EARTH SCIENCE
APPLIED SCIENCES

EARTH SCIENCE APPLICATIONS WEEK 2022

Day 3: Get Involved

August 11, 2022

EARTH SCIENCE APPLICATIONS WEEK 2022

WELCOME!

DAY 3 – AUGUST 11th: GET INVOLVED

<u>Event Attendance Guidelines</u>

1. Please stay muted with cameras off
2. Post questions for speakers in the chat & they will be answered there

Prizes and Challenges: Participate in Open Innovation to Advance the Earth Science Applied Sciences Community

Emily Gelbart & Diana Garcia Silva

NASA Headquarters Open Innovation Interns

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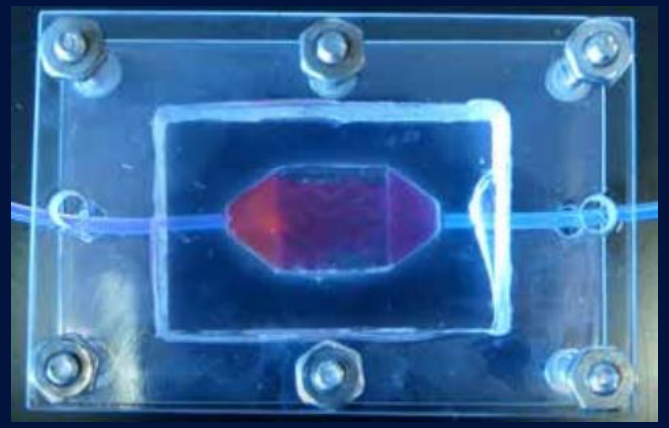
Applied Sciences Prizes & Challenges Program

Invites the public to participate in incentivized competitions called prizes and challenges to help NASA find solutions to complex problems.

- Solicit products, services, ideas, and content.
- Supporting technology and hardware demonstration
- Solving scientific questions
- Supporting entrepreneurs
- Learning from expert consultants
- Engaging and inspiring the public

Past Projects



Vascular Tissue Challenge

Waste to Base Materials Challenge

3D Printed Habitat Challenge

Where's Whale-do? Challenge

Applying Open Innovation and Multidisciplinary Machine Learning Insights to Address Harmful Algal Blooms

Emily Gelbart
NASA Headquarters Open Innovation Intern

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Harmful Algal Bloom Algorithm Prize Competition

- **Goal**: Develop an algorithm solution that
  - analyzes high spatial (~30 m or better) and temporal (every 1-2 days or better) resolution data and
  - identifies cyanobacteria in small water bodies (lakes, shorelines)

Figure 1. NASA Imagery of Harmful Algal Bloom

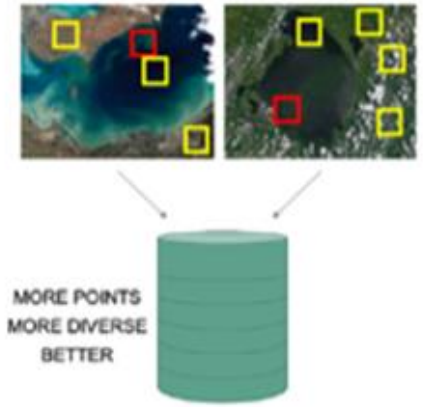
Machine Learning and Harmful Algal Blooms

HABs sampling data from different sources

- Contacted 150+ water quality organizations and health managers for data in the United States
- Looking for reports from 2013-2021

Final format CSV
- Date of Sampling
- Time of Sampling
- Latitude/Longitude of Sampling
- Cell density (cells/mL)

Label	Cyanobacteria (cells/mL)
0 = water, no cyanobacteria	None detected
1 = low concentration	< 20,000
2 = moderate	20,000–100,000
3 = high	>100,000–10,000,000
4 = very high	> 10,000,000
5 = land	-



Landsat and Sentinel-2 images corresponding to sampling times, sampling dates, and locations (latitude, longitude)

- Collected Imagery from NASA and ESA databases

Find appropriate pixel and classify based on cell density + Manually select and label pixels on land (negative data points) + Label pixels "water no HABs"

Data Status and Contributions

- Need to match and collect Landsat and Sentinel-2 data
- Publishing the dataset
  - Improves access to cell density data
  - Aim to create a living dataset

Data Acknowledgments
Water Quality Data Portal
EPA National Aquatic Research Survey Data
Central Data Exchange
California Environmental Data Exchange Network
Connecticut State Department of Public Health - Blue Green Algae Blooms
Delaware National Resources and the University of Delaware's Citizen Monitoring Program
Indiana State Department of Health HAB Map
Bureau of Water Kansas Department of Health and Environment
UMRBA
New Jersey Department of Environmental Protection: HAB
New Mexico Environment Department
N.C. Division of Water Resources N.C. Department of Environmental Quality
Pennsylvania Department of Environmental Protection
Texas Commission on Environmental Quality
USGS - Harmful Algal Bloom Science in Texas
Vermont Department of Health - Health and the Environment
Wyoming Department of Environmental Quality

Table 1. Data acknowledgments for HABs competition

Analysis of NASA's History in Crowdsourcing to support Earth and Environmental Science

Diana Garcia Silva
NASA Headquarters Open Innovation Intern

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Analysis of NASA's History in Crowdsourcing Project

Aimed at analyzing impacts from prizes and challenges that support Earth science endeavors

Goals:

1. Review past projects and understand what are the common types of impacts we see
2. Develop a metric to do future impact assessments for Prizes and Challenges Projects

Why is this Project Important?

