EARTH SCIENCE
APPLIED SCIENCES

2021 Earth Science Applications Week

Closing Plenary

August 12, 2021

EARTH SCIENCE APPLICATIONS WEEK 2021

WELCOME

OPENING REMARKS

Lawrence Friedl, Director
Applied Sciences Program

NASA SMD REMARKS

Dr. Thomas Zurbuchen,
Associate Administrator
NASA Science Mission Directorate

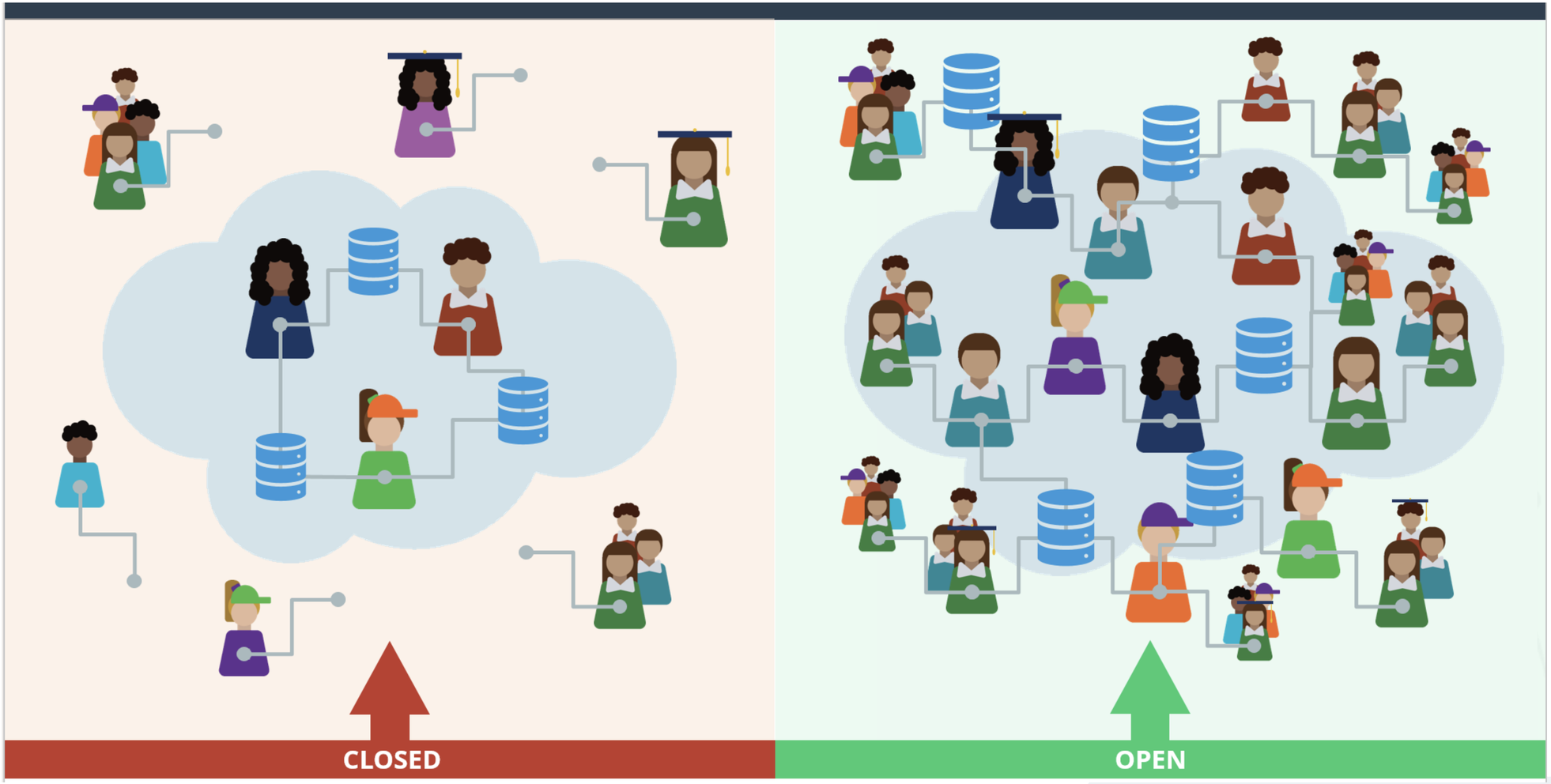
WEEK IN REVIEW

Dr. Emily Sylak-Glassman,
Program Manager
Applied Sciences Program

NASA Earth Science Data Pathfinders

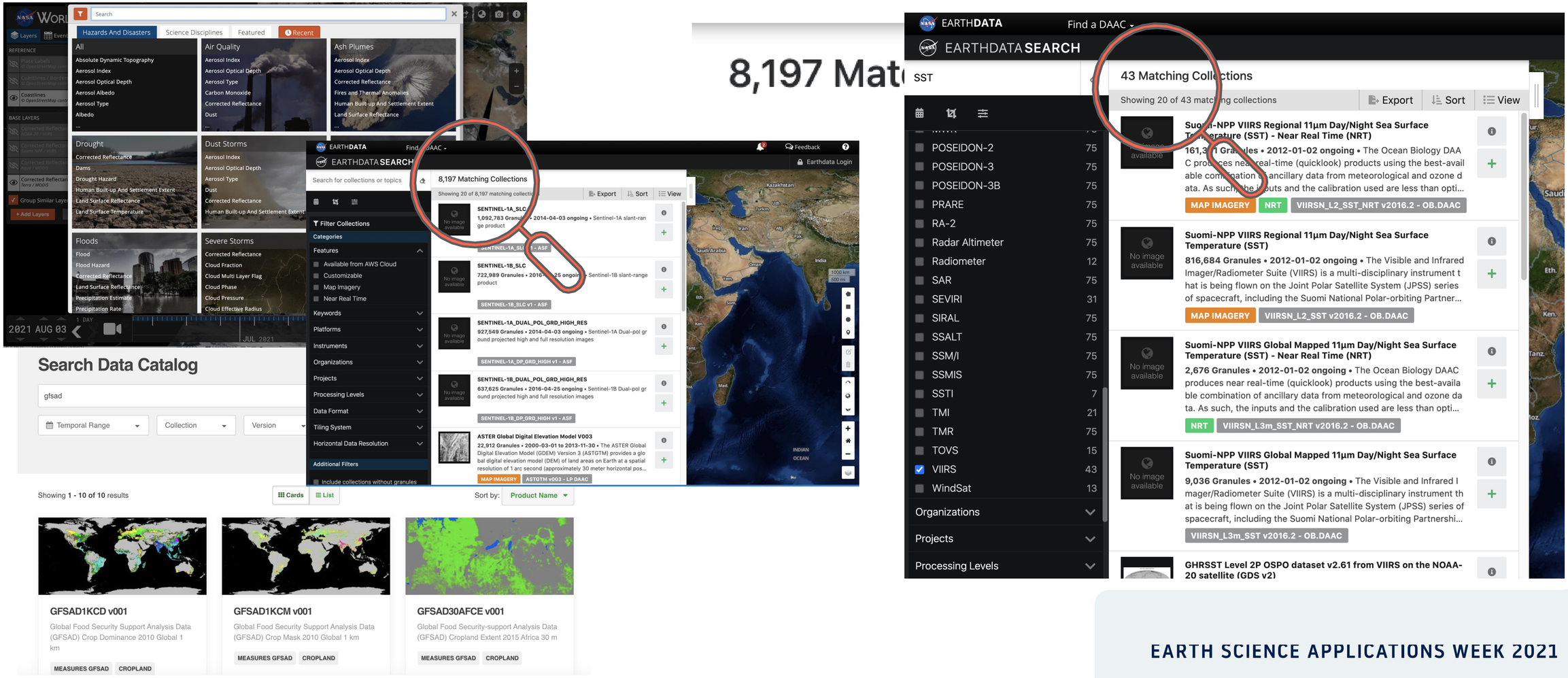
Cynthia Hall, Community Coordinator
NASA Earth Science Data Systems

