



# NASA Open Science

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Policies Pertaining to EVS Projects

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# What is Open Science?

“We define open science as a collaborative culture enabled by technology that empowers the open sharing of data, information, and knowledge within the scientific community and the wider public to accelerate scientific research and understanding.”

from Ramachandran, R., Bugbee, K., & Murphy, K. J. Moving from Open Data to Open Science. Earth and Space Science, Wiley Publication <https://doi.org/10.1029/2020EA001562>

# The Meanings of “Open” in Open Source Science



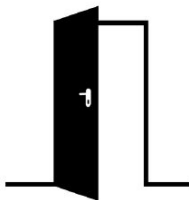
## Open (**Transparent**) Science

Both the scientific process and results should be visible, accessible and understandable.



## Open (**Accessible**) Science

Data, tools, software, documentation, publications should be accessible to all (FAIR).



## Open (**Inclusive**) Science

The process and participants should welcome participation by and collaboration with diverse people and organizations.



Created by Wendy Chen for the Moon Project

## Open (**Reproducible**) Science

The scientific process and results should be open such that they are reproducible by members of the community.

# Open-Source Science Policy for ESO

- A. All mission data, metadata, software, databases, publications, and documentation shall be available on a full, free, open, and unrestricted basis starting in Phase B with no period of exclusive access.
- B. Science workshops and meetings shall be open to broad participation and documented in public repositories.

1

**Software shall be developed openly** in a publicly accessible, version-controlled platform using a **permissive software license allowing for community use and contributions.**

4

Scientific data, metadata, software, publications and documentation **shall be archived by NASA and/or [Partner] starting in Phase B.**

2

**Manuscripts shall be published with open access licenses**; versions of as-accepted manuscripts shall be made available as open preprints and deposited in a NASA or [Partner] **repository upon publication.**

5

**NASA and [Partner] software, documentation and data shall be properly marked, cited, and/or attributed.** Metrics to measure and acknowledge open-source science contributions will be developed.

3

All mission **data, calibration information, and simulated products supporting development and validation of algorithms shall be made available without any conditions to use.**

6

**NASA and [Partner] will mutually develop an Open-Source Science Plan** that specifies details of collaboration.

# Open Science as Applied to EVS Projects

Follow Earth Science Data Systems Airborne Investigations Data System Requirements (ESDIS05125)

- Document data transfer in data management plans
- Produce data products and metadata
- Participate in data product application workshops
- Use ESD approved standards for data products

“Science data products and associated metadata along with the scientific algorithm software, coefficients, and ancillary data used to generate products will be delivered to the DAAC within 6 months”

# What does this mean for Software?

**Minimum:** Deliver software to DAAC for preservation with data. Software does not need to be pretty and will not be run by DAAC but will be retained to ensure future users can understand what steps were taken.

**Better:** Use open source software like python or use a jupyter notebook to communicate steps and processes

**Best:** Place open source software on github or other type of software sharing platform

# Some Resources

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## You are not alone!

- NASA Earthdata website: [earthdata.nasa.gov/esds/open-science](https://earthdata.nasa.gov/esds/open-science)
- [Open Data, Services and Software Policies](#)
- [Open Source Software Development Plan Guidelines](#)
- Support from your assigned DAAC
- [ADMG](#)
- New types of programs such as NASA OpenScapes  
<https://www.openscapes.org/>  
<https://earthdata.nasa.gov/learn/articles/openscapes>