National Aeronautics and Space Administration

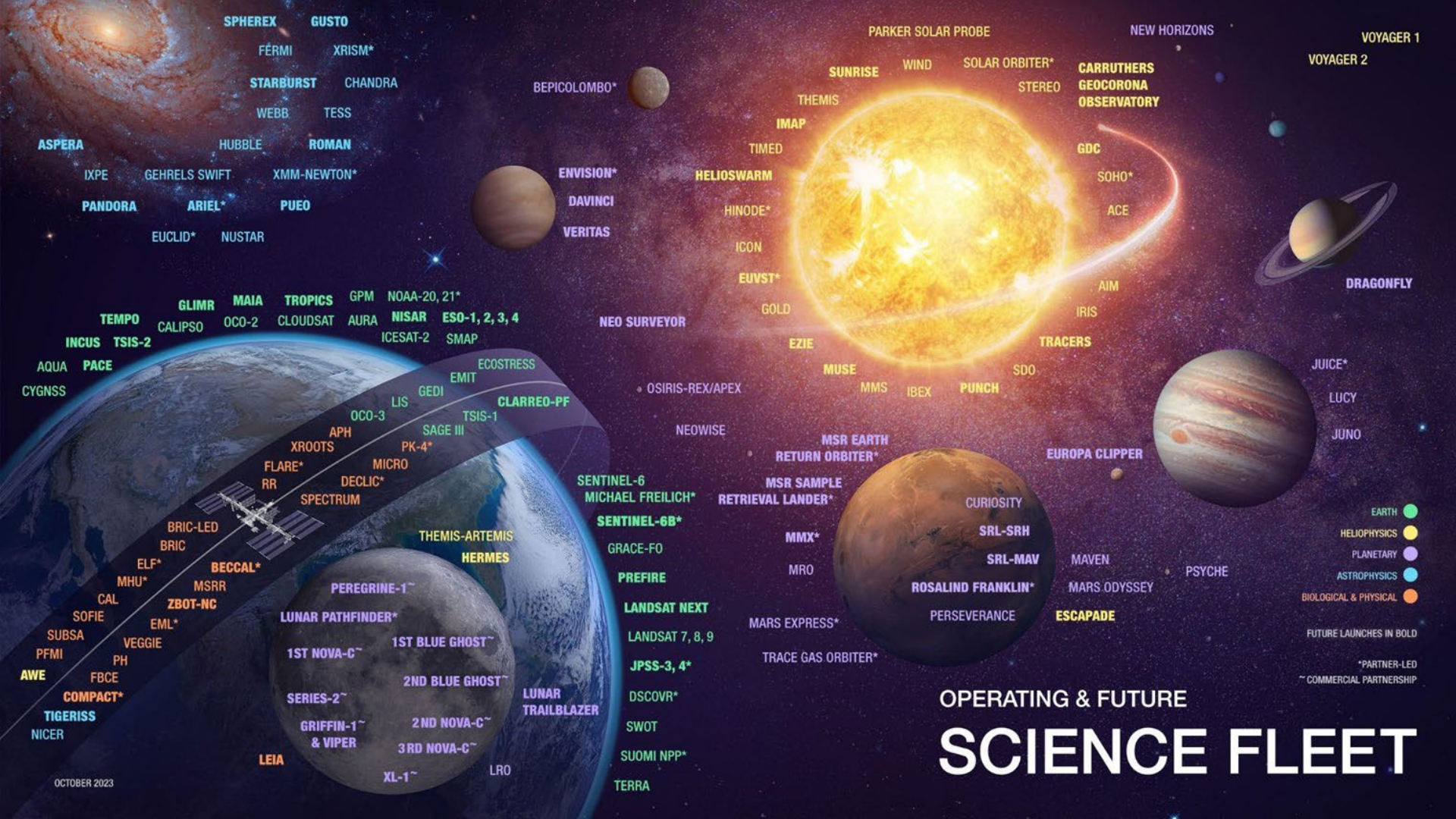
Open Science at NASA

Rachel Paseka

Office of the Chief Science Data Officer, NASA HQ

LCLUC Science Team Meeting

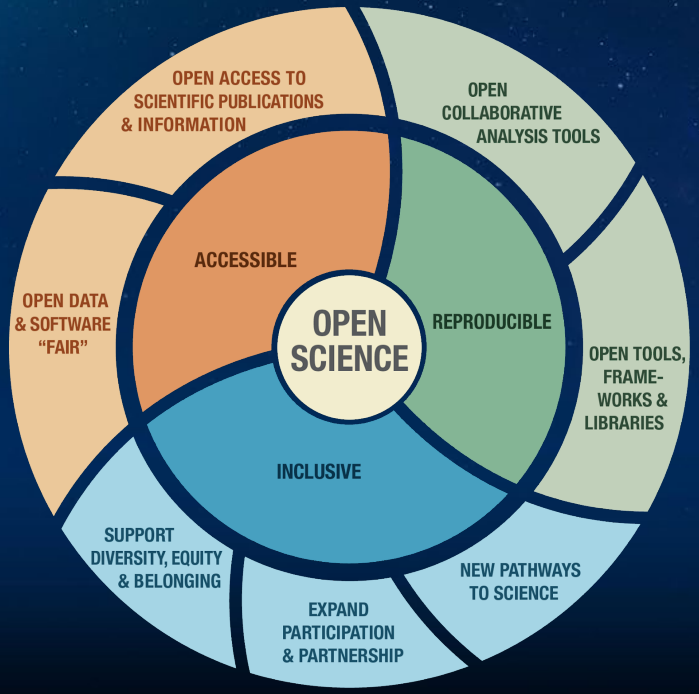
April 3, 2024



OPERATING & FUTURE

SCIENCE FLEET

Open Science is Accessible, Reproducible & Inclusive



Creates research that:

- Is cited more
- Has a bigger impact
- Increases transparency
- Is more inclusive

Inclusive science means more:

- Collaborative projects
- Access to 'hidden knowledge'
- Equitable Systems
- Increased Participation

NASA's 2023 Year of Open Science

NASA Science has designated 2023 as the Year of Open Science. Throughout the year NASA worked to energize and uplift open science across the community - what did we accomplish?

Visibility

Articles, announcements, social media
Open Science Video
NASA website
Nature World View
Opening up Article
Economic Forum Article
Green shoots Article

Capacity Sharing

Global experts developed NASA's introduction to Open Science best practices, tools, and practical skills: OS101

Summer Schools, Virtual Cohorts, and Additional Curricula Website

Incentives

NASA Open Science digital Badge (linked to ORCID)

High profile prizes and challenges

NASA supports open science activities > $5.5 million/year

Changing the Game

New Scientific Information Policy SPD-41a

Proposals include open science and data management plan

Workshop with university leaders on modernizing evaluation criteria

Challenges

- Culture eats strategy for breakfast.