Want to see what types of Value was generated and how do we measure those values in the future.

Impact Assessments

A structured decision process that describes the impacts from a project and identify pathways to reduce/mitigate their implications or enhance positive outcomes

- Different types of Impacts reported depends on Project scope

Environmental	Academic
Technology	Cultural
Social	Economic
Risk	Wellbeing
Policy	

Technology Impact

<u>Green Flight Challenge</u>

Build a fuel-efficient aircraft that can fly 200 miles is <2hrs using less than 1 gal of gasoline

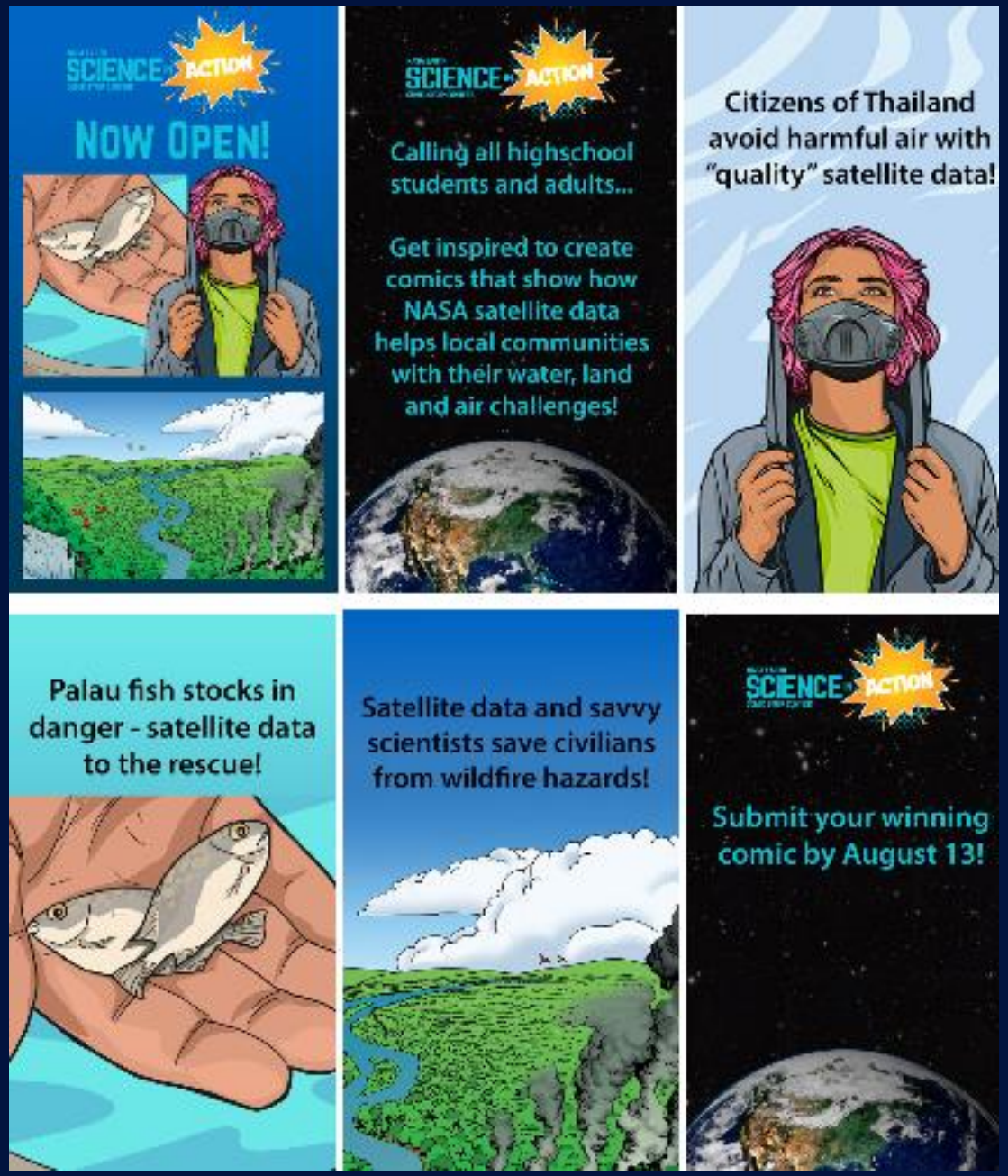
Stimulate green flight technology for safer, quieter, cleaner, and more sustainable aviation

Figure 11. Pipistrel Taurus G4.

Environmental Impact

xView2 Challenge

Machine learning algorithms that could process pre- and post-natural disaster satellite imagery to assess building damage & extent of natural disasters, like wildfires



Call to Action!

NASA Earth Science in Action Comic Strip Contest

Two eligibility tracks: high school aged participants, adults

https://www.sciartex.net/science-in-action-nasa-earth-comic-strip-contest.html

Thank You!

