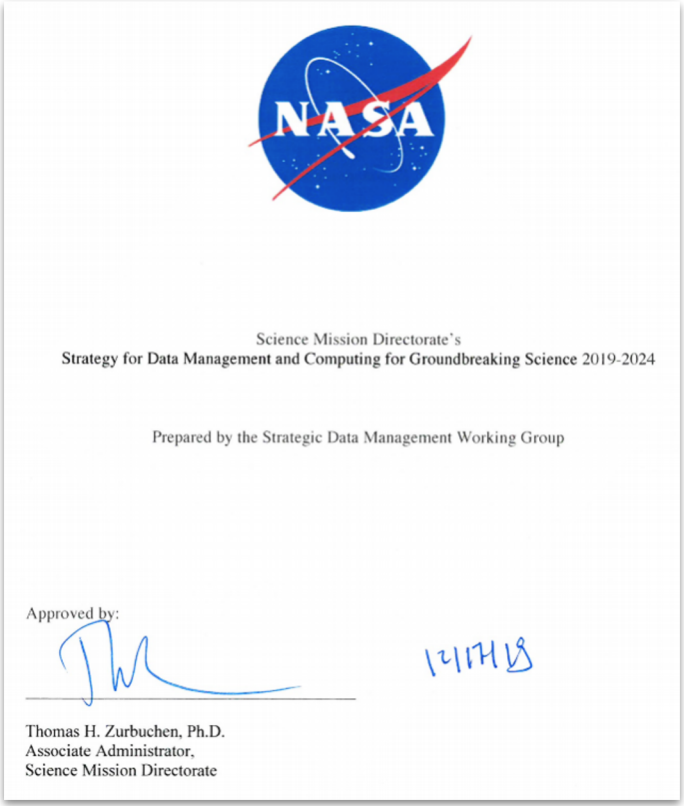
Transform to Open Science

Steve Crawford

Kevin Murphy, Katie Baynes, Chelle Gentemann, Yvonne Ivey, Manil Maskey, Kaylin Bugbee, Yaitza Luna-Cruz, Elena Steponaitis, Emily Cassidy, Christian Reyes, Frances Adele

7 December 2021

SMD Strategy for Data Management and Computing for Groundbreaking Science 2019-2024



Science Mission Directorate's
Strategy for Data Management and Computing for Groundbreaking Science 2019-2024

Prepared by the Strategic Data Management Working Group

Approved by:

12/17/19

Thomas H. Zurbuchen, Ph.D.
Associate Administrator,
Science Mission Directorate

Vision: To enable **transformational open science** through the continuous evolution of science data and computing systems for NASA's Science Mission Directorate.

Mission:

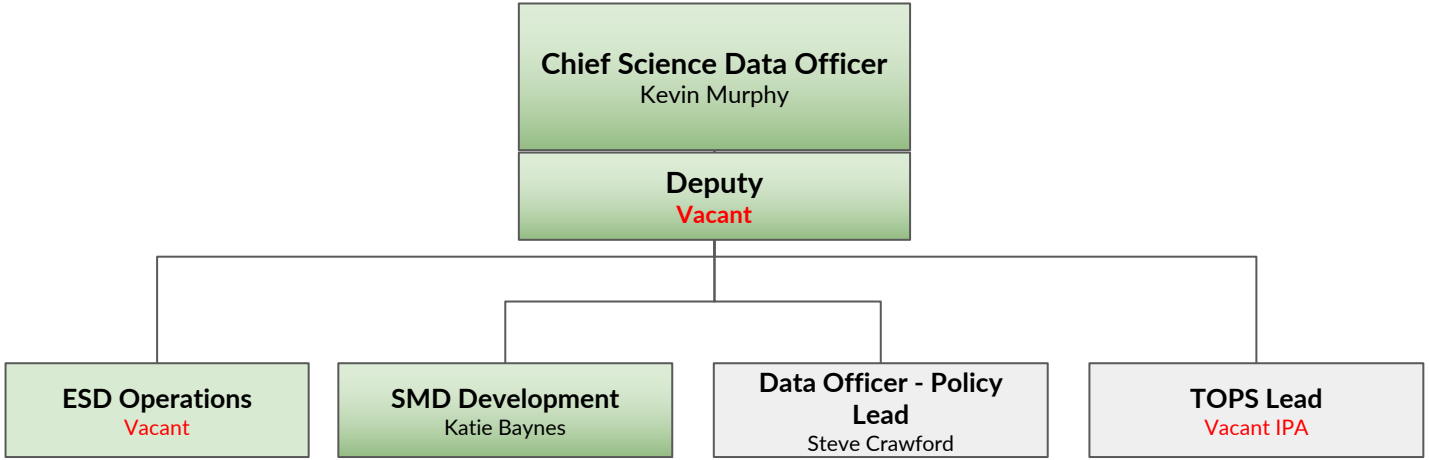
- Lead an **innovative and sustainable program** supporting NASA's unique science missions with academic, international, and commercial partners to **enable groundbreaking discoveries with open science**.
- **Continually evolve systems** to ensure they are usable and support the latest analysis techniques while protecting scientific integrity.

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

Chief Science Data Office



Manil Maskey - AI/ML Lead (MSFC)
Kaylin Bugbee - SMD Catalog Lead (MSFC)
Christian Reyes (C) - OSS Program Administration
Frances Adiele (C) - Administration

Yvonne Ivey (C) TOPS Project Manager
Chelle Gentemann (C) TOPS Sci Lead
Yaitza Luna-Cruz (C) Ops., DEIA, and ESDS Ops.
Emily Cassidy (C), communications
Elena Steponaitis (C) Policy and Dev. Mgt.