Open-source Science



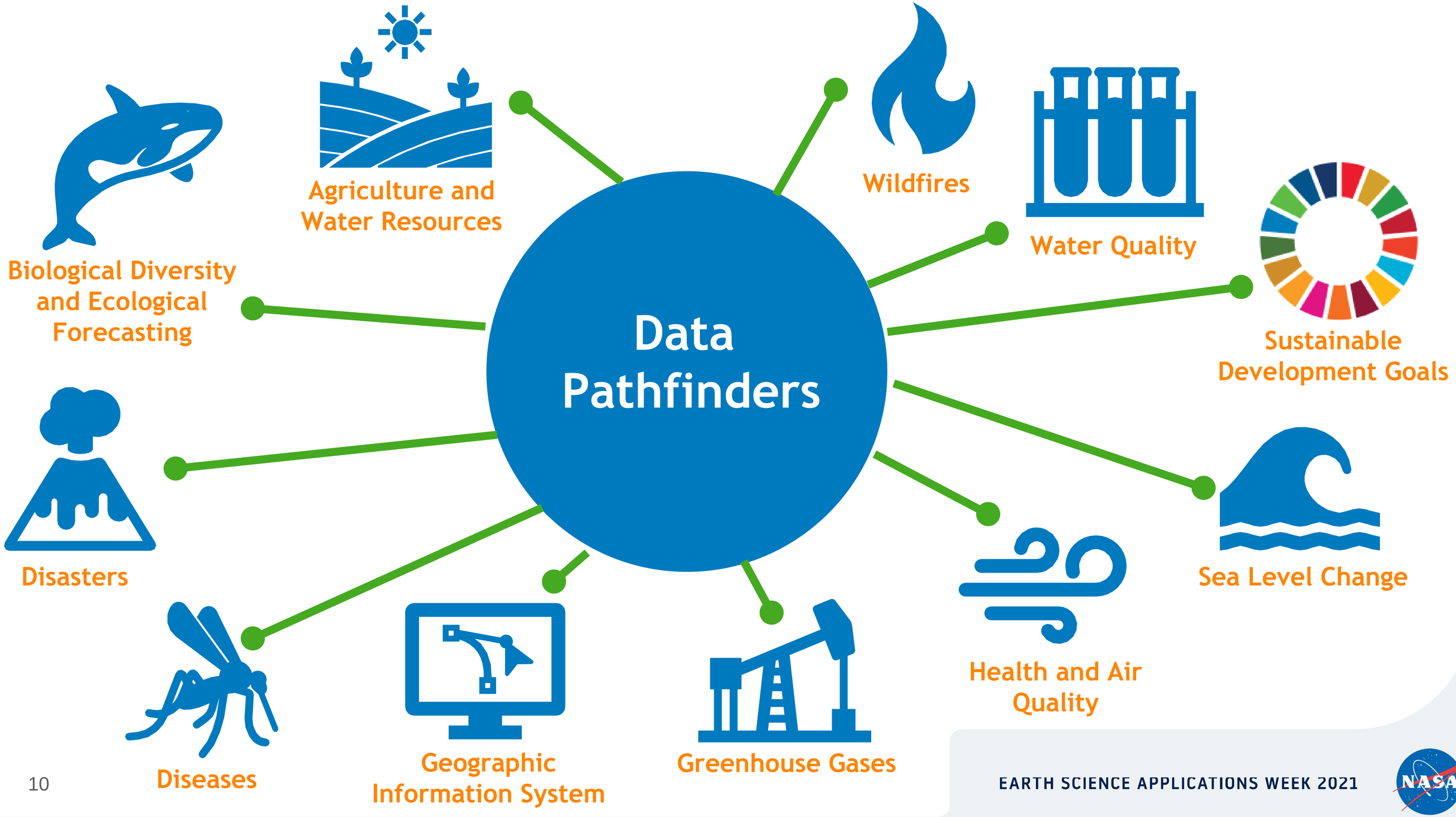
Challenges

- NASA Earth science data users have challenges with data discovery, dataset selection, and data application



Earthdata Data Pathfinders

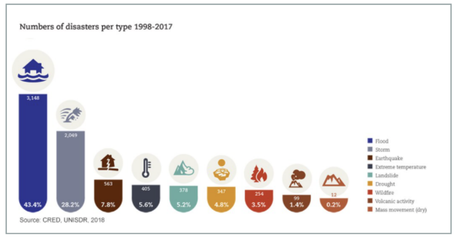
- Are data product selection guides focused on science disciplines and application areas, like fires, floods, diseases, and sea level change;
- Have direct links to commonly used datasets from NASA's Earth science collections;
- Link to tools which provide ways of visualizing and subsetting data, with an option to save data in various file formats.