Next Steps

HABS Project:

- Need to match and collect Landsat and Sentinel-2 data
- Publishing the dataset
  - Improves access to cell density data
  - Aim to create a living dataset

History in Crowdsourcing:

- Conduct interviews with project managers and participants
- Analyze impacts from P&C through retrospective methods

Get involved:

https://appliedsciences.nasa.gov/what-we-do/prizes-and-challenges

http://science.nasa.gov/citizenscience

NASA SOLE https://youtu.be/vXeR8fA-n2M

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EARLY ADOPTER PROGRAM

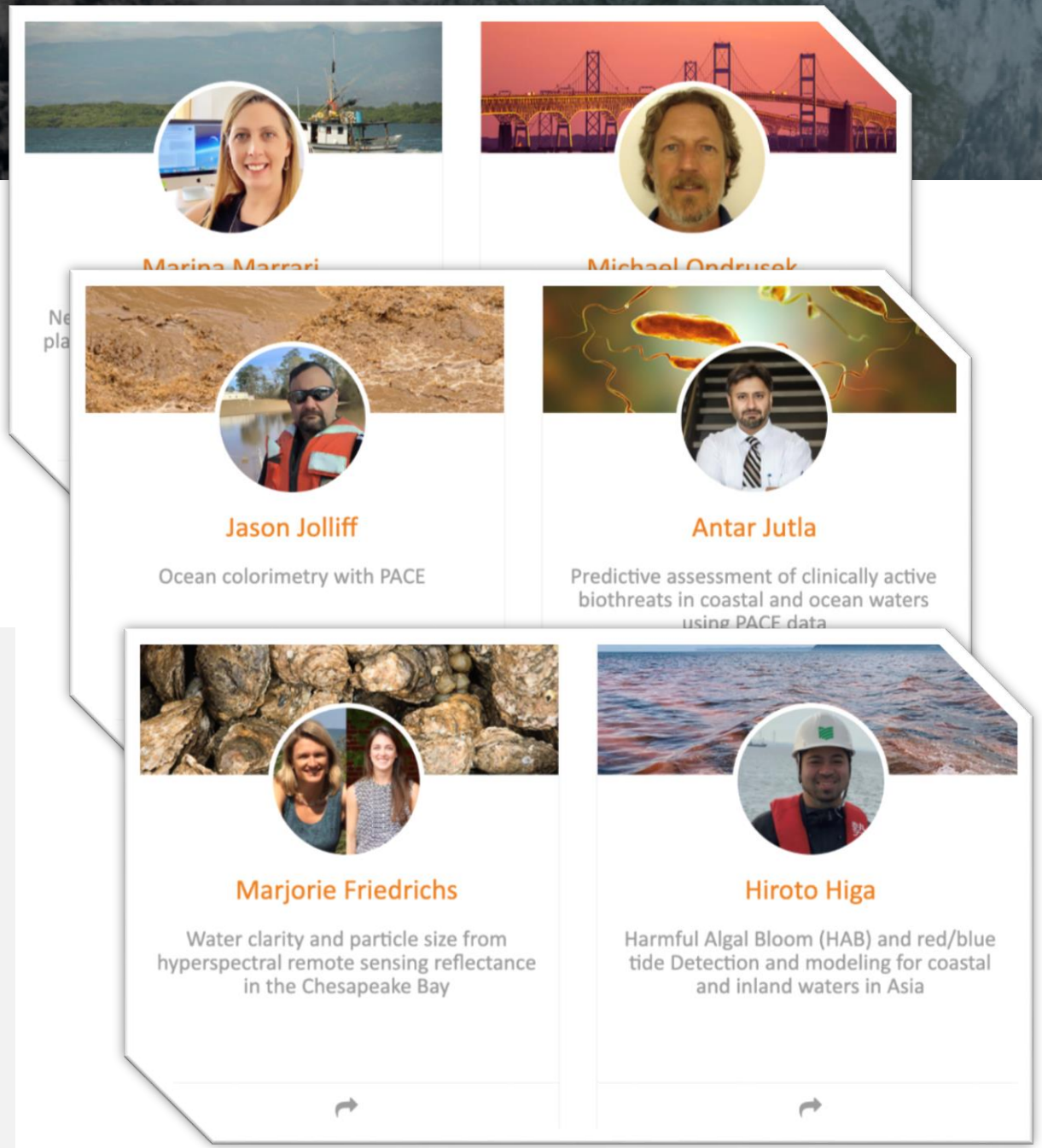
Erin Urquhart
PACE Applications Coordinator
NASA Goddard Space Flight Center

NASA Early Adopter Program

NASA Early Adopter programs promote applied science and applications research designed to scale and integrate NASA data into policy, business, and management activities that benefit society and inform decision making.

GOALS:

- PROVIDE OPPORTUNITIES TO PARTNER WITH MISSION SCIENTISTS
- PROVIDE THE MISSION WITH FEEDBACK ON UTILITY OF DATA
- SUPPORT EARLY ADOPTERS AND BUILD CAPACITY TO ACCELERATE DATA UPTAKE
- EXPAND MISSION VISIBILITY AND PARTNERSHIPS WITH NEW USER COMMUNITIES
- ENHANCE MISSION DATA PRODUCTS AND SERVICES BASED ON USER FEEDBACK



