National Aeronautics and Space Administration

NASA

A NASA OPEN-SOURCE SCIENCE MISSION: TOPS: TRANSFORM TO OPEN SCIENCE

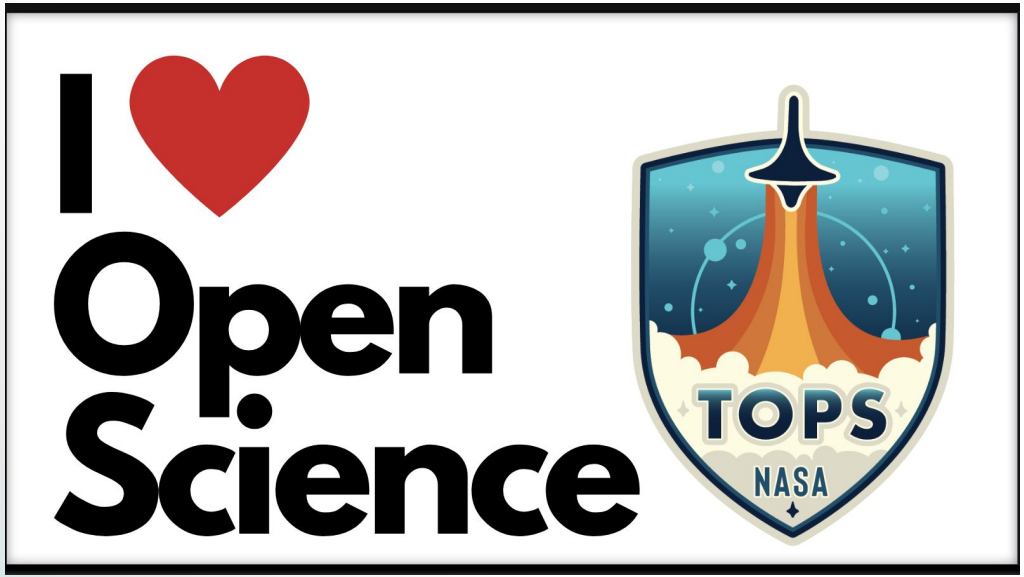
NASA HQ TOPS Core Team
Dr. Chelle Gentemann, TOPS Program Scientist
Yvonne Ivey, TOPS Project Manager
Cyndi Hall, TOPS Community Coordinator
Dr. Karla Mastracchio, TOPS Communication Strategy

NASA HQ OSSI Team
Kevin Murphy, Chief Science Data Officer SMD
Katie Baynes, Deputy Chief Science Data Officer SMD
Dr. Steve Crawford, Science Data Officer SMD
Amy (Uyen) Truong, Chief Science Data Office Coordinator
Christian Reyes, OSSI Coordinator
Dr. Yaitza Luna-Cruz, OSSI/TOPS Science Coordinator
Dr. Elena Steponaitis, OSSI/TOPS Science Advisor

Welcome!

We are encouraging people to use

#NASATops and #IHeartOpenScience



Code of Conduct

Expected Behavior

All participants are to...

- Be treated with respect and consideration, valuing a diversity of views and opinions
- Be considerate, respectful, and collaborative
- Communicate openly with respect for others, critiquing ideas rather than individuals
- Avoid personal attacks directed toward other participants
- Be mindful of your virtual surroundings and of your fellow participants
- Alert a host if you notice a dangerous situation or someone in distress
- Respect the rules and policies of the virtual meeting space

Unacceptable Behavior

- Harassment, intimidation, or discrimination of any form will not be tolerated
- Physical or verbal abuse of any participant
- Examples of unacceptable behavior include, but are not limited to, verbal comments related to gender, sexual orientation, disability, physical appearance, body size, race, religion, national origin, inappropriate use of nudity and/or sexual images in the meeting space or in presentations or threatening or stalking of any participant.
- Disruption of proceedings, panels, discussions, and/or lightning talks.

Code of Conduct (Continued)

Expected Behavior

- Anyone requested to stop unacceptable behavior is expected to comply immediately.
- Hosts may take any action deemed necessary and appropriate, including immediate removal from the meeting without warning.

Reporting Unacceptable Behavior

- If you are the subject of unacceptable behavior or have witnessed any such behavior, please immediately notify a meeting host.
- Notification should be done by contacting a host via direct chat or emailing your concern to Chelle Gentemann chelle.gentemann@nasa.gov
- Anyone experiencing or witnessing behavior that constitutes an immediate or serious threat to public safety is advised to contact 911 or your local emergency number.

Submit Feedback or Suggestions

Your inputs are essential to the success of our mission. Throughout this week's panel, please feel free to submit questions, feedback, or suggestions via the feedback tool.

You can use the QR code to access the feedback tool

Welcome

Chelle Gentemann

Transform to Open Science
Program Officer

Agenda

Time (ET)	*Agenda Item*	*Description*
12:00 pm	Introduction and Review of Code of Conduct	Karla Mastracchio
12:05 pm	Welcome and Meeting Objectives	Chelle Gentemann
12:10 pm	NASA's Open Science Vision	Kevin Murphy
12:20 pm	Introduction of Panelists	Yvonne Ivey
1:00 pm	Break	
1:10 pm	Transform to Open Science (TOPS): Introduction	Chelle Gentemann
1:20 pm	Transform to Open Science (TOPS): Areas of Action	Yvonne Ivey
1:40 pm	Discussion	Yvonne Ivey & Chelle Gentemann
2:00 pm	Break	
2:10 pm	Discussion: • How can TOPS best support adoption of open science? • How can TOPS best support open science communities? • What are future directions TOPS should consider?	Chelle Gentemann & Yvonne Ivey & Steve Crawford
2:55 pm	End of Day Wrap Up	Yvonne Ivey

Meeting Objectives

- The TOPS Community Panel will provide constructive feedback on TOPS mission, plans, and recent activities.
- This group will serve as a representative of their community in these conversations; and speak to their experience with open science; lessons learned in conducting open science; and provide input on future steps to be taken by TOPS, TOPS partners, and the greater NASA science community.
- Provide a written report within 4 weeks after each panel meeting.

