of the policy applying to solicitations starting in Fiscal Year 2022.

Supporting software requirements described in STD-1006 are excluded from this policy.

Changes or Additions to General Policies

H. Changes to Section III General Policies, Part B relating to Data:
    a. SMD-funded data should follow the FAIR Guiding Principles for scientific data management and stewardship. This means data should be findable, accessible, interoperable, and reusable (FAIR).
    b. SMD-funded data shall be made available in convenient[31], modifiable, and open formats.
    c. SMD-funded data shall be findable such that the data can be retrieved, downloaded, indexed, and searched.
    d. SMD-funded data shall include robust, standards-compliant metadata that clearly and explicitly describe the data.
    e. SMD-funded data shall be reusable with a clear, open, and accessible data license.[32]
    f. SMD-funded data collections shall be citable using a persistent identifier, and SMD should encourage that data users to cite the sources of the information used to conduct peer-reviewed, published research.
I. Changes to Section III General Policies, Part C relating to software:
    a. When released, SMD-funded software should follow best practices in the relevant open source and research communities.
    b. SMD-funded software shall be released under a permissive license that has broad acceptance in the community.
    c. SMD-funded software projects shall include a code of conduct and guidelines for how to make contributions.
    d. SMD-funded software shall be made available in a publicly accessible repository that is widely recognized by the community.
    e. SMD-funded software shall be citable using a persistent identifier, and SMD should encourage that users to cite the software if used to conduct peer-reviewed, published research.[33]
J. Change related to Section III General Policies, Part G relating to Data Management Plans:
    a. Variances for DMP plans are moved from the selection officer to the data officer
K. Additions to Section III: General Policies
    a. All SMD-funded activities shall include a software management plan describing the management and release of software to facilitate the implementation of these information policies.
    b. SMD shall require that all investigators supported by SMD funding have a persistent identifier such as ORCID.
    c. SMD shall provide a persistent identifier for all funding mechanisms and missions.

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[31] Convenient means the data are accessible without requiring proprietary software.
[32] Government works are by default in the U.S. public domain and should be used if no other license applies.
[33] 33 Open Source software policy options for Earth and Space Science

d. SMD shall provide information for how best to meet these policies. Where possible, SMD should provide additional information and tools to support meeting these policies.

e. Information shall be archived in repositories that are capable of maintaining the information for a period of at least 25 years.

L. Additions to Section IV: Additional Policies for Missions

   a. Mission software shall be developed openly in a publicly accessible, version-controlled platform that allows for contributions and engagement from the community.

M. Additions to Section V: Additional Policies for Research

   a. At the end of a research award, scientifically useful data associated with the award that has not already been made public shall be made publicly available.

      i. Extensions, variances, and exceptions of up to one year may be requested from the program officer. Any period longer than one year will follow the process in Section VII Variances.

   b. In order to achieve reproducibility, research software developed using NASA SMD funding and used in support of a scientific, peer-reviewed publication shall be released as open source software no later than the publication date.

      i. This does not include commercial software.

      ii. Software that was developed as part of a previous work is only required to be included if enhancements were made as part of the SMD-funded work.

   c. At the end of a research award, scientifically useful software developed or enhanced as part of the award shall be released as open source software.

      i. Extensions, variances, and exceptions of up to one year may be requested from the program officer. Any period longer than one year will follow the process in Section VII Variances.

   d. During SMD reviews, peer reviewed data and software shall be recognized as having the commensurate value as peer reviewed manuscripts.

   e. Lack of compliance with this policy by SMD-funded Principal Investigators will reduce the likelihood of selection of future proposals submitted to SMD programs by that individual as Principal Investigator.

N. Additions to Section VI: Additional Policies for other SMD-funded Activities

   a. The policy will apply to conferences, workshops, and symposia in the following way:

      i. Conferences, workshops, and symposia for which SMD is the primary sponsor shall follow this policy and make any information produced during the conference publicly accessible. Publications, presentations, data, software, media or other materials produced as part of the conference shall be deposited in the appropriate NASA repository.

      ii. Participants sponsored to attend conferences, workshops, and symposia with SMD funding shall deposit their contributions in the appropriate NASA repository.

      iii. Conference, workshops, or symposia for which SMD is not the primary sponsor shall be encouraged to adopt this policy for the information produced as part of the event.

O. Changes to Section VII: Variances

a. The SMD Associate Administrator (AA) is the final authority on this policy and shall determine the reasonableness of any variances to it.
    i. The SMD Data Officer shall have authority to grant any variances to this policy.
    ii. Requests for variances to the policy may be submitted by the program or project manager, or by the SMD program scientists or program officer, shall receive concurrence from the SMD division director, and approval from the SMD Data Officer.
    iii. Appeals to the decision of the SMD Data Officer may be submitted to the SMD AA, who has final approval authority for variances or deviations with dissent.
    iv. Each of these named individuals (program or project manager, SMD program scientist or program officer, SMD division director, SMD data officer, SMD AA) may delegate their responsibility as needed.
    v. Variances may be requested for an entire program or for an individual project.
b. If available, the recommendations of any peer review panels will be considered as part of assessing the reasonableness of a variance.
P. Changes to Section VIII: Measurement and Verification
    a. SMD will collect a variety of metrics intended to measure or assess the efficacy of its data systems and services to assess user satisfaction. Consistent with applicable laws, SMD will make those metrics available for review and will conduct independent reviews on SMD compliance with this policy at least once every five years.
    b. The policy will be reviewed at least once every five years.
Q. Added Appendix D. Guidelines for a repository
R. Added Appendix E. Levels of Mission Data