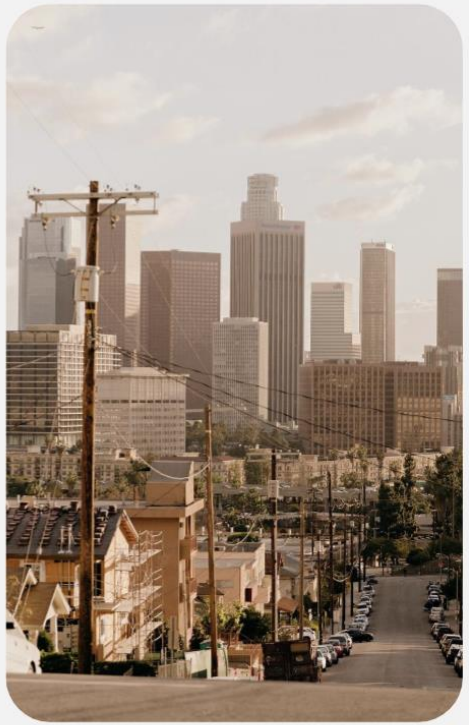
Early Adopter Examples

Fishing and Recreation

PACE

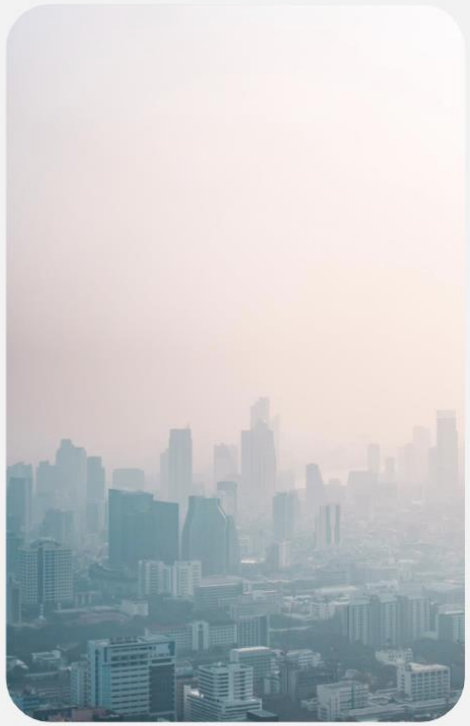
Coastal Zone Management

ICESAT-2



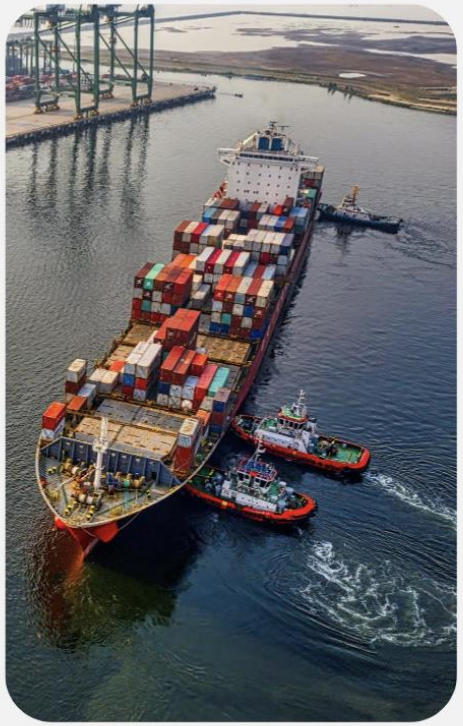
Urban Heat Islands

ECOSTRESS



Air Quality Forecasting

TEMPO



Maritime Commerce

ICESAT-2

Benefits of Becoming a NASA Early Adopter

Benefits include:

- Networking and building partnerships
- Participation in Applications activities
- Collaboration with other Early Adopters
- Partnerships with DAAC and Science Team members
- Access to simulated and proxy datasets

Early Adopter Eligibility

- Have an existing application or innovative idea for how NASA data can be used to:
  - Support decision-making activities
  - Impact society
- Applicants should work in close coordination with/on behalf of their stakeholders
- Willingness to learn about mission data, developmental products
- Willingness to provide testimonials that explain how data will improve decision making process

Partnership Opportunities

Early adopters + PACE SAT member = Goal

+

= Monitoring and Fisheries Applications in Central America

+

= Sustainable Aquaculture Site Selection

+

= Detecting and Differentiating Oil Slicks

+

+

= Fisheries and aquaculture decision support tool for the South African coast

Showcasing Early Adopter Work

Web presence, project promotion, invitation to launch events, and advocacy at external venues!

- The Mission Applications team will work closely with EAs to create a web profile highlighting each EA's practical application and how it supports decision-making, public health, and society.

Damian Brady

Aquaculture site prospecting: Applying PACE products to sustainable aquaculture site selection »

Dustin Carroll

Data-assimilative, global-ocean ECCO-Darwin biogeochemistry model »

Hunter Erickson

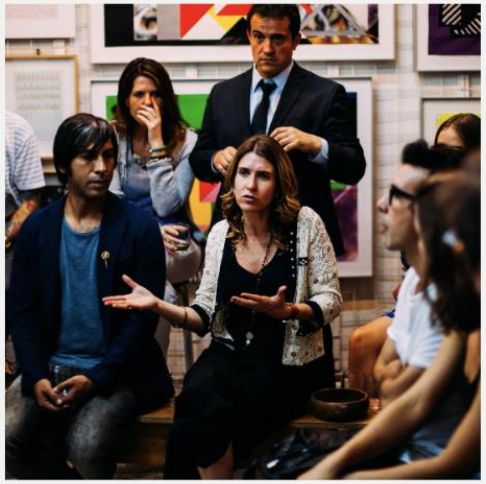
Managing environments in the palm of your hand »

Early Adopter Activities + Engagement Opportunities

By joining an Early Adopter program, you will have the opportunity to participate in various Mission activities!