Welcome

Kevin Murphy

NASA Chief Science Data Officer

Introductions

Yvonne Ivey
TOPS Project Manager

NASA Community Panelists

1. James Colliander
2. Kelle Cruz (Hans Guenther)
3. Monica Granados
4. Dominique Harrison
5. Kelsey Hightower
6. Pen-Yuan Hsing
7. Kari Jordan (SherAaron Hurt)
8. Logan Kilpatrick
9. Brian Nosek
10. Fernando Perez
11. Malvika Sharan
12. Gloria Washington
13. Talitha Washington
14. Lou Woodley
15. Qiusheng Wu














NASA Community Panelists

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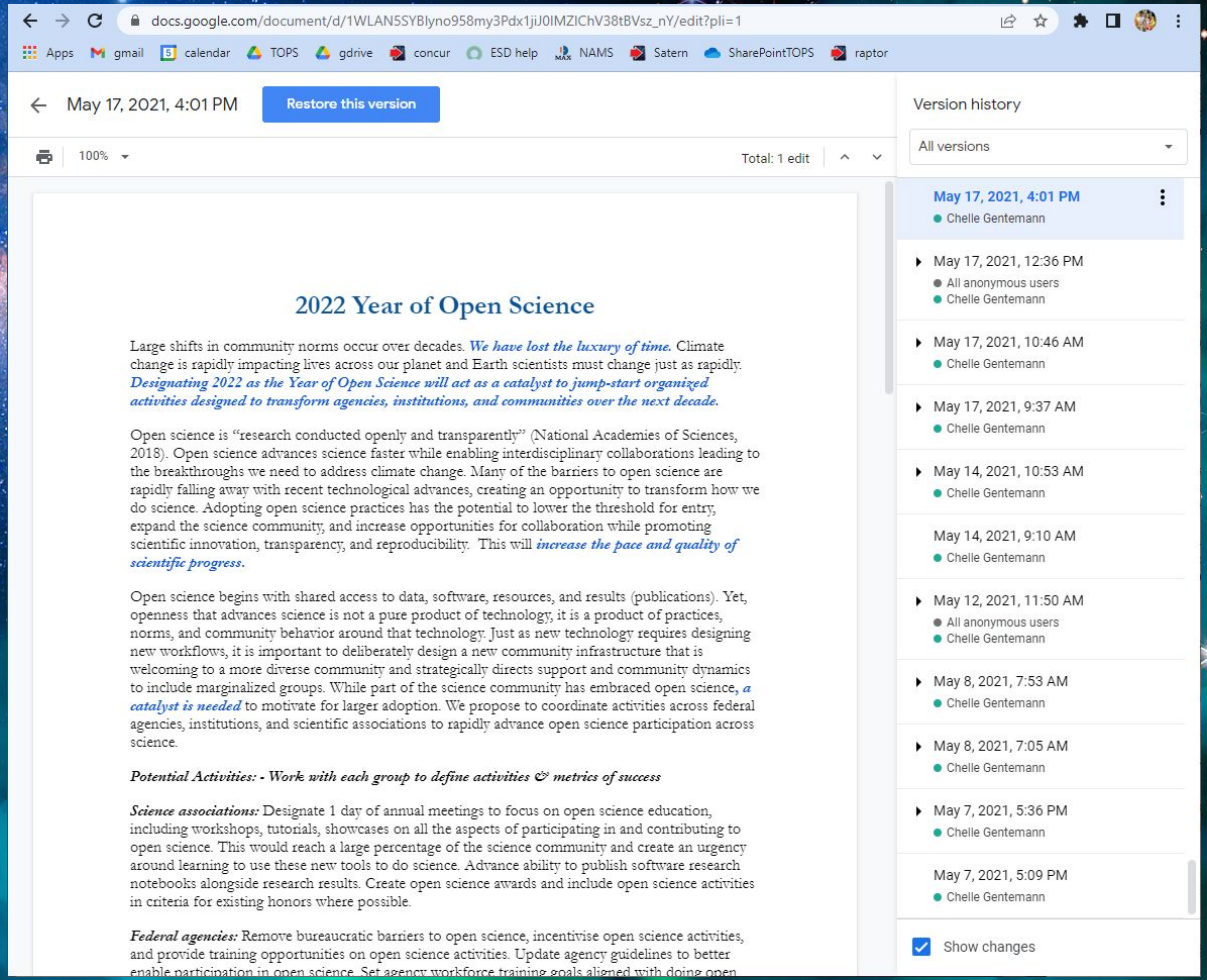
11. Malvika Sharan
12. Gloria Washington
13. Talitha Washington
14. Lou Woodley
15. Qiusheng Wu