- Incentives are not always aligned with values
- Advancing equitable participation in science
- Points of view:

Opportunities

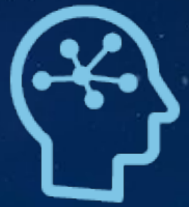
- Momentum
- Partnerships
- Measuring Impacts
- Recognizing the value of data and code
- New ways to share results
- Global transformation to a more equitable, open future

Continued Investments: NASA's OCSDO Enables Open Science

DATA & COMPUTING SERVICES

Developing core data and computing services to enable open science

DATA SCIENCE & INNOVATION



Implementing innovative data science tools (e.g. AI/ML), with a focus on inclusion and expanding the accessibility of scientific information

OPEN SCIENCE IMPLEMENTATION

Policy development, capacity building, incentives, and advocacy

Funding for Open Science

NSPIRES

https://nspires.nasaprs.com/

Workshops and conferences

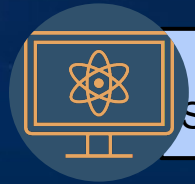
TWSC - 24

Development of citizen science projects

F. 9

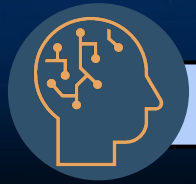
Open-source tools, framework and libraries

F. 7



Innovative, new ways to support Open Science

F. 14



Machine learning tools

F. 17

Supplement for open science and cloud omputing

F. 8

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

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, ~$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.7 Open Source Tools, Frameworks & Libraries

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

In ROSES-24, proposals should be one of two types:

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.

