

# Polarimeter to Unify the Corona and Heliosphere



## PUNCH as an Open Science Mission

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PUNCH 4 Science Meeting  
7 July 2023






# PUNCH's Open Science Journey

## Goals

- Create a welcoming, open, collaborative atmosphere.
- Advance PUNCH mission science through open collaboration.
- Improve PUNCH data products and software through collaborative efforts.
- Build public trust in PUNCH mission results through open sharing of work in progress and community engagement (such as the growing flow tracking team).
- Guard against negative influences through DOIs and collaboration/conduct rules.
- Tell the story of the PUNCH mission to the wider community.

our power grids, satellites, and astronauts. For the first time PUNCH will track the solar wind continuously across the void, to help us better understand the Sun, the solar wind, and their effects on humanity.

### NEWS

-  PUNCH Outreach Retreat a success!
- PUNCH 4 Meeting: July 6-7, 2023  
2022-12-19
- PUNCH Winter Telecon - January 23, 2023  
2022-12-13
- PUNCH Outreach Celebrates First "In-Person" Team Meeting in New Mexico  
2022-11-03

PUNCH is a mission in the NASA Small Explorers line. This mission website is maintained by SwRI and UCAR.

**THE MISSION**  
Fast Facts About PUNCH and Its Instruments

**THE SCIENCE**  
A New View of the Corona and Heliosphere

**GET INVOLVED WITH PUNCH OUTREACH**  
Science Outreach with PUNCH

**GET INVOLVED WITH PUNCH SCIENCE**  
Data Access and Analysis Tools



# Open Science overview

In January 2023, the White House, 10 Federal Agencies, and a coalition of universities and organizations declared 2023 to be a “Year of Open Science.”

Many organizations and federal agencies have open science initiatives:

<https://open.science.gov/>

The Year of Open Science has 4 goals:

1. Establish strategic approaches for advancing open science,
2. Promote equitable participation in open science through transparency, integrity and equity of reviews,
3. Account for open science activities in evaluations and incentives, and
4. Engage underrepresented communities in the advancement of open science and research.

NASA’s initiative is a 5-year program called TOPS:  
Transform to Open Science





# Open Science overview

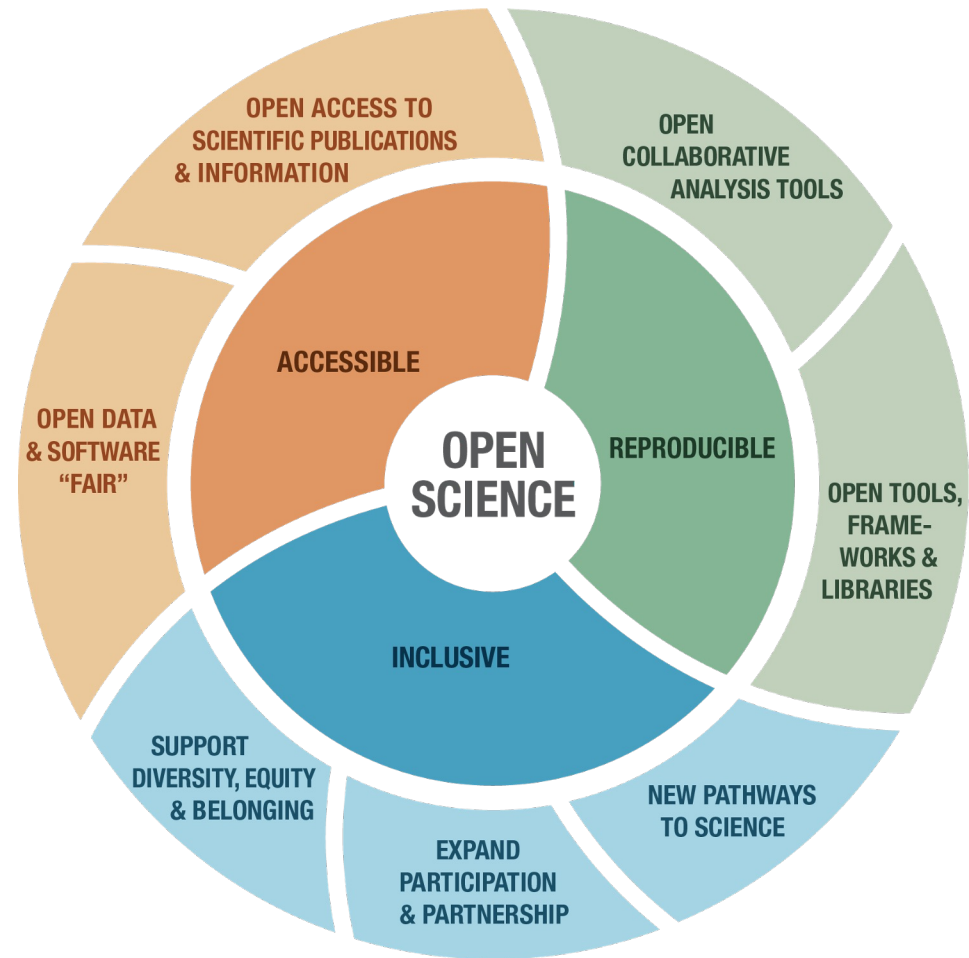
## What are the principles of Open Science?