Describe Yourself in 3 Minutes Or Less

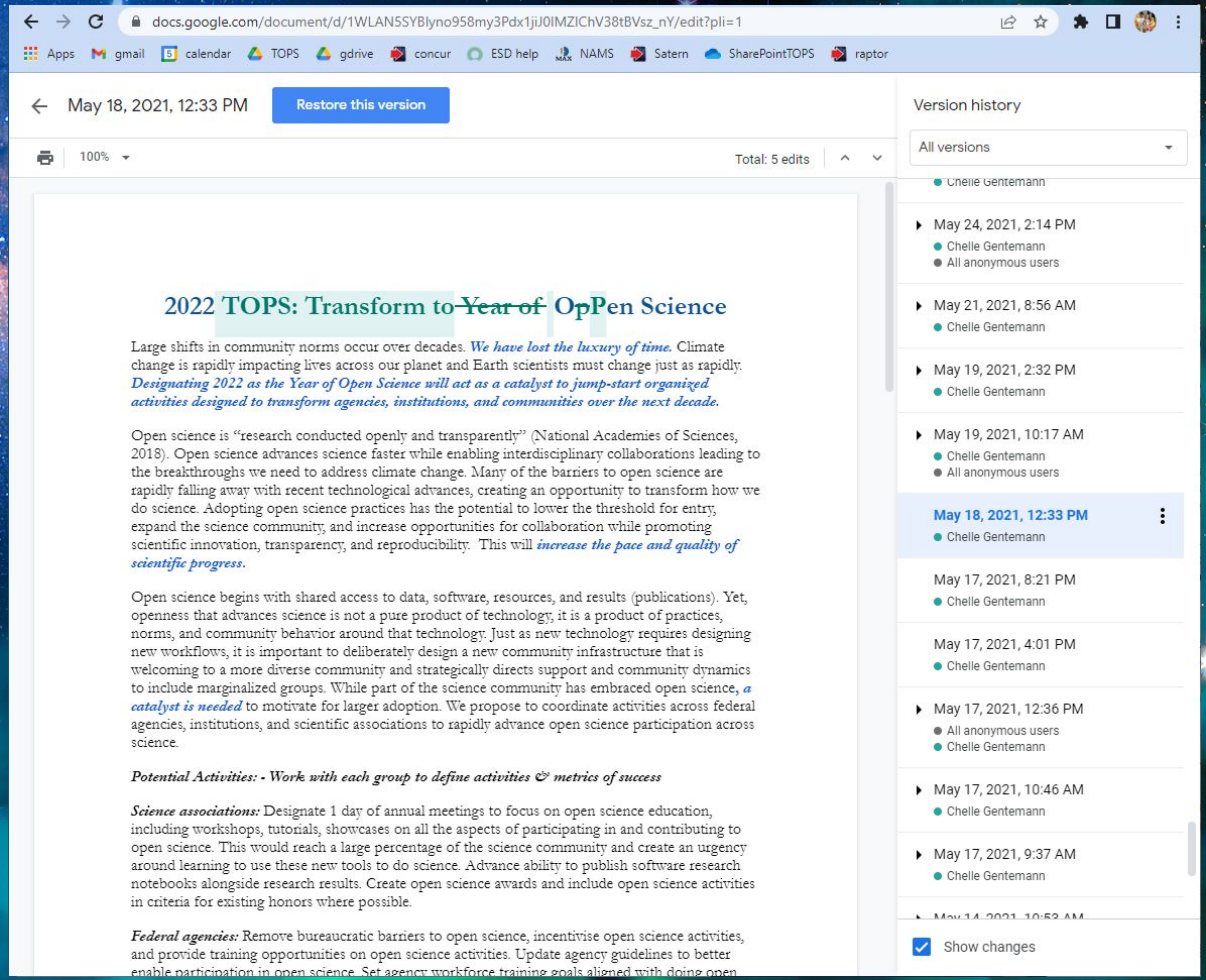
- Name
- Title and Institution
- Why did you volunteer with NASA TOPS?
- Why open science?


TOPS
TRANSFORM TO OPEN SCIENCE
National Aeronautics and Space Administration
NASA
A NASA OPEN-SOURCE SCIENCE MISSION:
TOPS: TRANSFORM TO OPEN SCIENCE
Introduction to TOPS