TELECONFERENCES

WORKSHOPS



FOCUS SESSIONS

TUTORIALS

TOWN HALLS

Earth Science Missions Recruiting Early Adopters

- PLANKTON, AEROSOL, CLOUD, OCEAN ECOSYSTEM (**PACE**) MISSION
- ICE, CLOUD AND LAND ELEVATION SATELLITE-2 (**ICESAT-2**) MISSION
- CARBON MONITORING SYSTEM (**CMS**) INITIATIVE
- SURFACE WATER AND OCEAN TOPOGRAPHY (**SWOT**) MISSION
- MULTI-ANGLE IMAGER FOR AEROSOLS (**MAIA**) MISSION
- TROPOSPHERIC EMISSIONS: MONITORING OF POLLUTION (**TEMPO**) MISSION
- NASA-ISRO SYNTHETIC APERTURE RADAR (**NISAR**) MISSION

SCAN ME

https://appliedsciences.nasa.gov/what-we-do/earth-science-missions

How to Dig Deeper: The Earth Science Applications Guidebook

Synthesizing best practices on EO applications

Erin Martin & Sterling Riber

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VIEW GUIDEBOOK

What is the guidebook?

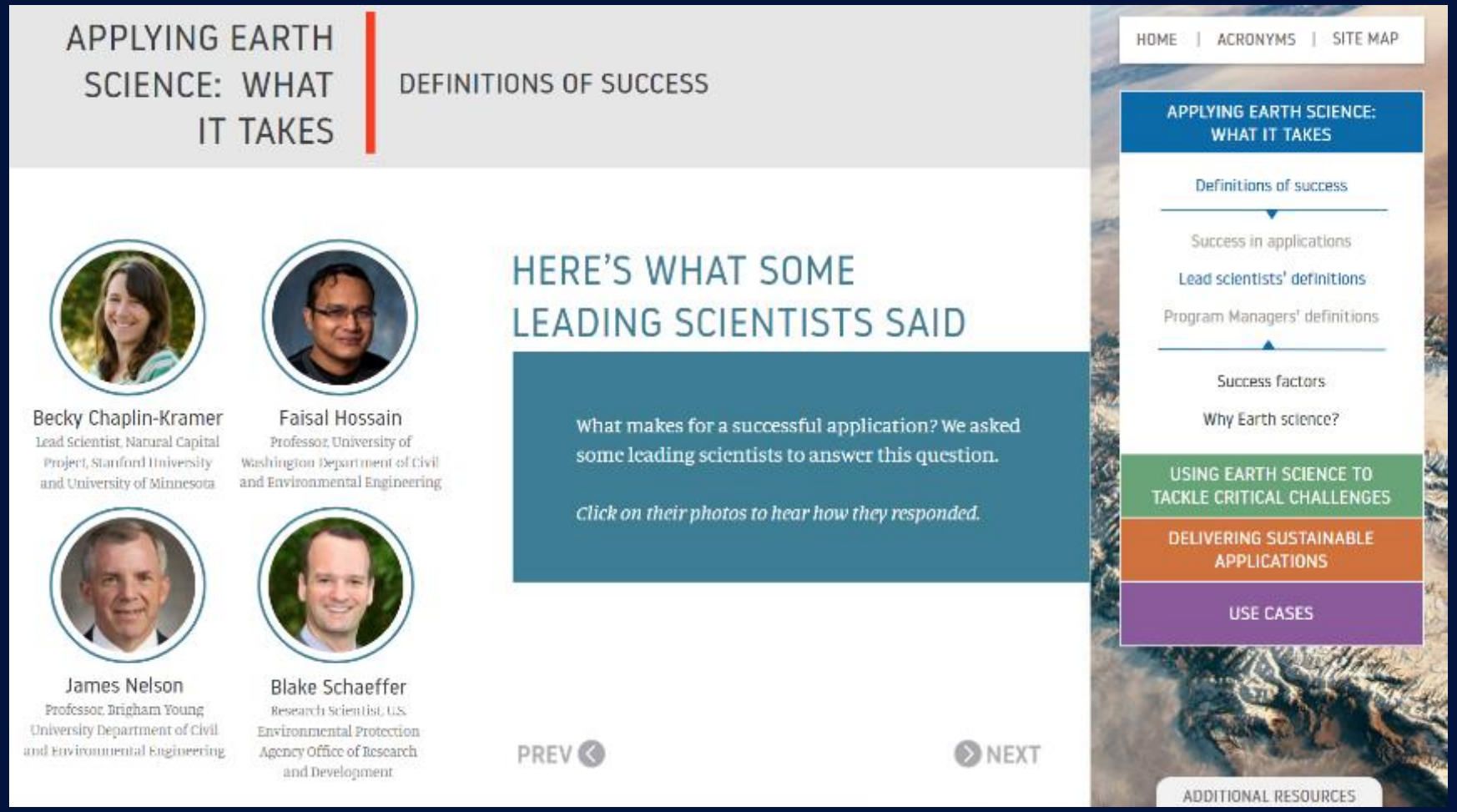
An online resource with practical tips and guidance on how to build applications with impact.

Key features include:

- *Multiple entry pathways*
- *Multimedia features*
- *Easy user interface*
- *Plain language presentation*
- *Downloadable content*

People-centered…

Featuring insights from people passionate about using science to solve today's urgent problems.



Informative…

With compelling examples of WHO is using EO information and HOW it is making a difference in their decisions and actions.