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.

### Why open science?

- Accelerates scientific discovery.
- Greater collaboration and efficiency.
- Enhanced transparency and reproducibility
- Mandated by the U.S. White House and NASA.

Source: <https://www.whitehouse.gov/ostp/news-updates/2023/01/11/fact-sheet-biden-harris-administration-announces-new-actions-to-advance-open-and-equitable-research/>





# Open Science Missions

The TOPS initiative recommends that individuals complete five training modules:

- Ethos of Open Science
- Open Tools and Resources
- Open Data
- Open Software
- Open Results

There are additional recommendations for teams, organizations and projects. TOPS has three supplemental open science guides (individuals, teams, and organizations).

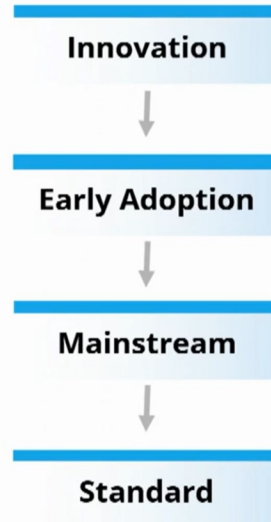
Thus far, there are no guidelines specific to an open mission - PUNCH can be the first!



# PUNCH's Open Science Journey

How does a mission incorporate open science principles?

## Implementation Strategy for Scaling Open Scholarship



### **Make it Possible**

INFRASTRUCTURE, TOOLS, PROCESSES

### **Make it Easy**

RESEARCHER-CENTRIC, INTEGRATED SOLUTIONS

### **Make it Normative & Rewarding**

COMMUNITY-BUILDING, TRAINING, INCENTIVES

### **Make it Required**

POLICY REFORM AND IMPLEMENTATION



Image credit: Lisa Cuevas Shaw, Chief Operating Officer and Managing Director, Center for Open Science. The session was part of the COS 10 Year Anniversary, which took place in Washington, DC on May 8, 2023.

[https://www.youtube.com/watch?v=dgB8Ry\\_cRwE&list=PLChfyH8TVDGmWyGePxToZ4ZcNiBkFKubl&index=5](https://www.youtube.com/watch?v=dgB8Ry_cRwE&list=PLChfyH8TVDGmWyGePxToZ4ZcNiBkFKubl&index=5)



# PUNCH's Open Science Journey

How does a mission incorporate open science principles?

(Draft guidelines from R. Ringuette)

## Engage

- Team leaders and members become familiar with the practices of open science (and complete the training modules when available).
- Host listening sessions for the PUNCH team to discuss how to include open science practices.
- Draft an open science policy for PUNCH.
- Appoint team members responsible for guiding open science practices.
- Discuss ways to incorporate open science practices in all mission aspects.
- Work through possible legal limitations and policies.
- Clearly identify activities and resources that are open to non-team-members.
- Utilize open access platforms (like HelioNauts, github discussion) to ensure everyone has access to knowledge and solutions.



# PUNCH's Open Science Journey

How does a mission incorporate open science principles?