May 17, 2021



May 18, 2021


docs.google.com/document/d/1WLAN5SYBlyno958my3Pdx1jJ0IMZIChV38tBVsz_nY/edit?pli=1
Apps
gmail
calendar
TOPS
gdrive
concur
ESD help
NAMS
Satern
SharePointTOPS
raptor
May 18, 2021, 12:33 PM
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Total: 5 edits
2022 TOPS: Transform to ~~Year of~~ OpPen Science
Large shifts in community norms occur over decades. We have lost the luxury of time. Climate change is rapidly impacting lives across our planet and Earth scientists must change just as rapidly. Designating 2022 as the Year of Open Science will act as a catalyst to jump-start organized activities designed to transform agencies, institutions, and communities over the next decade.
Open science is "research conducted openly and transparently" (National Academies of Sciences, 2018). Open science advances science faster while enabling interdisciplinary collaborations leading to the breakthroughs we need to address climate change. Many of the barriers to open science are rapidly falling away with recent technological advances, creating an opportunity to transform how we do science. Adopting open science practices has the potential to lower the threshold for entry, expand the science community, and increase opportunities for collaboration while promoting scientific innovation, transparency, and reproducibility. This will increase the pace and quality of scientific progress.
Open science begins with shared access to data, software, resources, and results (publications). Yet, openness that advances science is not a pure product of technology, it is a product of practices, norms, and community behavior around that technology. Just as new technology requires designing new workflows, it is important to deliberately design a new community infrastructure that is welcoming to a more diverse community and strategically directs support and community dynamics to include marginalized groups. While part of the science community has embraced open science, a catalyst is needed to motivate for larger adoption. We propose to coordinate activities across federal agencies, institutions, and scientific associations to rapidly advance open science participation across science.
Potential Activities: - Work with each group to define activities & metrics of success
Science associations: Designate 1 day of annual meetings to focus on open science education, including workshops, tutorials, showcases on all the aspects of participating in and contributing to open science. This would reach a large percentage of the science community and create an urgency around learning to use these new tools to do science. Advance ability to publish software research notebooks alongside research results. Create open science awards and include open science activities in criteria for existing honors where possible.
Federal agencies: Remove bureaucratic barriers to open science, incentivise open science activities, and provide training opportunities on open science activities. Update agency guidelines to better
Version history
All versions
Chelle Gentemann
May 24, 2021, 2:14 PM
Chelle Gentemann
All anonymous users
May 21, 2021, 8:56 AM
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May 19, 2021, 2:32 PM
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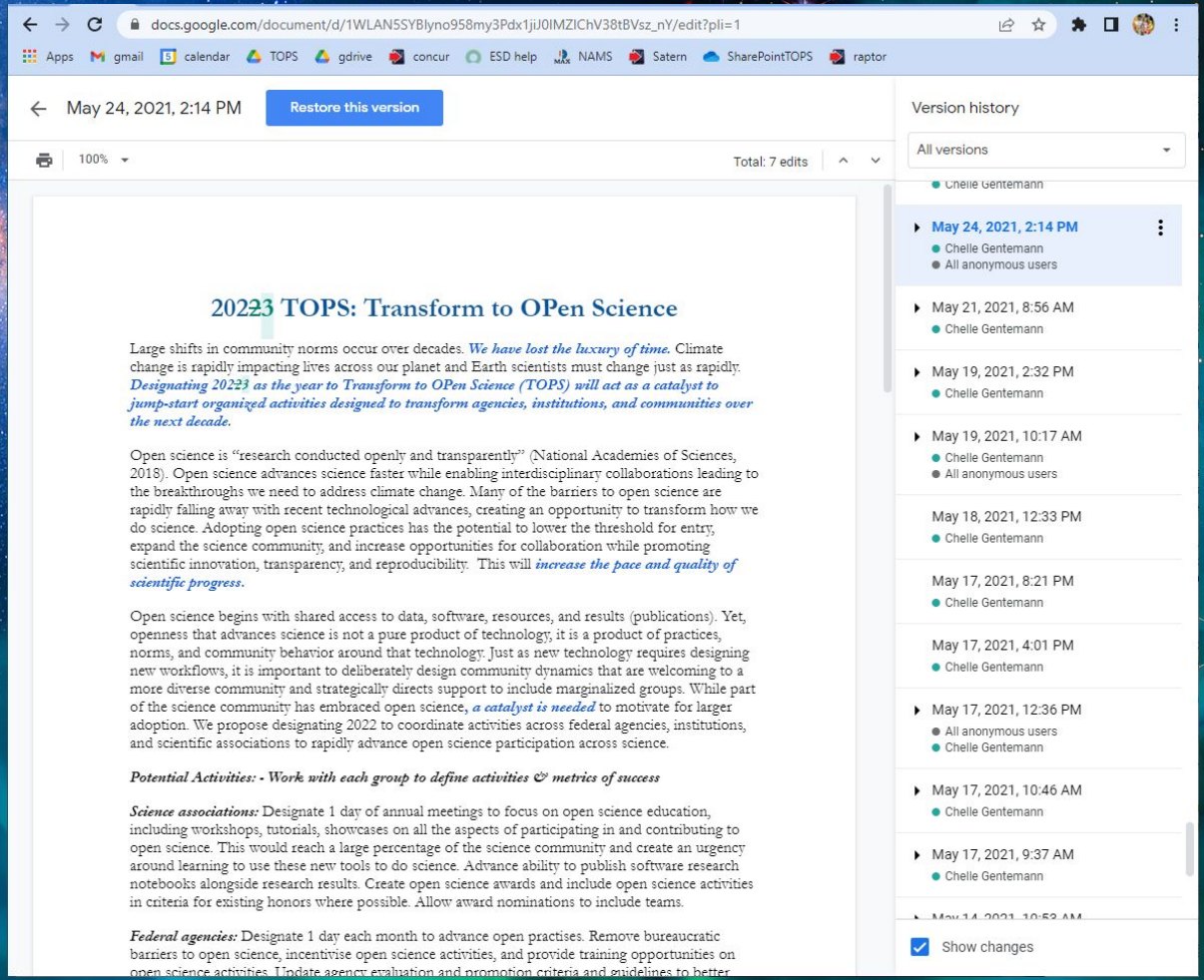
May 24, 2021



2022~~3~~ TOPS: Transform to OPen Science

Large shifts in community norms occur over decades. *We have lost the luxury of time.* Climate change is rapidly impacting lives across our planet and Earth scientists must change just as rapidly. *Designating 2022~~3~~ as the year to Transform to OPen Science (TOPS) will act as a catalyst to jump-start organized activities designed to transform agencies, institutions, and communities over the next decade.*

Open science is "research conducted openly and transparently" (National Academies of Sciences, 2018). Open science advances science faster while enabling interdisciplinary collaborations leading to the breakthroughs we need to address climate change. Many of the barriers to open science are rapidly falling away with recent technological advances, creating an opportunity to transform how we do science. Adopting open science practices has the potential to lower the threshold for entry, expand the science community, and increase opportunities for collaboration while promoting scientific innovation, transparency, and reproducibility. This will *increase the pace and quality of scientific progress.*

Open science begins with shared access to data, software, resources, and results (publications). Yet, openness that advances science is not a pure product of technology, it is a product of practices, norms, and community behavior around that technology. Just as new technology requires designing new workflows, it is important to deliberately design community dynamics that are welcoming to a more diverse community and strategically directs support to include marginalized groups. While part of the science community has embraced open science, *a catalyst is needed* to motivate for larger adoption. We propose designating 2022 to coordinate activities across federal agencies, institutions, and scientific associations to rapidly advance open science participation across science.