Data Pathfinders
Agriculture and Water Resources
Wildfires
Water Quality
Biological Diversity and Ecological Forecasting
Sustainable Development Goals
Disasters
Sea Level Change
Health and Air Quality
Diseases
Geographic Information System
Greenhouse Gases

Earthdata Data Pathfinders

Disasters Data Pathfinder

Natural disasters affect millions of people every year. According to the United Nations Office for Disaster Risk Reduction (UNDRR), there were roughly 7250 disasters between 1998 and 2017, killing over 1.3 million people. Of those, flooding and storms account for the greatest number of disasters, while earthquakes cause the largest number of deaths; close to 750,000 people died from earthquakes during that period. It is also important to note that climate change will likely increase frequency of extreme heat and other extreme weather events in the coming decades.



Credit: United Nations Office for Disaster Risk Reduction

Understanding the vulnerability and exposure of a community (defined in About the Data) to a disaster aids in the mitigation, prevention, and management of the disaster, while also providing information to help with response and relief efforts. NASA provides several types of data that support disaster mitigation and response.

Disaster Data Pathfinders:

- Cyclones
- Earthquakes and Volcanoes
- Extreme Heat
- Floods
- Landslides
- Wildfires

New to using NASA Earth science data? This pathfinder is designed to help guide you through the process of selecting and using applicable datasets, with guidance on resolutions and direct links to the data sources.

After getting started here, there are numerous NASA resources that can help develop your skills further. If you are new to remote sensing, check out What is Remote Sensing? or view NASA's Applied Remote Sensing Training on Fundamentals of Remote Sensing and other Disaster-related trainings.

About the Data

Use the Data

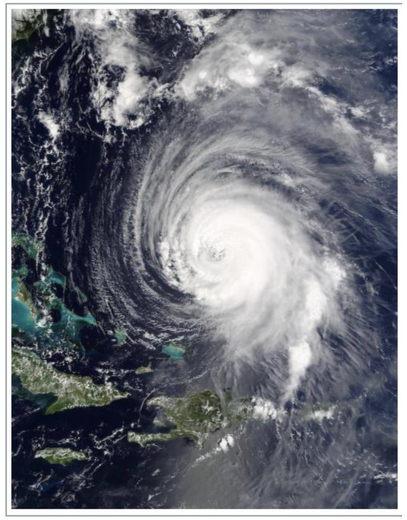
Other NASA Assets of Interest

Measurement	Satellite/Platform	Sensor	Spatial Resolution	Temporal Resolution
Active Fire and Thermal Anomalies, Cloud Top Temperature, Land Surface Temperature, Surface Reflectance, Sea Surface Temperature, Vegetation Indices	Terra and Aqua	Moderate Resolution Imaging Spectroradiometer (MODIS) *	250 m, 500 m, 1000 m, 5600 m	1-2 days
Active Fire/Thermal Anomalies, Land Surface Temperature, Nighttime Imagery, Sea Surface Temperature, Surface Reflectance, Vegetation Indices	NASA/NOAA Joint Polar Satellite System (JPSS) NOAA-20 satellite and Suomi NPP	Visible Infrared Imaging Radiometer Suite (VIIRS) *	500 m, 1000 m, 5600 m	daily
Clouds	NASA/NOAA Geostationary Operational Environmental Satellite-East (GOES-East) and GOES-West	Advanced Baseline Imager (ABI)	1 km	10 min
Clouds	Japan Meteorological Agency Himawari-8	Advanced Himawari Imager	1 km	10 min
Elevation/Topography	Space Shuttle	Shuttle Radar Topography Mission (SRTM)	30 m	Static

Earthdata Data Pathfinders

Cyclones Data Pathfinder

Tropical storms are low-pressure systems that form over warm tropical waters, where the sea surface temperatures are greater than about 80°F (26.5°C). Because of this critical temperature, they occur in different seasons in the Atlantic, Pacific, and Indian Oceans. The storms are cyclonic, meaning they rotate in either a clockwise (Southern Hemisphere) or counterclockwise (Northern Hemisphere) direction, often having outer edges that extend hundreds of kilometers from the center of the storm. A tropical depression reaches storm status when its winds maintain a speed of 33 knots (around 38 mph or 62 km/h) or more. A tropical storm reaches hurricane status when its winds maintain a speed of 64 knots (74 mph or 119 km/h) or more. These massive storms bring sustained heavy winds and rainfall, devastating coastal communities with storm surges and both coastal and inland areas with flooding and winds.



Hurricane Isabel, which was once a powerful Category 5 hurricane in the central Atlantic with winds estimated at 160 mph, finally came ashore on September 18, 2003, as a much weaker Category 2 storm. Credit: NASA.