Cooperative agreements. Up to 5 years

Sustainment Awards

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

Grants or cooperative agreements. Up to 3 years.

Anticipating 3-5 foundational awards, 8-10 sustainment awards. Total budget ~$4M/year. Notice of intent (NOI) due date May 3, 2024. Proposal due date June 7, 2024.

NSPIRES page | NASA Open Science Funding Opportunities

The future is an open book…

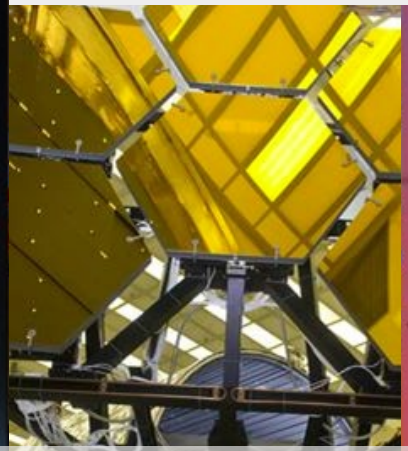
*What is **one thing** you can do **right now** to make your research more open?*

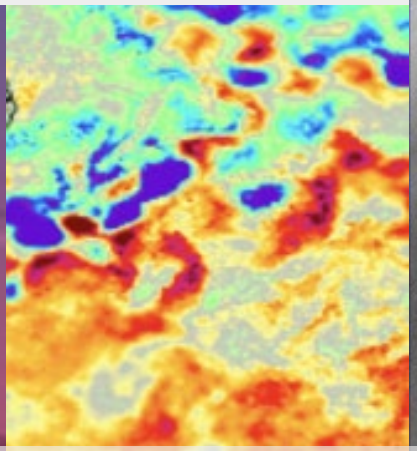
Take OS101!

https://go.nasa.gov/40pPQMx

BACKUP SLIDES

Open Science 101: Benefits of open science presented as a scientific workflow





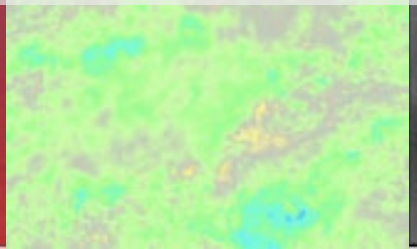
Ethos of Open Science

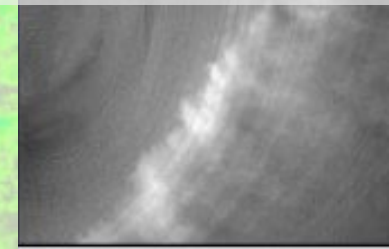
Open Science Tools

Open-Code

Open Data

Open Results





Images: JSC, JPL, & MSFC

Foundational AI Models

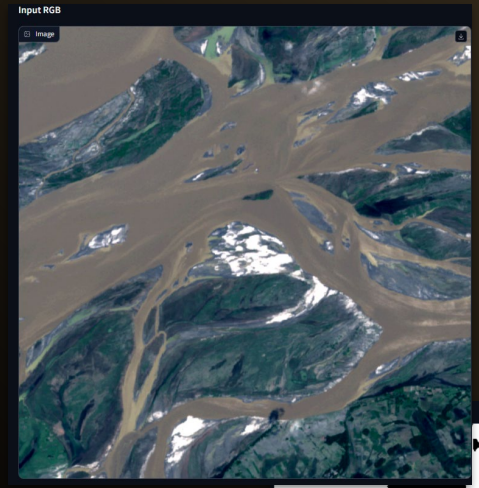
Pretrained on NASA Harmonized Landsat Sentinel-2 dataset - can be used for multiple tasks instead of building task specific AI models

Examples of how it can be used:

- Burn scar mapping
- Flood detection
- Multi-temporal crop identification

Openly available at Hugging Face including Models, Datasets, and Code.

See the article on Earth Data for more details. Collaboration with IBM under a Space Act Agreement.