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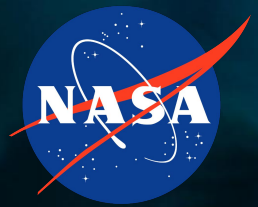
Science associations: Designate 1 day of annual meetings to focus on open science education, including workshops, tutorials, showcases on all the aspects of participating in and contributing to open science. This would reach a large percentage of the science community and create an urgency around learning to use these new tools to do science. Advance ability to publish software research notebooks alongside research results. Create open science awards and include open science activities in criteria for existing honors where possible. Allow award nominations to include teams.

Federal agencies: Designate 1 day each month to advance open practises. Remove bureaucratic barriers to open science, incentivise open science activities, and provide training opportunities on open science activities. Update agency evaluation and promotion criteria and guidelines to better

1 year later….



github.com/nasa/Transform-to-Open-Science

LICENSE.MD	Adding public domain license	9 months ago
README.md	Update README.md	17 hours ago

README.md

Announcements!

- 12 May 2022 TOPS Community Forum
- 17-19 May 2022 TOPS Community Panel
- Funding Opportunities

Transform to OPen Science (TOPS)

What We Do

The world is changing rapidly. Everyday new problems emerge and it takes groundbreaking scientific discoveries to solve them. To stay ahead, the pace of science must accelerate and science needs to be even better, more accurate, and faster to enable the truly transformative breakthroughs that will help us thrive. Closed science, hoarding information and resources, silos of knowledge holds science back. We need more voices that work together and share knowledge and resources. Only then will we find new and unexpected solutions. Transforming to Open Science (TOPS) will allow us to create a scientific culture that is ready for 21st century challenges. Open Science will **broaden participation, increase accessibility to knowledge, and embrace new technologies** that can respond to these changes at scale. We hope you will join us in creating an open science infrastructure in your organization. TOPS will show you how!

Goals

Open Science creates more advanced and inclusive research faster, builds a more just and equitable world, and ensures that minds from all walks of life can participate in science. TOPS is NASA's ambitious plan to accelerate open science practices. It's a 5 year journey that will

1. Increase understanding and adoption of open science principles and techniques
2. Accelerate major scientific discoveries
3. Broaden participation by historically excluded communities

TOPS and the Year of Open Science

2023 is the Year Of Open Science, a global community initiative to spark change and inspire open science engagement through events and activities that will shift the current paradigm and change practices. *The Transform to Open Science (TOPS) project coordinates efforts designed to rapidly transform agencies, organizations, and communities.*

Releases
No releases published
Create a new release

Packages
No packages published
Publish your first package

Contributors 13
+ 2 contributors

Languages
CSS 68.7% HTML 25.8%
SCSS 5.1% Other 0.4%

Open Science: Accessible, Reproducible & Inclusive…

Creates research that is:

Cited more

Creates a bigger impact

Increases transparency

Generates more scholarly collaborations

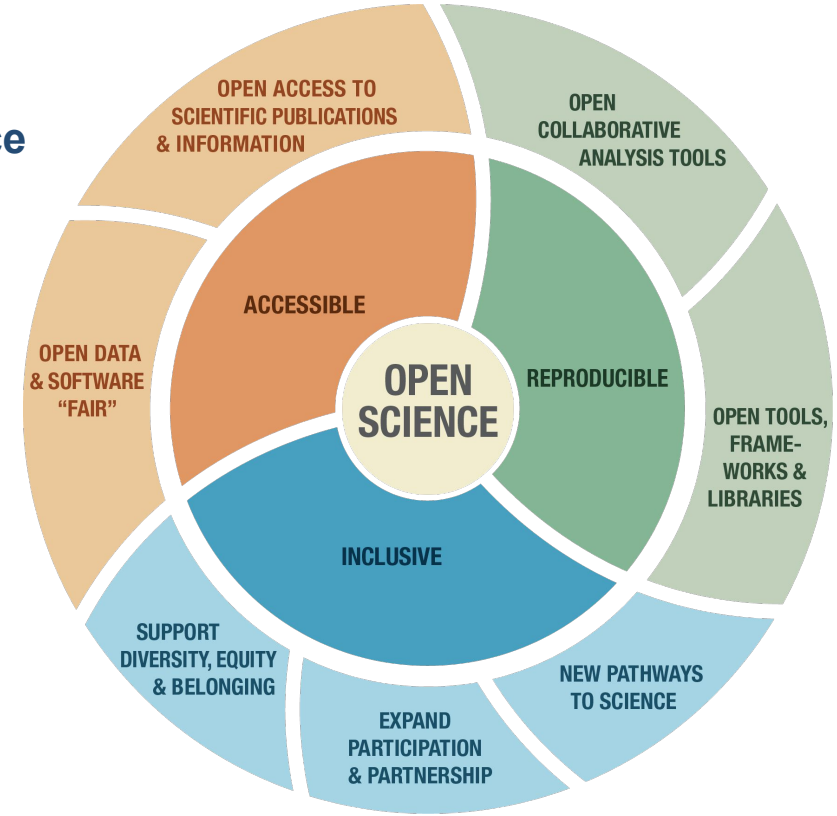
Inclusive science means more:

Collaborative projects

Access to ‘hidden knowledge’