NOAA provides up-to-date information on storm tracking and intensity within the Atlantic and East Pacific Oceans at its National Hurricane Center and the Naval Oceanography Portal provides information on storm tracking within the West Pacific and Indian Oceans through its Joint Typhoon Warning Center. Note that hurricanes, cyclones, and typhoons are all cyclonic storms with wind speeds over 64 knots; the name is dependent on location.

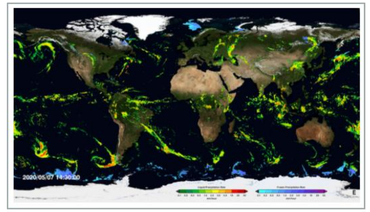
NASA provides information that can help in pre-storm emergency preparedness, by helping urban planners and emergency management professionals understand the exposure and vulnerabilities as well as post-storm damage assessment and response. In addition to the datasets below, NASA has several other projects that may have cyclone-related model-based data or tools. View the Other NASA Assets section to find out more.

- **Pre-storm Assessment**
- **Near Real-time Assessment**
- **Post-storm Assessment**
- **Tools for Data Access and Visualization**

Pre-storm Assessment

Precipitation

NASA's Precipitation Measurement Missions (PMM) provide a continuous long-term record (over 20 years) of precipitation data through the Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measurement (GPM) missions. The follow-on mission, GPM, provides even more accurate measurements, improved detection of light rain and snow, and extended spatial coverage. GPM has developed a story map providing information on the 2020 Hurricane Season.



Near real-time IMERG Early Run Half-Hourly Image, acquired on May 7, 2020. Credit: NASA.

The products from TRMM and GPM are available individually and have also been integrated with data from a global constellation of satellites to yield improved spatial/temporal precipitation estimates providing a temporal resolution of 30 minutes (in the case of GPM). The integrated products are the TRMM Multi-satellite Precipitation Analysis (TMPA) and the Integrated Multi-satellite Retrievals for GPM (IMERG). IMERG's multiple runs accommodate different user requirements for latency and accuracy (Early = 4 hours, e.g., for flash flood events; Late = 12 hours, e.g., for crop forecasting; and Final = 3 months, with the incorporation of rain gauge data, for research).

Data Products for Measuring Precipitation

Research-quality data products can be accessed via Earthdata Search:

- TMPA from Earthdata Search
  Rainfall estimate at 3 hours, 1 day, or NRT and accumulated rainfall at 3 hours and 1 day. Data are in HDF format and can be opened using Panoply. Data are available from 1997.
- IMERG from Earthdata Search
  Early, Late, and Final precipitation data on the half-hour or 1-day timeframe. Data are in NetCDF or HDF format, and can be opened using Panoply. Data are available from 2000.