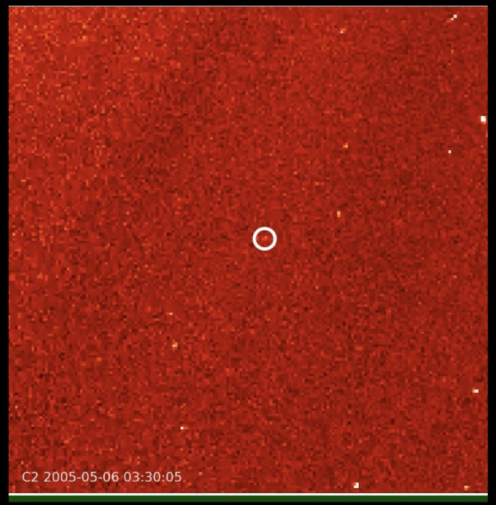
The pretrained Prithvi-100m model is finetuned to segment the extent of floods on Sentinel-2 images from the Sen1Floods11 dataset.

(Example over India)

Data Challenges

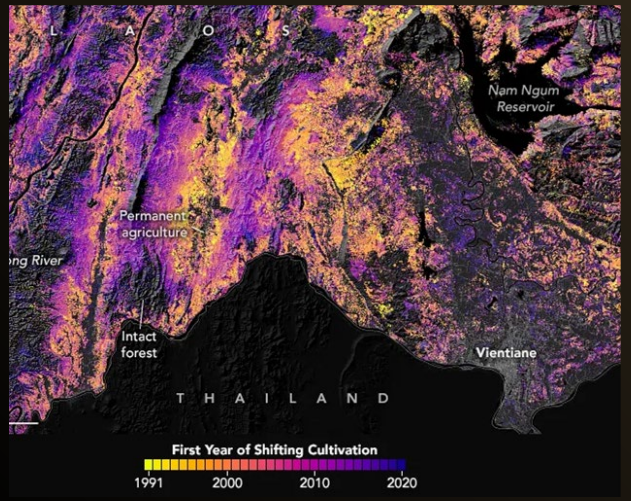
OCSDO has supported data challenges that have engaged a much larger community to use advance data science techniques to address open questions.

SOHO Comet



Mars Challenge

Pale Blue Dot



DATA and COMPUTING SERVICES

Search and Discovery Platforms

SciX is a literature-based digital library focusing on Space Science research. It covers and unifies the fields of Astrophysics, Planetary Science, Heliophysics, and Earth Science. It will also cover NASA funded research in Biological and Physical Sciences.

The **Science Discovery Engine** is a search platform that enables discovery of over 85% of NASA's open science data and documentation across disciplinary areas.

Core Data and Computing Services Program will identify and develop scientific data and computing capabilities and architectures to support Open Science.

SciX

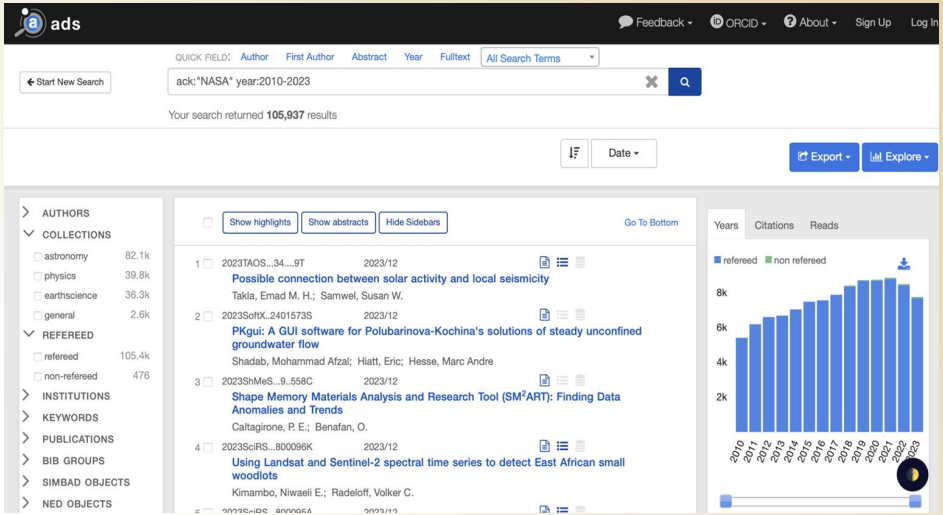
[SciXplorer.org]