## Practice

- Share sample datasets in a public repository with a DOI.  
*(preferably SDAC or SPDF, could be Zenodo)*
- Create a network of projects with DOIs (e.g. one subproject per working group) on the Open Science Framework (<https://osf.io/>).
- If allowed, post research plans (with DOIs!) on the OSF project pages.
- Construct and post a collaboration code of conduct on the PUNCH website and all related pages. *(e.g. code repositories and OSF project webpages)*
- Define a clear way for potential collaborators to contact PUNCH science working group leaders.
- Add short routine updates (e.g. every 1-2 months) on each groups page on what the group is working on or has recently achieved (e.g. 1-2 paragraphs with a graphic or group picture).





# PUNCH's Open Science Journey

How does a mission incorporate open science principles?

## Practice

- Collaborate with existing open source software to accelerate PUNCH development (*e.g. through PyHC telecons and mailing list*).
- Create a public code repository with a DOI for each section of software. (*If this is done with Github, it can be linked to the OSF pages easily.*)
- Collaborate with the public on documentation and tests for those softwares.
- Create a book of executable notebooks demonstrating various portions of the data processing, calibrations, and science analyses. (*Can host on PUNCH website, HelioCloud, or other platforms.*)
- Conduct routine (e.g. yearly) competitions between science working groups to replicate the other groups' work. Include the public on this via hackathons. (*This work can be published!*)
- Contribute a success story to the NASA TOPS effort. (<https://science.nasa.gov/open-science/transform-to-open-science/stories/>)
- Provide feedback to the NASA TOPS open science recommendations.



# PUNCH's Open Science Journey

How does a mission incorporate open science principles?

## Reward and Reinforce

- Create an open science points system for individuals and teams to be acknowledged for effort (or earn rewards).
- Use the TOPS and OSF badges to recognize significant open science accomplishments of each science working group (see <https://osf.io/tvyxz/> and examples).
- Make these badges public on the PUNCH website and related pages (e.g. code repositories, OSF project pages/subpages, etc). (Wear them proudly!)
- Incorporate open science activities in promotion assessments and hiring practices.
- Routinely recognize leadership in open science activities in mission-wide emails, but also include other forms of leadership and initiative.
- Present on these efforts at major meetings and venues each year.





# PUNCH's Open Science Journey

## Kudos\* for PUNCH!

- No special access for Co-I's: data and tools are publicly available as soon as possible
- PUNCH SOC and data pipeline
  - planned as open source from the start
  - possibility of community-provided code and data products to be incorporated and supported by PUNCH
  - prioritizes compatibility with user infrastructure (such as PyHC)
- Website's top priority is to provide information on PUNCH to public
- Aggressive and innovative public outreach program
- Major scientific community engagement (e.g. activities that include more than Co-I's)
  - Flow tracking
  - Synthetic and modeled data, tool development
  - Open meetings and special sessions

\* Based on input from Rebecca Ringuette and other NASA Open Science leaders



# PUNCH's Open Science Journey

## Recommendations\* for PUNCH

- Draft an **open science statement and action plan**.
- Encourage as many co-I's as possible to **complete TOPS certification**.
- Website and communication:
  - Provide information that makes it clear what **activities and efforts are open for participation** (currently the "Get Involved" section has nothing about getting involved in it)
  - More **clear data use guidelines and contact information**
  - More **information on science activities** (Flow Tracking page in development!)
  - Some terms are not well defined
- Identify an **openly accessible resource** like HelioNauts and/or Github as the place for community members to ask questions, share advice, and retrieve knowledge.
- Consider supplemental submissions to e.g. Journal of Open Science Software to provide users with a peer-reviewed in-depth **resource to understand tools and data products**.
- **Interactive tutorial resources** to accelerate user proficiency
- Identify team members responsible for **coordination/liaisonhip to complementary and/or infrastructure activities** (like PyHC and the upcoming DASH workshop).
- Provide an **anonymous, safe way for people to share concerns**.

\* Based on input from Rebecca Ringuette and other NASA Open Science leaders



# Moving forward

Congratulations team!

PUNCH was designed from the beginning to be an open science mission.

Team members have adapted to community requests and created collaboration opportunities that allow PUNCH to far exceed the baseline scientific goals.

Let's build on this and become a model for other missions.

*Special thanks to all the members of the broader community who have joined us to make this possible. We couldn't do this without you.*