National Aeronautics and Space Administration

NASA

ROSES24 Open Source Tools, Frameworks, and Libraries

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How to Participate in Today's Event

Today's event will be recorded and the slides and presentation recording will be posted.

Please submit your questions to:
https://nasa.cnf.io/sessions/d9m2/#!/dashboard

Attendees are muted by default. Attendees may be asked to raise their hand to further clarify a question. Submitted questions will be taken first.

Questions from today's event will be added to a list of "Frequently Asked Questions" and posted on NSPIRES.

Agenda

01 NASA SMD'S OFFICE of the CHIEF SCIENCE DATA OFFICER

02 OPEN SOURCE TOOLS, FRAMEWORKS AND LIBRARIES

03 PROPOSAL PREPARATION

04 QUESTION AND ANSWER

Office of the Chief Science Data Officer

GOAL 1

Develop and Implement Capabilities to Enable Open Science

GOAL 2

Continuous Evolution of Data and Computing Systems

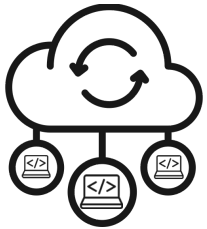
GOAL 3

Harness the Community and Strategic Partnerships for Innovation

OCSDO Enables Open Science

Each activity helps OCSDO achieve its goals of enabling Open Science for NASA.

DATA & COMPUTING SERVICES

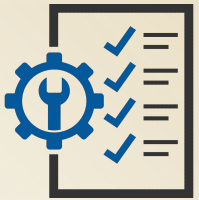


Core Services for Science Discovery
Developing core data and computing services to enable open science

DATA SCIENCE/AI

Data Science and Artificial Intelligence
Implementing innovative data science tools, with a focus on inclusion and expanding the accessibility of scientific information

OPEN SCIENCE

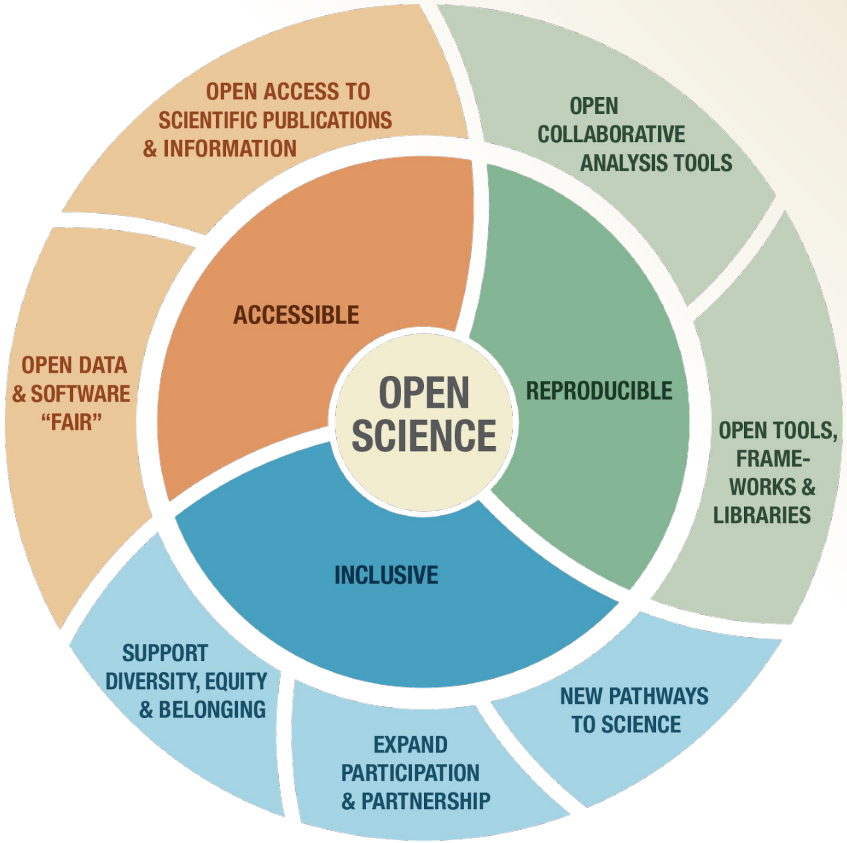


Open Science implementation
This includes Policy development, education, incentives, and advocacy on open source software

Open Science

is the principle and practice of making research products and processes available to all, while respecting diverse cultures, maintaining security and privacy, and fostering collaborations, reproducibility and equity.