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

Core Data and Computing Services

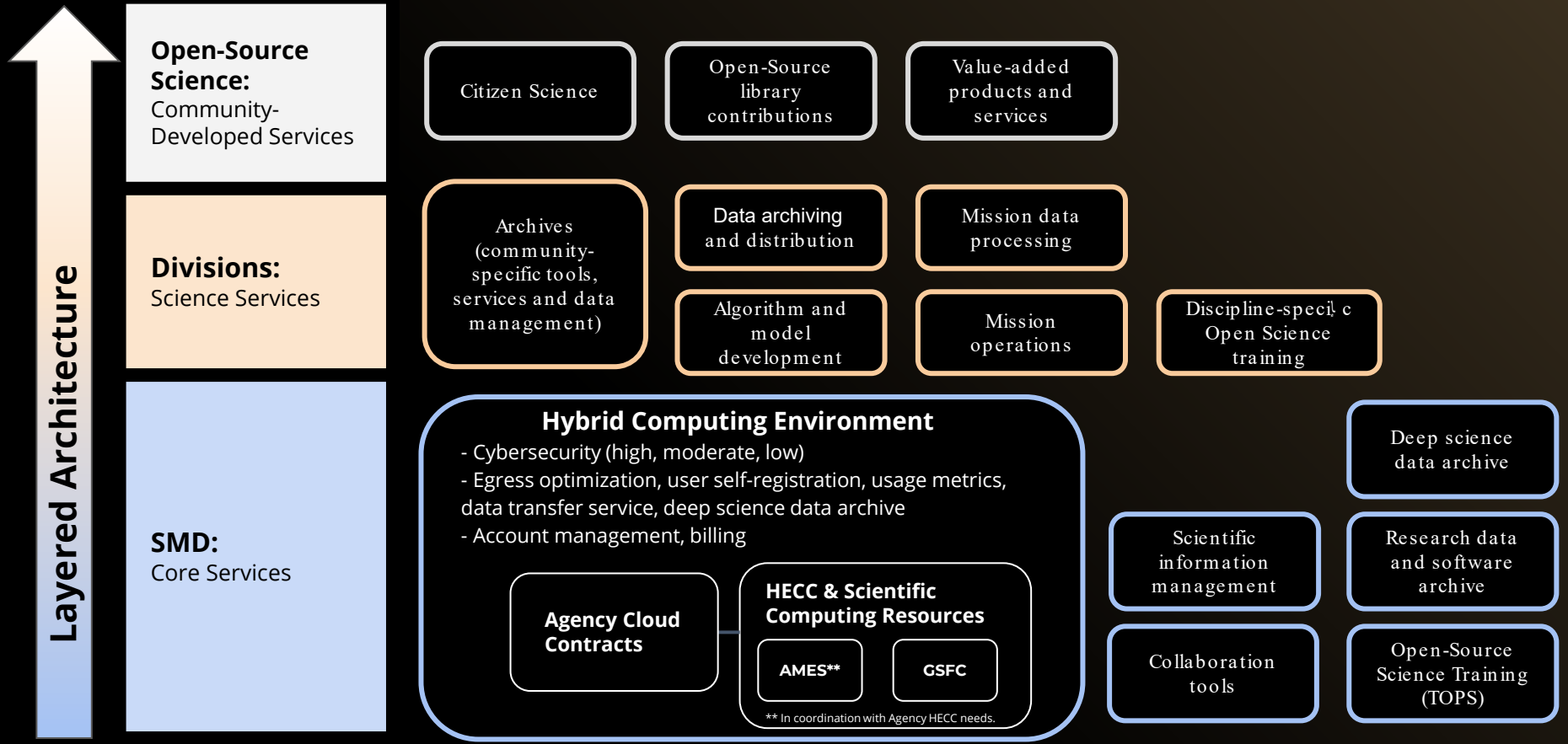
CDCSP will provide an **SMD-wide cloud computing infrastructure** that enables SMD Divisions to perform data stewardship and access, scientific research, and reduce the need for duplicative infrastructure development amongst Divisions.

The Program aims to accomplish this through the formulation of a Core Service Project Office(s) that offers standardized, architectures and provides common services to SMD Divisions.

The Program will be providing:

- Standardized architectures and common services to SMD
- Research data and software repositories
- An SMD-wide identity management system
- Technical support for SMD data and computing including cybersecurity

SMD Core Services: Foundation of a Layered Architecture



cloud image: Nou Project