Equitable Systems

Participation

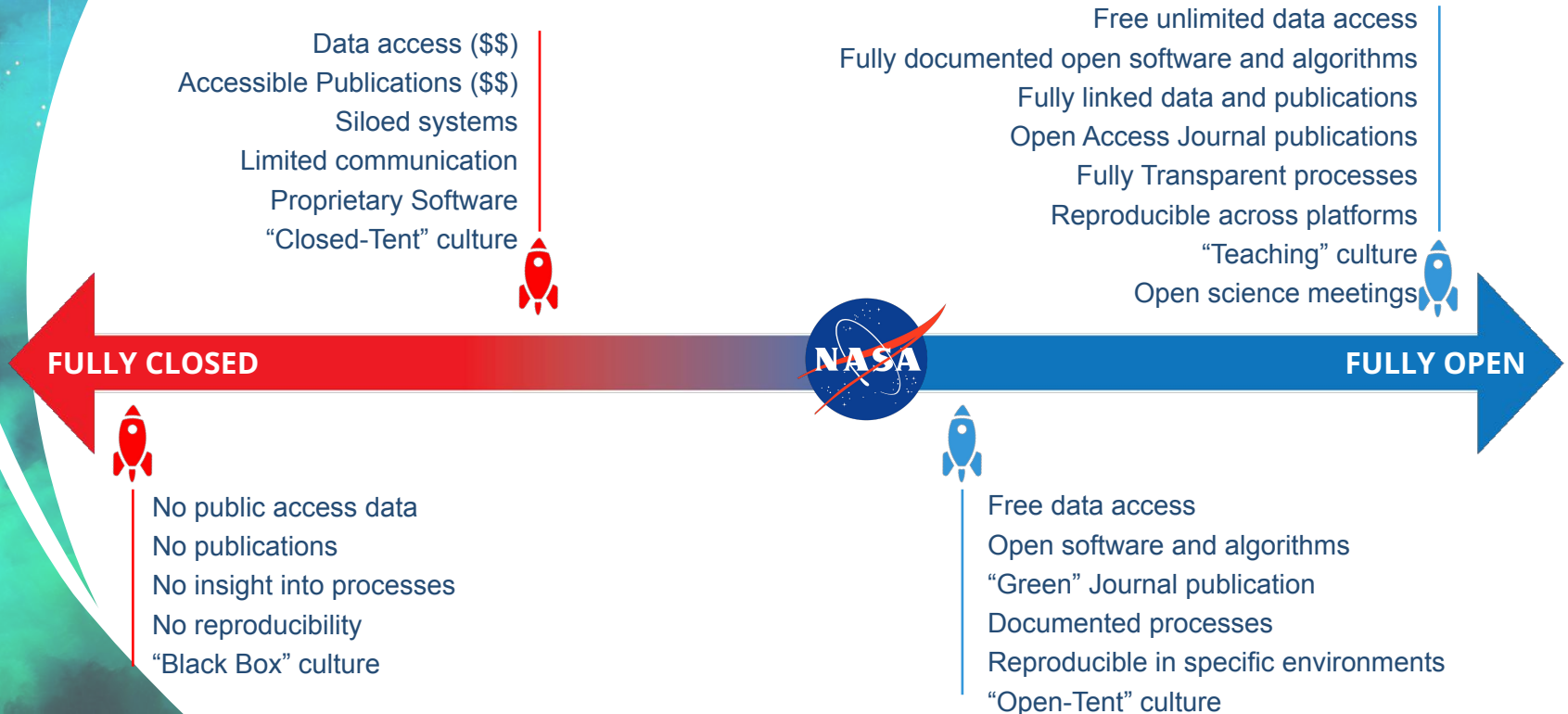


Open-Source Science is NASA's method to put Open Science into practice.

- **Open** the entirety of the scientific process, ***from start to finish***
- **Broaden** community involvement in the scientific process
- **Increase** accessibility of data, software, & publications
- **Facilitate** inclusion, transparency, and reproducibility of science

NASA's Open-Source science is the *activation* of an open science community

A continuum of open-source science



Why Open Science?

We are facing **Big** Challenges:

Covid, Climate change, …

Image credit: NOAA

We need ***more*** people - more hands, more eyes, more brains - with diverse experiences to participate so that we ask the best questions and find the best solutions

Image credit: Twentieth Century Fox

Open Science:

- Accelerates the pace of science
- Increases the impact of science
- Expands applications of data and science
- Shares hidden knowledge & expands participation in science

Why Now?

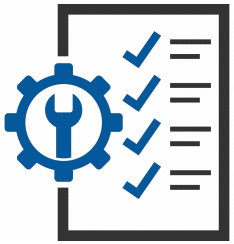
We **now** have the tools to make open science a reality. Advances in technology have created accessible, reproducible, inclusive science at a scale not possible a few years ago.

There is national and global momentum for the move to open science.

Equal and open access benefits the public

NASA's Open-Source Science Initiative

Unlocking the full potential of a more equitable, impactful, efficient, scientific future



Policy development, education, compliance tools
Updating NASA Science policies on scientific information to better enable the activation of open science (eg. SPD-41a)

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

ROSES Elements
Supporting open-source software, tools, frameworks, libraries, platforms, and training with over $5 million dollars in grants per year

Community Building & Partnerships - Transform to Open Science (TOPS)
Accelerating adoption of open science and expanding participation of marginalized communities in science


TOPS
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A NASA OPEN-SOURCE SCIENCE MISSION:
TOPS: TRANSFORM TO OPEN SCIENCE
Yvonne Ivey
TOPS Area of Actions

Leading the Path to Open-Source Science

Transform to Open Science (TOPS) is a $40 million* 5-year NASA Science Mission Directorate mission

Objectives:

- ★ Increase understanding & adoption of open science.
- ★ Accelerate major scientific discoveries.
- ★ Broaden participation by historically underrepresented communities.