Open Science is Accessible, Reproducible & Inclusive



Creates research that is:

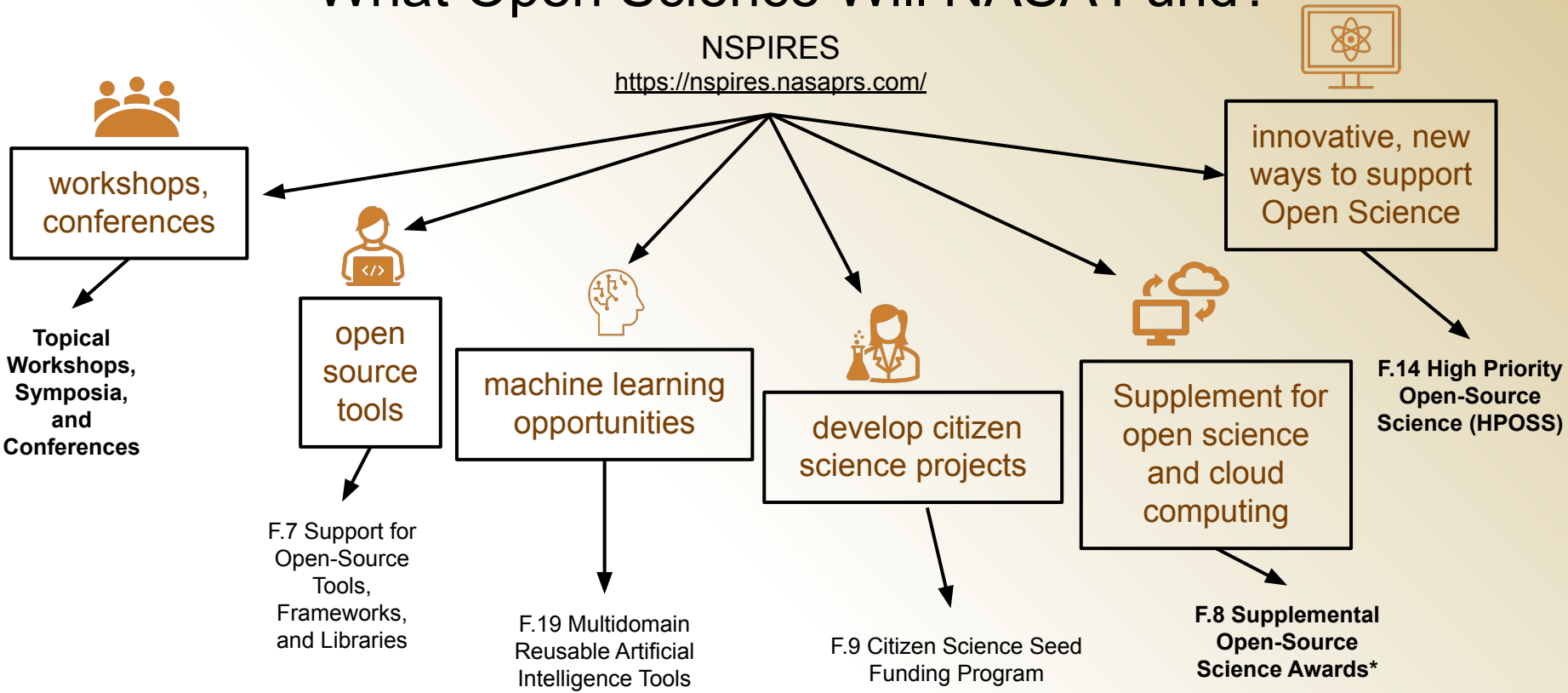
- Cited more
- Has a bigger impact
- Increases transparency
- More inclusive

Inclusive science means more:

- Collaborative projects
- Equitable Systems
- Increased Participation

What Open Science Will NASA Fund?

NSPIRES
https://nspires.nasaprs.com/



* Requires an existing NASA grant or facility.

Bold: No Due Date programs - always open

ROSES F.7 Open Source Tools, Frameworks, & Libraries

Support for existing open-source software tools, frameworks, and libraries (OSTFL) that have significant usage in the NASA science community.

Open-source software tools, frameworks, and libraries that have significant usage in the NASA science community, were developed following open and collaborative practices, and are aligned with the scientific vision and data strategic plan of SMD as described in *Science 2020-2024: A Vision for Scientific Excellence - 2023 Update* and the *SMD's Strategy for Data Management and Computing for Groundbreaking Science 2019-2024* documents.