Open Source Science Initiative

OPEN SCIENCE

Open science is 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.

OPEN-*SOURCE* SCIENCE

Build on concepts from Open-Source Software, expanding participation in developing code, applying to the scientific process to accelerate discovery by openly conducting science from project initiation through implementation.

WHAT IS “OPEN” ABOUT OPEN-SOURCE SCIENCE?

The Four Meanings of “Open” in Open-source Science

OPEN (**TRANSPARENT**) SCIENCE
scientific process and results should be visible, accessible, and understandable

OPEN **(ACCESSIBLE)** SCIENCE
data, tools, software, documentation, and publications should be accessible to all (FAIR)

OPEN **(INCLUSIVE)** SCIENCE
process and participants should welcome participation by and collaboration with diverse people and organizations

OPEN (**REPRODUCIBLE**) SCIENCE
scientific process and results should be open such that they are reproducible by members of the community

Open-Source Science @ SMD

Initiates **Transform to OPen Science (TOPS),** a 5-year program to increase understanding and adoption of open science principles and techniques
Designates **2023 as Year of Open Science**

Continues **investments in open-source science digital infrastructure**, **cross-divisional AI capabilities and Digital Transformation activities**. (ROSES elements, data catalog, open journal database)

Prototype **common data catalog** by FY22Q4 and expand Astrophysics Data System

Initial investments in cross-division **open scientific cloud environments and data analysis platform prototypes**.

$130M in Divisional investments in Open-Source Science that are **aligned** with this program.

Fiscal year	OSS Total ($M)
FY21	$8
FY22	$21
FY23	$20
FY24	$20
FY25	$20
FY26	$20
FY27	$20

SPD-41: Scientific Information Policy

The science mission directorate has adopted SPD-41 that is a consolidation of existing policies applicable to SMD. These policies are based on our understanding of existing NASA and Federal guidance, and they are already part of solicitations for funding such as ROSES or SALMON Announcement of Opportunities. This applies to all SMD-funded activities related to producing scientific information, but *the policy excludes restricted information such as ITAR, export control, CUI.*

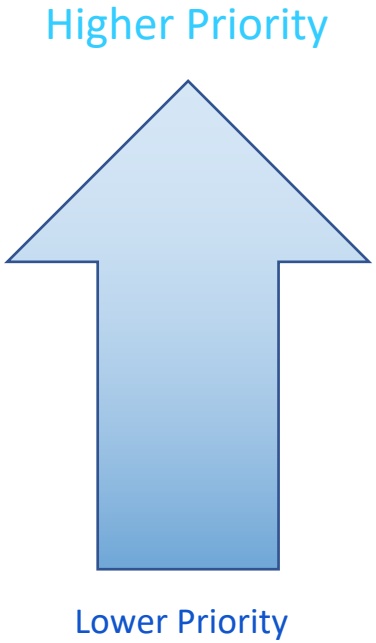
- These policies are applicable to all current or future awards, contracts, or cooperative agreements for scientific activities.
- SPD-41: The Science Information Policy
- Science Information Policy Website

In addition, SMD has released a Request for Information on proposed additions to the information policy based on new Federal guidance, NASA policy, National Academy studies, or community best practices. Responses are due Feb 11, 2022.

Next steps on the Information Policy

The development of the policy is only an early step in the overall 5 year process.
Here are *some* of the next steps:

1. RFI on the proposed policy additions and implementation
2. Identify ways to automate
3. Provide further guidance from the divisions
4. Provide training (TOPS)
5. Provide support for adopting open science
6. Support and/or develop technologies



Transform to Open Science

> PROTECTING & IMPROVING LIFE ON EARTH
> LIFE ON OTHER PLANETS
> MYSTERIES OF THE UNIVERSE

Accelerating Scientific Discovery

Overview

- TOPS 5-year initiative will act as a catalyst to ***jump-start*** a suite of coordinated activities designed to rapidly transform science.
- Designate **2023 as the Year of Open Science (YOOS).**
- Our focus for TOPS will be on early career scientist in NASA SMD communities, and welcome participation and coordination with other groups.

In 5 years, TOPS will:

1. **Increase understanding and adoption of open science principles and techniques in our Mission and Research Communities:** 20K scientists earn open science certifications, achievements, and badges at summer schools, society meetings, & other events
2. **Accelerate major scientific discoveries through supporting the adoption of open science:** ROSES solicitation to support major scientific discoveries using open science methods in each division: 5 major results within 5 years
3. **Broaden participation by historically excluded communities:** Double participation by historically excluded communities in submitted proposals, applications from students, and participation in mission teams.

These activities are designed to ***support and strengthen*** other NASA SMD initiatives including on Inclusion, Diversity, Equity, and Accessibility (IDEA), science activation, and climate change.

TOPS Communities of Practice

Visibility

Promote 2023 - Year of Open Science (YOOS), best practices in open science, and build partnerships with academia and scientific organizations

Capacity sharing: Learning resources and activities

Workshops, summer schools, and online learning enabled by interactive open science platforms populated by curated content .

Incentives

Reward and recognize open science work, fund open science activities, and advance science through challenges and other events.

Pathways Expansion

Prioritize true change and collaborate with historically excluded communities to co-develop opportunities and advance discovery.

Please reach out to us to find out more!

More information about TOPS is available at the website and GitHub repository

Opportunities

- Build training material using the “Open Science Imperative”
- Support open science in policy and solicitations
- Share the SPD-41 for others to use
- Update language in solicitations to support and encourage open science
- Assessing how open is the science being produced by SMD
- Create clear guidance on licenses and how to share publications, data, and software
- Adding to the open science success stories database
- Provide training and promoting on inclusive practices
- Adding to the Open Science Toolkit