Practical and relevant…

Offers actionable approaches on management, partners, proposals - and much more.

Accessible…

Presents application pathways in plain language for audiences of varying technical backgrounds.

More to come in 2022-23…

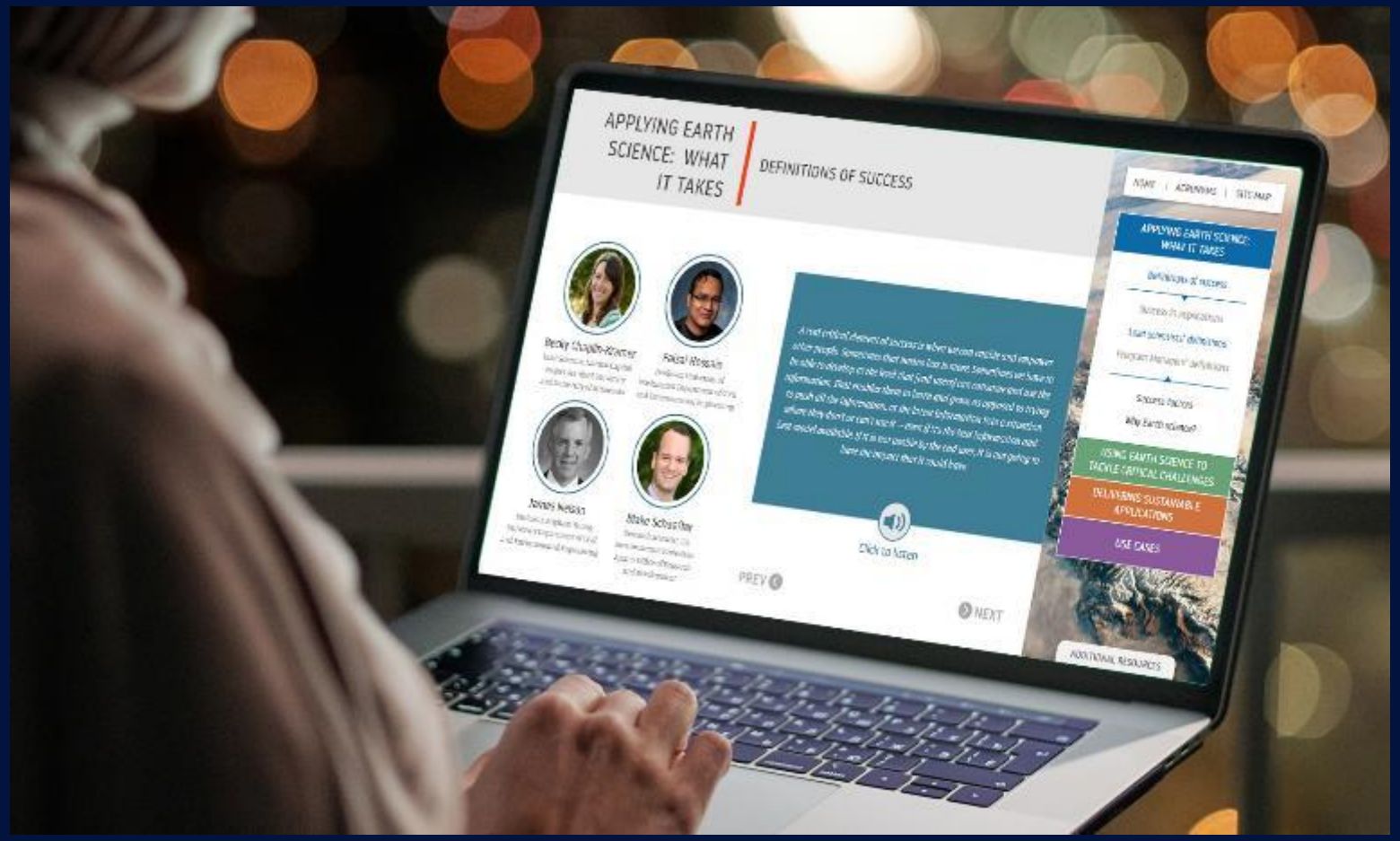
Symposium

New content

Training

Get involved…

Please share with your networks.



appliedsciences.nasa.gov/guidebook

VIEW GUIDEBOOK

THANK YOU!

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NASA's Transform to Open Science (TOPS)

Cynthia Hall

Community Coordinator
cynthia.r.hall@nasa.gov

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Community is Key!