Proposals should look to improve the sustainability and utility of these tools, frameworks, or libraries through improvements such as adding extensions, documentation, infrastructure, security, and maintenance of the software.

NSPIRES page | NASA Open Science Funding Opportunities

Tools, Frameworks, and Libraries

Tools

Systems that support scientific processes and analysis. This can include:

- software packages
- Web- or cloud- based tools or other digital services
- Related to publications data, software, events, data analysis, modeling, machine learning, or other scientific processes.

Frameworks

Systems that incorporate a variety of inputs to enable scientific processes. This can include:

- data formats
- collections of models
- citizen science infrastructure
- Other digital services.

Libraries

Generic software packages, often with a larger user base, implementing well-known algorithms, providing statistical analysis, visualization, or other services that are incorporated in other software or used on their own.

These classifications are meant to be inclusive but are not exhaustive, and proposers are welcome to identify how their projects might fit into these classifications.

OSTFL Foundational Awards

Open source software tools, frameworks, and/or libraries that have a significant impact on two or more divisions of the SMD. These projects have significant usage by NASA missions, centers, repositories, and/or community.

Proposals for Foundational Awards must demonstrate the significant nature of the project to SMD.

- The proposal ***must*** show how two or more SMD divisions are using the tool, framework, or library.
- This *should* include the substantial involvement or participation by a NASA mission, Center or contractor, and/or data repository. This may include the usage by the Earth or Space Science community.
- Foundational awards ***must*** include an Inclusion Plan (see later slide).

Expected to be Cooperative Agreements of up to 5 years.

OSTFL Sustainment Awards

Open source software tools, frameworks, and/or libraries that have significant impact in one or more divisions of the SMD.

- These awards are expected to be for up to three years in duration.
- These may be Grants or Cooperative Agreements
- For proposals to a single division, please see the division specific instructions in Section 4.
- Proposals that target two or more divisions should follow the most relevant Division specific requirements or the requirements for software development in accordance with SPD-41a: Scientific Information Policy for the Science Mission Directorate

What work is eligible for consideration?

To be eligible to be the subject of work in a proposal to this program element:

- The open-source software tools, frameworks, and libraries proposed **must have already been released under an open-source license (e.g., Apache-2, BSD-2-clause, GPL)** at the time this call has been released (March 4, 2024).
- The project must be **under active development and usage.**

Legacy software that is no longer supported is outside of the scope of this program element. The development of new open-source tools, frameworks, or libraries are not solicited with this call.

Please see the solicitation and back-up slides for further descriptions of eligibility, more options if you are not eligible, and more information on foreign participation.

Proposal Preparation

A **clear description of the software**, relevance to the SMD science community, and the relationship to NASA SMD scientific vision and data strategic plan.

- Must include the impact, usage by communities and divisions, status of the software development, and level of community contributions.

The **project management** for the software must be described

- Must include governance and development model, license, metrics for sustainability, collaboration with related projects, and inclusive practices of the project to foster community development

Proposal Preparation

The **sustainable activities** to be undertaken for the software must be described.

- This may include, but not be limited to, adding **extensions, documentation, infrastructure, refactoring, security, and maintenance** of the software.

- A discussion that demonstrates that the requested resources are necessary and sufficient for success in achieving the proposed effort. The resource discussion should include how many hours at what specific level of support persons are required.

- This description should include aspects of how information about the software is disseminated to the community, which may include documentation, training, workshops, and/or publications.

Open Science Data Management Plans

An Open Science and Data Management Plan (OSDMP) **describes how the scientific information** that will be produced from SMD-funded scientific activities **will be managed and made openly available.**

As software and community development will already be described as part of the main proposal, the OSDMP only needs to describe **how data, publications, or other open science activities will be handled** in accordance with *SPD-41a: Scientific Information Policy for the Science Mission Directorate*.

Further resources:

- Guidance on writing an OSDMP
- Open Science Guidance for Researchers (PDF | GitHub)
- Transform to Open Science Open Science 101
- Scientific Information Policy

Inclusion Plans

Inclusion, defined as the full participation, belonging, and contribution of organizations and individuals, is a core NASA value. Inclusion Plans are **designed to raise awareness of barriers to creating and sustaining positive, inclusive working environments.**

- For proposals for Foundational Awards, an Inclusion Plan, not to exceed two pages, **must** be included in all proposals immediately following the Open Science and Data Management Plan (OSDMP).
- The assessment of the Inclusion Plan will not be part of the adjectival rating for the proposal and will not inform the selection of proposals.
- Teams may request funding for the hiring of experts and/or those familiar with inclusion best practices
- Sustainment Awards do not require a Inclusion Plan. As a reminder, the body of the proposal must still include a description of the “inclusive practices of the project to foster community development.”