Year of Open Science

Goals for 2027:

- ★ 20K earn Open Science Badge
- ★ 5+ major discoveries
- ★ Increase participation of underrepresented groups by 2x

*pending appropriations

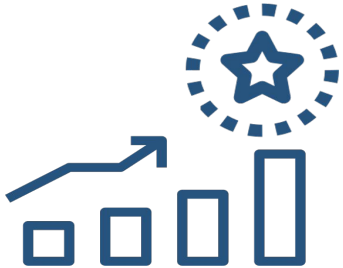
2023 is NASA's Year of Open Science

TOPS will be energizing and uplifting open science across the scientific community through:

Engagement

Capacity Sharing Resources

Incentives



Moving towards openness

Area of Action: Engagement

Focused Community **Building**

- Activities at all large science annual meetings
- Launch the TOPS Open Science Curriculum
- Targeted Outreach with MSIs
- Monthly Community Forums
- TOPS Community Panel
- GitHub (discussions enabled)
- Website

Area of Action: Capacity Sharing Resources

OpenCore Open Science Curricula: 5 Modules Organized as a Scientific Workflow

What is open science, why does it benefit me, and why does it benefit the greater scientific community?

How to use popular open science tools

How to share software

How to effectively use and share open data

Best practices for sharing all results and analysis, as well as peer reviewing

ETHOS OF OPEN SCIENCE → OPEN TOOLS & RESOURCES → OPEN SOFTWARE → OPEN DATA → OPEN RESULTS

Earn Micro-Badges at Each Level

Complete All 5 & earn TOPS Open Science Badge & Certification

Area of Action: *OpenCore*

- *OpenCore* hosted on Open edX
  - High quality, interaction open online course
  - Free, public, open
  - Fast-pass option
  - Open edX Learning Management System (LMS) tracks learners, completion of modules, and data analytics

- Easily discoverable and accessible
  - In-person workshops at big society meetings and summer schools
  - Organized virtual cohorts
  - Independent learning

Gamification of open science courses through badges and certifications via prizes, challenges, and hackathons!

Area of Action: Capacity Sharing Resources

Engagement with the Community

TOPS Champions

Scientists to help teach modules at events and act as Open Science champions

Cohorts

Engage with learners through a virtual cohort model to increase Open Science Badge achievement

Summer Schools

Institutions selected to run ~6 weeks of teaching the 5 modules to selected science teams + open competitive under-represented researchers

Curriculum Expansion

Groups funded to migrate/create discipline specific modules and data science skills modules to Open edX TOPS platform

Hackathons

More hackathons that advance data science skills and open science

Area of Action: Incentives

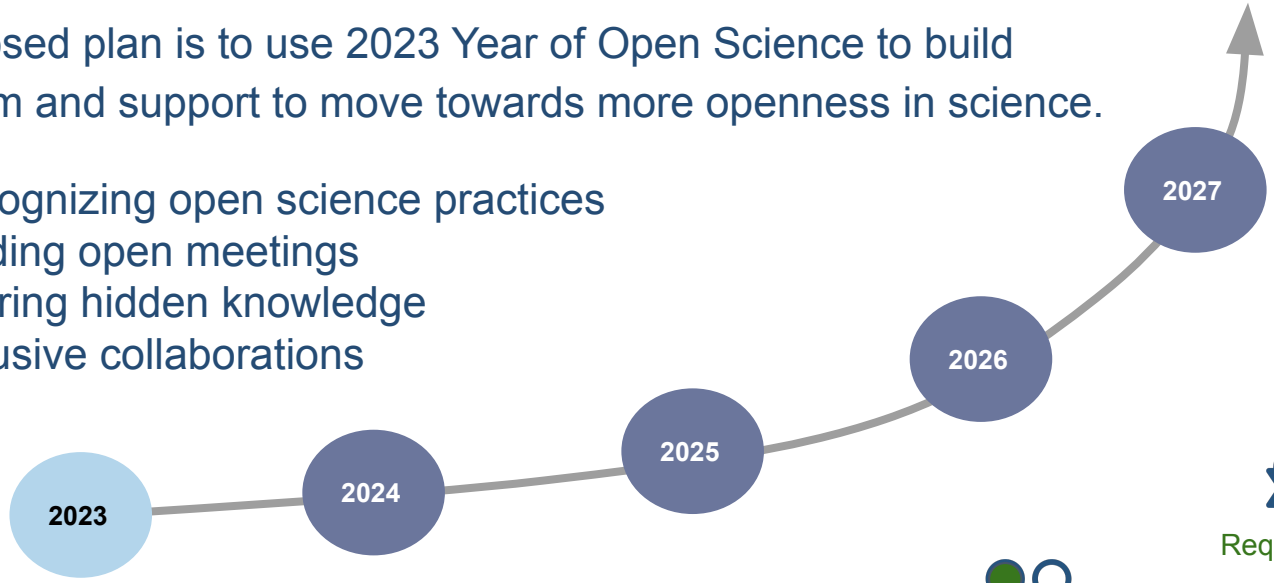
Open Science Awards

- Award Purpose: To reward significant leadership and progress toward open science and showcase the benefits of open science
- Societies establish and sustain TOPS Open Science Prizes and Awards programs
- TOPS will work with societies to evaluate and update their existing awards and recognitions to:
  - Include open science activities as review criteria
  - Where possible allow for team nominations

Area of Action: Moving towards Openness
Year of Open Science and the Future

Our proposed plan is to use 2023 Year of Open Science to build momentum and support to move towards more openness in science.