Open Knowledge

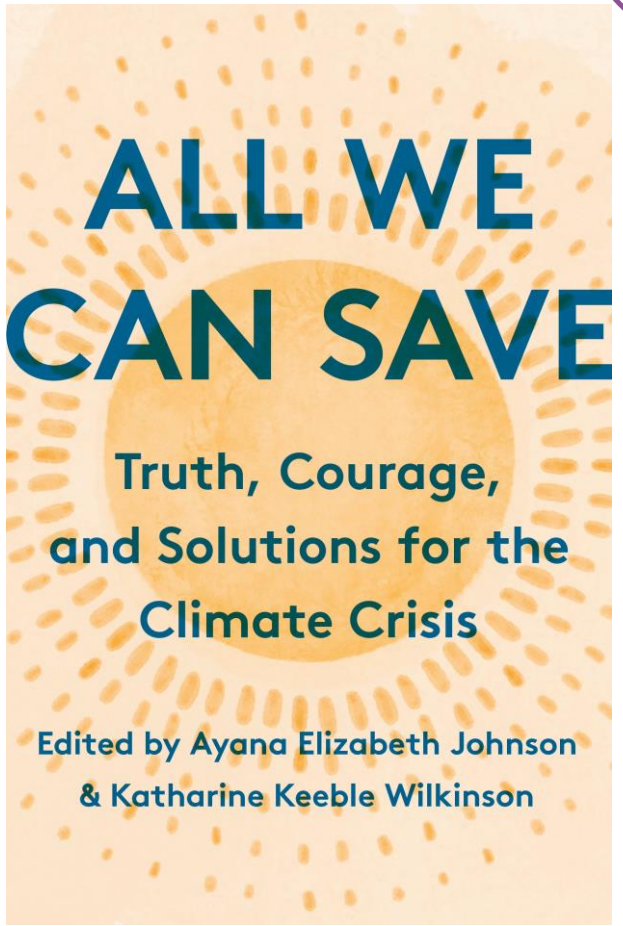
+

Diverse Voices

Better Data

Better Science

Bigger Impacts

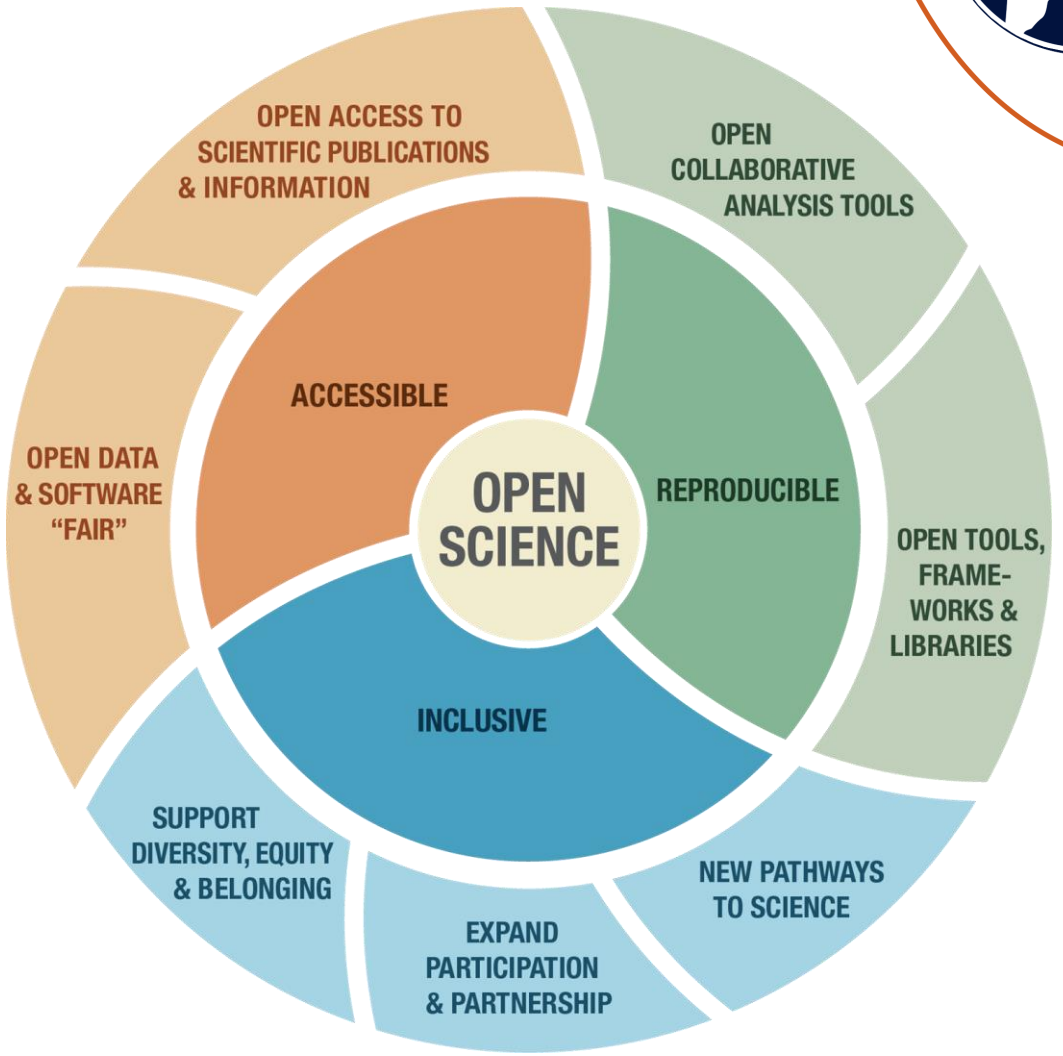


A NASA OPEN-SOURCE SCIENCE INITIATIVE:

TOPS: TRANSFORM TO OPEN SCIENCE

What is Open Science?

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.



Another Leap Forward: Open-Source Science

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

The strategy is focused around:

- **Opening** the entirety of the scientific process, ***from start to finish***
- **Broadening** community involvement in the scientific process
- **Increasing** the accessibility of data, software, and publications
- **Facilitating** inclusion, transparency, and reproducibility of science

Maximizing the scientific return of NASA data is the core of open source science.

Why Now?

Current challenges:

- Climate change
- Protecting our interconnected world from extreme space weather events
- Identifying threats from interplanetary space
- Searching for life beyond Earth
- Unlocking the secrets of the Universe

What are we going to do about it?