Resources

- Inclusion Plan Resources
- SMD Town Hall on Inclusion Plan Requirements

Evaluation

Proposals will be evaluated on three criteria: **Merit, Relevance, and Cost**.

In addition, the following will be considered as well:

A. The evaluation of relevance will include the alignment of the software with the SMD scientific vision and data strategic plan.
B. The evaluation of impact as part of merit will include an assessment of usage in the community; open-source software, tools, frameworks, and libraries that are currently widely used in the community will be prioritized for support.
C. The evaluation of impact may include the level of collaboration and coordination as a strength. However, the absence of this is not in and of itself a cause of weakness.

Funding

The expected budget for the program is **$4 million per year.**

Expected number of awards:

- 3-5 Foundation Awards
- 8-10 Sustainment Awards

There is no set minimum or maximum awarded amount. In the ROSES20 selections, yearly budgets for awards ranged from $85,000 to $475,000.

Previous Results

In **ROSES20**, **61 proposals** were received.

- In **2021** an original selection of **8 awards** were made for **three years each.**
- In **2022**, due to more funding being made available, an additional round of **8 awards** were made for **two years each.**

See backup material for list of all awards. The original 8 awards titles and abstracts are also available here.

Notice of Intent

To facilitate the early recruitment of a conflict-free review panel and ensure that proposals are submitted to the appropriate category, a Notice of Intent (NOI) should be submitted by **May 03, 2024**.

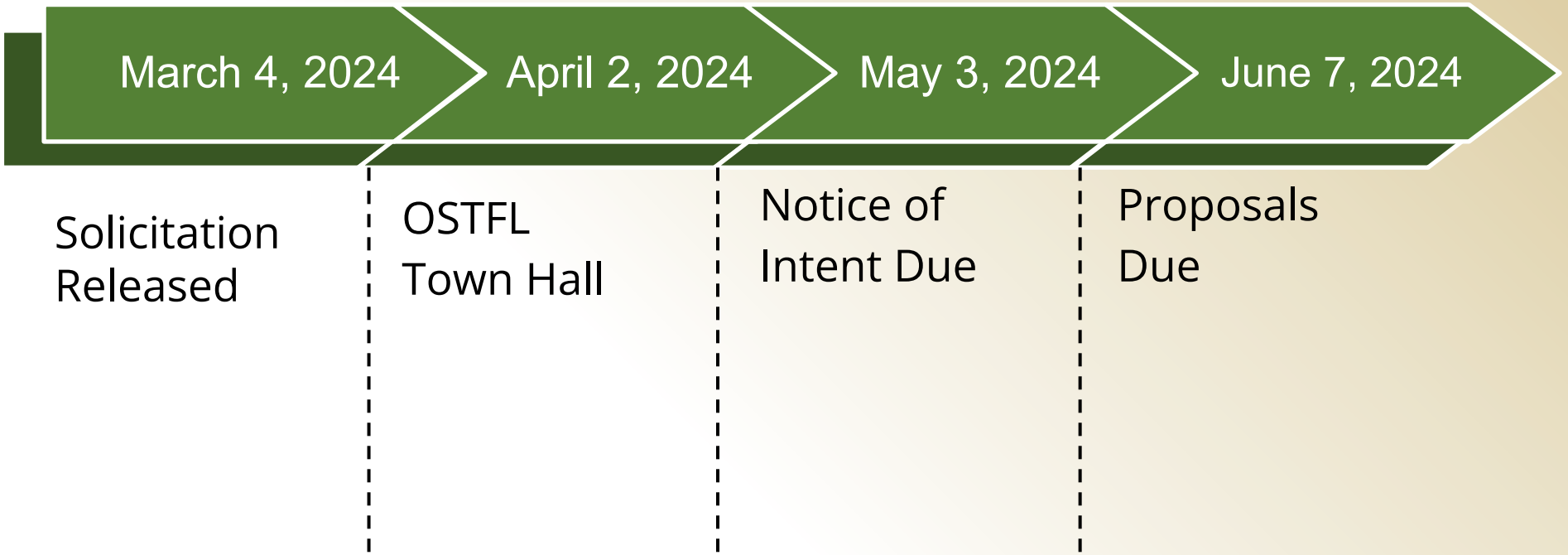
The NOI is strongly encouraged, but not mandatory.

