

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

SMD Policy Document SPD-41

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Responsible SMD Official: Science Data Officer

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I. Background

The information produced as part of NASA's scientific research activities represents 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 available¹.

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 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 and NASA and SMD policies (see references and footnotes for sources). These references are listed in Appendix A.

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

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

- D. 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), and
 - e. the Federal laws and regulations governing classified information or security requirements.
- E. This policy does not apply to information exempted by the Freedom of Information Act² such as pre-decision information collected or produced as part of a panel review.
- F. 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 PubSpace repository and made publicly available no-later than 12-months after their publication 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 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
 - b. Data formats shall be machine-readable (i.e., data are reasonably structured to allow automated processing).⁶
 - c. SMD-funded data shall include robust, standards-compliant metadata that clearly and explicitly describe the data.
 - d. SMD-funded data shall be reusable with a clear, open, and accessible data license.⁷

² <https://www.foia.gov/>

³ NPR 2200.2D

⁴ OPEN Government Data Act

⁵ OMB A-130

⁶ OPEN Government Data Act

⁷ Government works are by default in the U.S. public domain and should be used if no other license applies.

- e. SMD-funded data collections shall be indexed as part of the NASA catalog of data.⁸
- C. The following policies are applicable to software that has been developed using SMD-funding when it is made publicly available:
 - a. SMD-funded software should be released under a permissive license that has broad acceptance in the community.
 - b. 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.^{9,10}
 - i. This does not include single use software or commercial software.
- D. New technologies developed from SMD funding shall be reported to NASA.^{11,12}
- 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.¹³
- 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.¹⁴
- G. All SMD-funded scientific activities shall have data management plans describing the management and release of data to facilitate the implementation of these information policies.¹⁵
 - a. For some activities such as those focused on education, a data management plan may not be required at the discretion of the selection official. However, the policy is still applicable to any scientific information produced during those activities.
 - b. Software that is used in the activity should be described as part of the data management.
- H. SMD's policies should remain consistent with best practices to maximize access to information and to keep costs as low as possible.¹⁶
- I. SMD should provide information for how best to meet these policies. Where possible, SMD should provide additional information and tools to support meeting these policies.¹⁷
- J. 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.¹⁸
 - 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.

⁸ NPD 2200.1

⁹ NPR 2210.1C

¹⁰ [NASA Grant and Cooperative Agreements Manual](#)

¹¹ NPD 2091.1

¹² NASA FAR 1852.227

¹³ Section 508 of the US Rehabilitation Act

¹⁴ OMB A-130

¹⁵ NPD 2230.1

¹⁶ OMB A-130

¹⁷ Strategy for Data Management and Computing for Ground-Breaking Science 2019-2024

¹⁸ [NASA Plan for Increasing Access to the Results of Scientific Research](#)

- 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).
- K. 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.¹⁹
- L. SMD should foster and encourage contributions and engagement with communities and organizations setting standards and best practices.^{20,21}

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:

- A. Publications produced on all aspects of the Mission²² shall be made publicly accessible via the 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, software, algorithms, 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 practical 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 shall be released through the NASA software release authority.²³

¹⁹ OMB M-16-21

²⁰ Strategy for Data Management and Computing for Ground Breaking Science 2019-2024

²¹ OMB M-16-21

²² Mission data are released into the public domain and non-SMD-funded activities have no requirements with respect to the usage of that data.

²³ NPR 2210.1 Release of NASA Software

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.²⁴
 - 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.
- B. In order to achieve reproducibility, research software developed using SMD funding and used in support of a scientific, peer-reviewed publication should be released as open source software no later than the publication date.
 - a. This does not include commercial software.

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.²⁵

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. The SMD AA may delegate their responsibility as needed.
- B. 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.

²⁴ [NASA Plan for Increasing Access to the Results of Scientific Research](#)

²⁵ American Innovation and Competitiveness Act

VIII. 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](#)
 - NPD 7100.1 [Curation of Institutional Scientific Collections](#)
 - NASA [FAR Supplement 1852.227](#)
 - [NASA Plan for Increasing Access to the Results of Scientific Research](#)
 - [NASA Grant and Cooperative Agreements Manual](#)
 - [NASA Guidebook for Proposers](#)

- Acts
 - OPEN Government Data Act, as part of the [Foundations for Evidence Based Policymaking Act](#)
 - [American Innovation and Competitiveness Act](#)

- Memorandum and Government Directives
 - M-13-13: [Open Data Policy-Managing Information as an Asset](#)
 - OSTP [Increasing Access to the Results of Federally Funded Research](#)
 - Executive Order 13642: [Making Open and Machine Readable the New Default for Government Information](#),
 - OMB M-16-21: [Federal Source Code Policy: Achieving Efficiency, Transparency, and Innovation through Reusable and Open Source Software](#)
 - OMB A-130: [Managing Information as a Strategic Resource](#)
 - Section 508 [IT Accessibility](#)
 - Resources for open data: <https://resources.data.gov>
 - 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
 - [Data Guidelines](#)
 - [AAS Software policy](#)

Existing SMD Policies and Guides

- Earth Science
 - <https://science.nasa.gov/earth-science/earth-science-data/data-information-policy>
 - <https://earthdata.nasa.gov/collaborate/open-data-services-and-software/esds-open-source-policy>
- Heliophysics
 - https://hpde.gsfc.nasa.gov/Heliophysics_Data_Policy_v1.2_2016Oct04_signed.pdf
- Planetary Data:
 - <https://pds.nasa.gov/datastandards/about/>
- Citizen Science
 - <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 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. A DMP includes any software that would enable the replication/reproduction of published results and any future research building on those results

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 be 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 includes 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.

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