- Recognize the transformative potential of open science to reduce inequalities while advancing science

Leading the Path to Open-Source Science

Transform to Open Science (TOPS) is a $40 million* 5-year NASA Science Mission Directorate initiative geared towards accelerating the adoption and understanding of open science

Key Goals:

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

*pending appropriations

NASA’s 2023 Year of Open Science

The Year of Open Science will build momentum and support the move towards more openness in science.

Engagement

Capacity Sharing Resources

Incentives

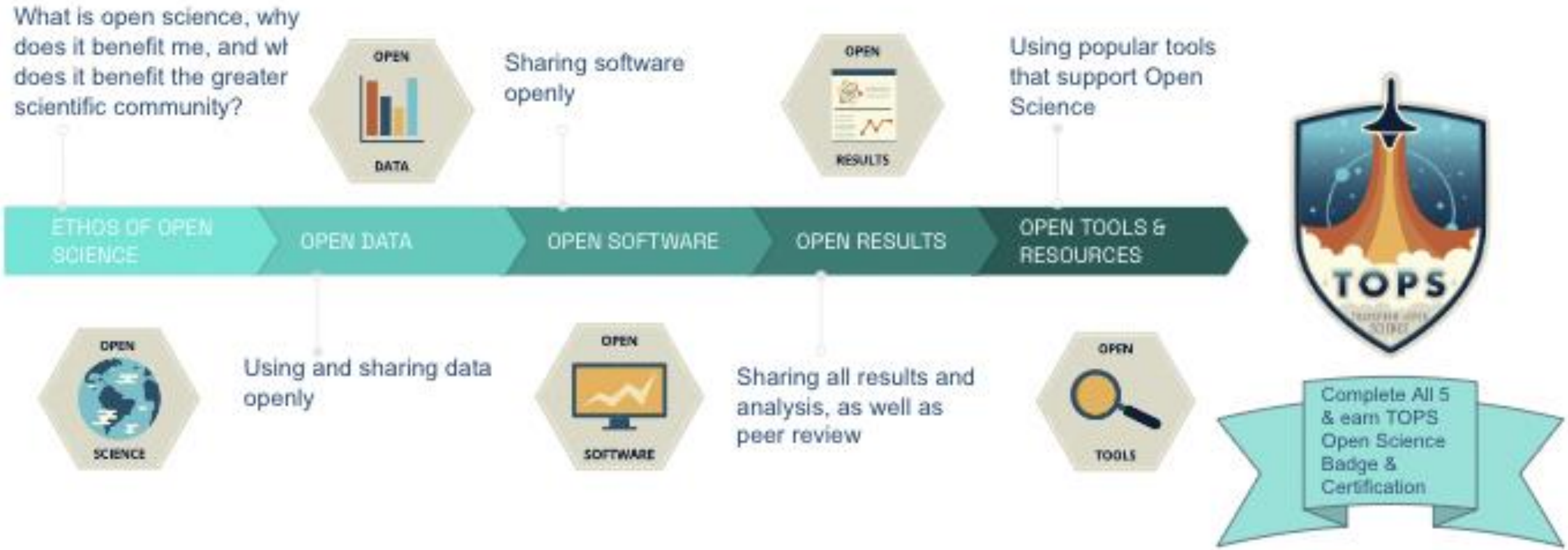
Moving towards Openness

Throughout 2023, TOPS will be energizing and uplifting open science across the scientific community through a suite of community building opportunities focused around:

- Recognizing open science practices
- Holding open, public meetings to support discourse around open science
- Sharing hidden knowledge
- Inclusive collaborations

Opening Up Science For All

TOPS is designing OpenCore: An Open Science Curriculum
5 Modules Organized as a Scientific Workflow



Open Science in Action

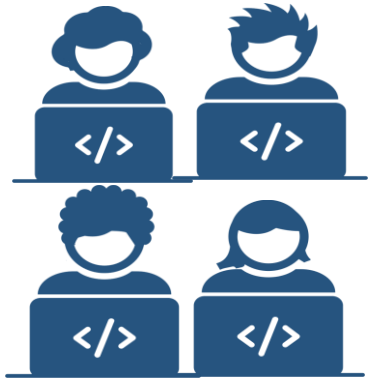
Capacity Sharing within the Community

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 8-12 weeks of teaching the 5 modules to selected science teams + open competitive student/early career 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

To Change Everything, We Need Everyone And That Includes You!

To implement a cultural shift, we need community engagement from the broad spectrum across the scientific community!

Learn more and collaborate with us - we're working on GitHub!

Questions?

TOPS Email List

TOPS Website

Learn more and collaborate with us!

CC BY

CLOSING REMARKS

Dr. Karen St. Germain
Director
Earth Science Division

CLOSING REMARKS

Dr. Kate Calvin
Chief Scientist & Senior Climate Advisor
NASA

CLOSING REMARKS

Lawrence Friedl
Director
Applied Sciences Program

Many Thanks to our speakers...

Lawrence Friedl
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Dr. Emily Sylak-Glassman
Cara Crosby
John Haynes
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Dr. Jenny Bratburd
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Tenzin Wangmo
Sonam Seldon-Tshering

Karma Dorjee
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Amanda Clayton

Natasha Johnson-Griffin

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THANK YOU!

SLIDES & RECORDINGS WILL BE POSTED BY AUG 31st