NOI Elements

- Short description of project
- Type of award (Foundational or Sustainment)
- License for the project
- List of co-investigators
- List of up to five experts qualified to review proposal

NASA does not expect to provide feedback in response to the NOI. In exceptional cases, feedback may be provided if the type of award or license of the project is not appropriate.

Timeline


March 4, 2024
April 2, 2024
May 3, 2024
June 7, 2024
Solicitation Released
OSTFL Town Hall
Notice of Intent Due
Proposals Due

Questions and more resources

- F.7 Open Source Tools, Frameworks, and Libraries
- F.7 Open Source Tools, Frameworks, and Libraries Frequently Asked Questions
- NASA Proposer Guide and other resources
- SMD ROSES Resources
- Software for the Science Mission Directorate Workshop from May 7-9
- More questions: HQ-SMD-CSDO-ROSES@mail.nasa.gov

Please submit your questions to:
https://nasa.cnf.io/sessions/d9m2/#!/dashboard

Backup

Additional Opportunities for funding

The transformation of legacy software may be supported under the F.8 Supplements for Open-Source Science or the F.14 High Priority Open-Source Science.

Development of new tools may be supported under existing division program elements

- D.2 Astrophysics Data Analysis,
- C.4 Planetary Data Archiving, Restoration and Tools, or
- B.20 Heliophysics Tools and Methods)
- F.14 High Priority Open-Source Science program element.

Software may also be proposed as an element to existing science solicitations.

Who is eligible for this program?

Eligibility for ROSES funding is based on the proposing organization, not the individual investigator. See section III of the ROSES-2024 Summary of Solicitation for full details on eligibility.

Participation is **open to all categories of U.S. institutions** including:

- educational institutions
- industrial institutions
- for-profit, and not-for-profit organizations
- Federally Funded Research and Development Centers (FFRDCs)
- University Affiliated Research Centers (UARCs)
- NASA Centers (including JPL)
- other US government agencies

Proposals from non-U.S. institutions are welcome, but *they must be on a no-exchange-of-funds basis*; funding may not be requested to support research activities at non-US institutions but may be requested to support activities at US institutions, e.g., for funding a Co-Investigator at a U.S. institution. NOTE: Restriction on NASA funding involving China, see the ROSES Summary of Solicitation for details.

Eligibility of Funding for Foreign Non-Research Activities

NASA funding may not be used for subcontracted foreign research efforts, including travel. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted.

SMD views software engineering activities as a service and not research. Thus, maintenance, bug fixes, documentation, code review, software infrastructure, and user support would be considered services. However, SMD views efforts related to design, writing specifications, or creating new algorithms as research. Final decisions about the appropriate use of the funds for non-U.S. sources will only be made by the Grant Officer on review of the accepted proposal.

For more information on foreign participation including restrictions involving China, see Section III.c of the *ROSES Summary of Solicitation*.

ROSES20 2021 Selections
No One Owns the Rainbow: Open Source Imaging Spectroscopy for SBG and Beyond
Revamping Matplotlib for Modern Data Structures
Enhancing analysis of NASA data with the open-source Python XArray Library
Improved Sustainment, Alignment, and Impact of Open Source Flight Dynamics Tools for SMD Science Objectives
Reinforcing the Foundations of Scientific Python
Enhancing arXiv interoperability: steps towards interdisciplinary research
Strengthening the Foundations of the SunPy Ecosystem
Sustaining the Astropy Project

ROSES20 2022 Selections
NASA-Oriented Improvements to and Maintenance and Support of the netCDF Operators (NCO) Toolkit
Geemap: Interactive mapping and intelligent analysis of geospatial big data with Google Earth Engine
Enabling High Performance Access to HDF5 data in the cloud
Extending and Generalizing the Fermi GBM Data Tools to Other Missions
Improving the sustainability and utility of the Julia programming language
Improving and Sustaining the Ames Stereo Pipeline
Supporting Dedalus, an open-source CFD framework with modern spectral methods
Improving the Geospatial Data Abstraction Library (GDAL) : Enhancements to the build system, documentation, test suite, and code maintainability

Software for the Science Mission Directorate

The workshop aims to explore the current opportunities and challenges for the various categories and lifecycle stages of software that are relevant for activities funded by the NASA Science Mission Directorate (SMD).