- Recognizing open science practices
- Holding open meetings
- Sharing hidden knowledge
- Inclusive collaborations



Require a lot*

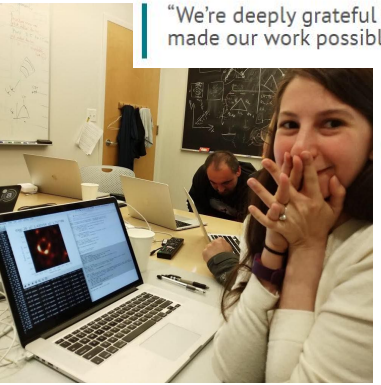
Require a little more*

Require a little*

Proposed: Update necessary systems to allow for documentation of past open science activities and proposed data, software, and publication plans

Open Science Results Speak for Themselves…

> "We're deeply grateful to all the open source contributors who made our work possible." –Dr. Katie Bouman



First image of black hole

> "The open source community is very important for scientists; imagine if we had to do everything from scratch every single time." –Dr. Chi-Kwan Chan

> We "greatly improve[d] our own work by adopting well-tested community packages that contain the collected wisdom of many other projects." –Dr. Lindy Blackburn

> "with the open source projects in NumFOCUS, we were able to iterate our algorithms so fast that they enabled us to finish our work in two years"

Scott Collis (He/Him) @Cyclogenesis_au

Replying to @ChelleGentemann @openscience and @theNASEM

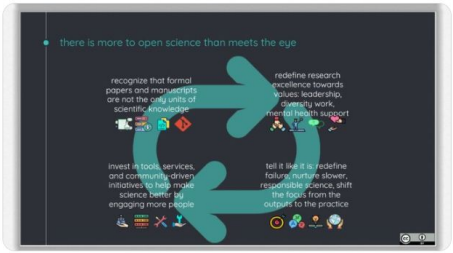
Being an open scientist has:
1) accelerated my career. It has allowed me to choose projects which benefit more people.
2) Has created long lasting collaborations and friendships. When you are open you are… open!
3) Made me a better scientist. "Show your working!"

6:36 AM · Mar 12, 2022 · Twitter Web App

Paola Masuzzo @pcmasuzzo

Replying to @ChelleGentemann and @theNASEM

An aspect we should talk more about, open research practices as a driver to a real reform in the research endeavour. I try to depict it in this image :)



Dr. Julia Stewart Lowndes @juliesquid

Replying to @ChelleGentemann and @theNASEM

Congrats Chelle!
The welcoming, inclusive, collaborate-and-reuse culture of the #rstats community is something that changed my science-life and my life-life. Hard to distill but here are a few attempts:
openscapes.org/blog/2020/02/2…
openscapes.org/blog/2019/02/1…
openscapes.org/blog/2019/08/2…

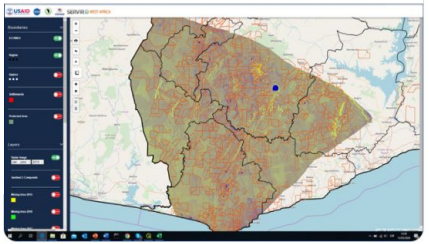
3:15 PM · Mar 11, 2022 · Twitter Web App

Belize GEO @BzGEO · Mar 11

Replying to @ChelleGentemann and @theNASEM

Our friends @SERVIRGlobal have many examples of how algorithms + code from one region have been customized for use in another. An example is gold mining monitoring, where Amazonia + W. Africa have collaborated in an #OpenScience context, leveraging #GEE.

> **simonestaiger** @simonestaiger · Apr 8, 2020
> Reducing illegal gold mining in the tropical forests of Ghana and Peru: A forthcoming collaboration across the Atlantic #SERVIRamazonia servir.ciat.cgiar.org/illegal-gold-m… @USAIDPeru @SERVIRGlobal @CERSGIS_GH @NovoaSidney @amazonacca @sig_gis @BiovIntCIAT_eng



Lucas Sterzinger @lucassterzinger

Replying to @ChelleGentemann and @theNASEM

Probably the most common answer, but using @xarray_dev, @dask_dev, @ProjectJupyter, and @matplotlib has been the backbone of my research since day 1. Working with these tools also motivates me to make the data and code for my plots open source, making my science more reproducible

7:41 AM · Mar 11, 2022 · Twitter Web App

Pierre de Buyl @pdebuyl

Replying to @ChelleGentemann and @theNASEM

In remote sensing: using @PyTrollOrg satpy as a comparison point for reading geostationary satellite data, @scitools_iris and panoply from @NASA for plotting said data.

12:15 PM · Mar 11, 2022 · Twitter Web App

Sam Ehrenstein @elasticsnake

Replying to @ChelleGentemann and @theNASEM

In computer science, research moves very fast. It would not be possible to keep up with the latest work if not for the arXiv and open-access conferences.

1:47 PM · Mar 14, 2022 · Twitter W

Ricardo Barros Lourenço @rblourenco

Replying to @ChelleGentemann and @theNASEM

I've briefly returned to the public-private sector (between 2019-21) and the nicest thing about working with OSS during all my career was the ability to show new methods to be applied in that company, which was of clear understanding, helping auditing efforts.

7:56 AM · Mar 12, 2022 · Twitter Web App

Max Grover @mgroverwx · Mar 11

Replying to @ChelleGentemann and @theNASEM

Here's a great use-case of @Py_ART , which is funded by @doescience @armnewsteam ! Over 200 citations so far, with many including awesome code like this paper which enables #OpenScience !

> **Milind Sharma** @Gewitter_Blitz · Mar 11
> The power of open source software! The authors (@jehcssou and @deeplycloudy) also provide a clean code to encourage reproducible science. I could apply their technique to my dataset within a few hours. Neat! Yes to #OpenScience

Quotes from https://numfocus.org/case-studies/first-photograph-black-hole