The workshop will be virtual with an in-person option at NASA Headquarters in Washington, DC from May 7-9.

Virtual registration still open: https://science.data.nasa.gov/news/software-workshop-2024/

ROSES F.8 Supplement for Open-Source Science (SOSS)

Augmentation to existing ROSES awards to make NASA science more accessible, inclusive, and reproducible

Two types of proposals are welcome, both requiring an existing parent award:

Increase the accessibility, inclusivity, and reproducibility of the science from the parent award, and/or **contribute** back to the open-science communities relevant to the parent award.

Same scope as ROSES-22 SOSS, ~$50k/award

Provide **cloud credits** to further support or expand the parent award.

New since ROSES-23, $10–15k/award

- Awards to support work for one year. Total program budget of ~$400k for ROSES-24.
- Proposals will be reviewed on a rolling basis. Apply any time before March 28, 2025.

NSPIRES page | NASA Open Science Funding Opportunities

ROSES F.14 High Priority Open-Source Science (HPOSS)

Supporting innovative work to make NASA science more accessible, inclusive, and reproducible

In ROSES-24, two types of proposals are welcome:

Development of new technology to support open-source science, including tools, data formats, software, frameworks, or libraries.

Same scope as ROSES-22/23 HPOSS

Development of capacity building materials to advance open science adoption, including curricula, tutorials, or other training materials

New in ROSES-24; absorbs previously solicited TOPS-T

- Awards of ~$100k to support work for one year. Total budget of ~$1.2 M for ROSES-24.
- Proposals will be reviewed on a rolling basis. Apply any time before March 28, 2025.

NSPIRES page | NASA Open Science Funding Opportunities

SciX

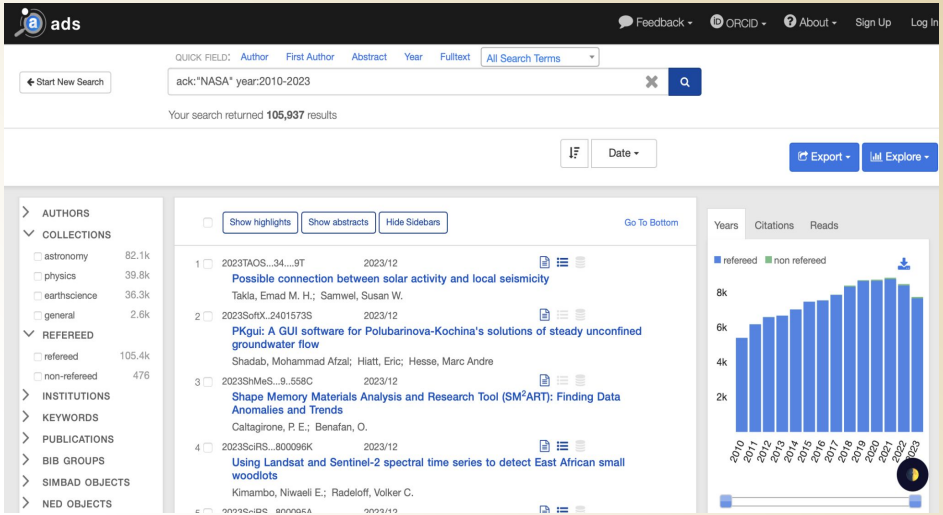
[SciXplorer.org]

NASA SciX is a literature-based, **open digital information system** covering the fields of Astrophysics, Planetary Science, Heliophysics, Earth Science, and NASA space-based experiments.

It can be used to identify NASA funded research in Earth and Space Science.

Beta version is now available.

https://scixplorer.org/



Example search based on acknowledgements from the ADS, from which SciX is developed:
https://ui.adsabs.harvard.edu/search/q=ack%3A%22NASA%22%20year%3A2010-2023&sort=date%20desc%2C%20bibcode%20desc&p_=0

NASA's Transform to Open Science (TOPS)

A 5-year mission to accelerate adoption of open science

Goals:

- Increase understanding and adoption of open science principles and techniques
- Broaden participation by historically excluded communities
- Accelerate scientific discovery

Open Science 101

A community-developed introduction to **core open science skills**

https://nasa.github.io/Transform-to-Open-Science/