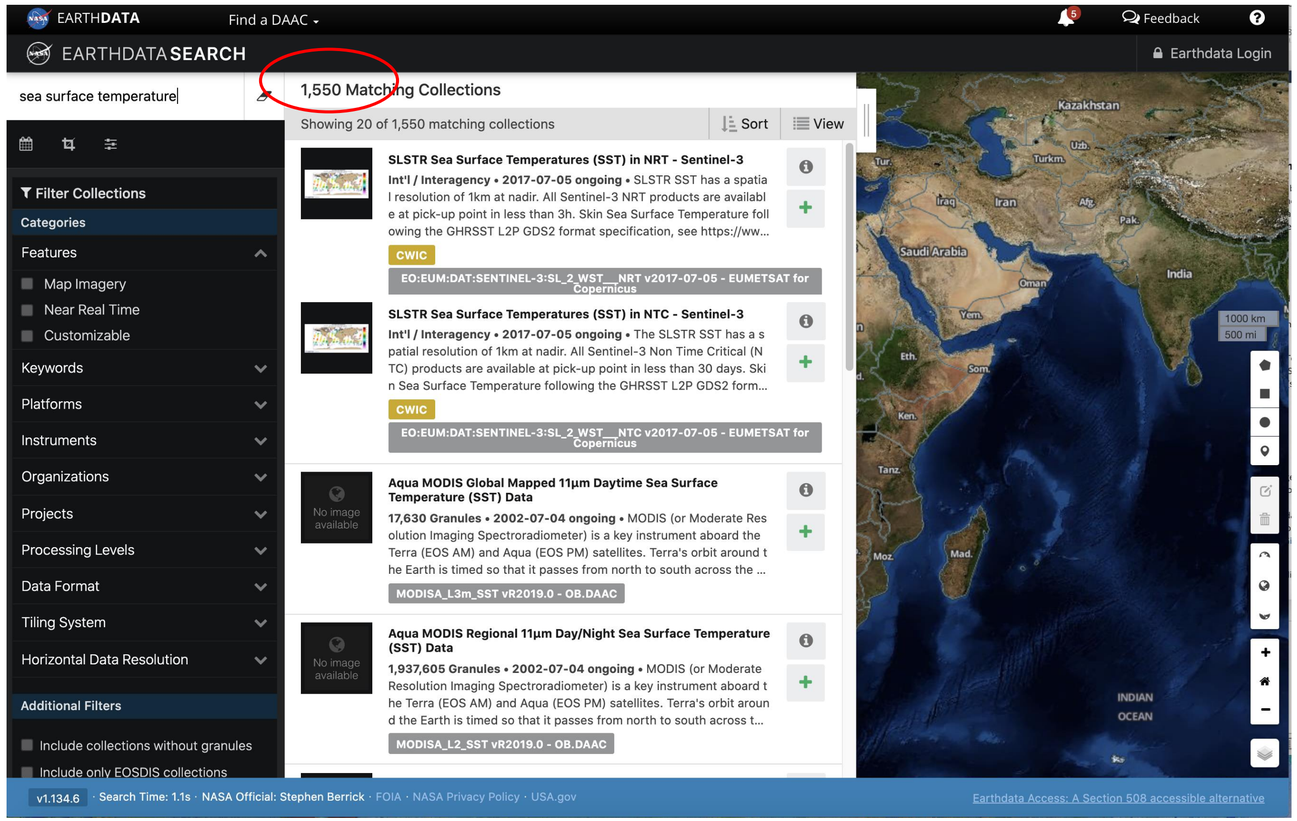
Data products can be visualized as a time-averaged map, an animation, seasonal maps, scatter plots, or a time series through an online interactive tool, Giovanni. Follow these steps to plot data in Giovanni: 1) Select a map plot type. 2) Select a date range. Data are in multiple temporal resolutions and multiple temporal coverages, so be sure to note the start and end date to ensure you access the desired dataset. 3) Check the box of the variable in the left column that you would like to include and then plot the data. For more information on choosing a type of plot, see the Giovanni User Manual.

- TMPA in Giovanni
- IMERG in Giovanni: Data are available from 2000-present.

Data can be visualized in Worldview:

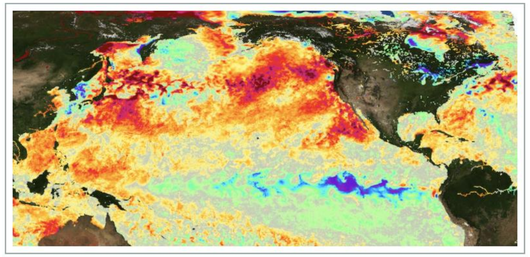
- IMERG Precipitation Rate in Worldview
- AMSR2 Precipitation Rate in Worldview
  Advanced Microwave Scanning Radiometer 2 (AMSR2) instrument collects data that indicate the rate at which precipitation is falling on the surface of the ocean and is measured in millimeters per hour (mm/hr).

Earthdata Data Pathfinders



Thermal Expansion — Sea Surface Temperature

More than 90% of atmospheric heat is absorbed by the ocean, causing the ocean to warm and expand; this is called thermal expansion. This warming has contributed roughly one-third of the global sea-level rise observed by satellite altimeters since 2004. Measurements such as SST and SSH aid in our understanding of this process.



Sea surface temperature anomalies, September 21, 2020, from the Multiscale Ultrahigh Resolution data product. Visualization from the State of the Ocean (SOTO) tool. Credit: NASA

Satellites enable measurement of SST from approximately 10 µm below the surface (infrared bands) to 1 mm (microwave bands) depths using radiometers. The spatial patterns of SST reveal the structure of underlying ocean dynamics.

Research-quality data products from MODIS on Terra and Aqua, and from VIIRS on Suomi NPP and JPSS NOAA-20 can be accessed via Earthdata Search; for subsetting SST data, use PO.DAAC's HiTIDE Tool (see the Tools for Data Access and Visualization section for more information):

- Terra MODIS SST data from Earthdata Search
- Aqua MODIS SST data from Earthdata Search
- Suomi NPP VIIRS SST from Earthdata Search
- NOAA-20 VIIRS SST from Earthdata Search

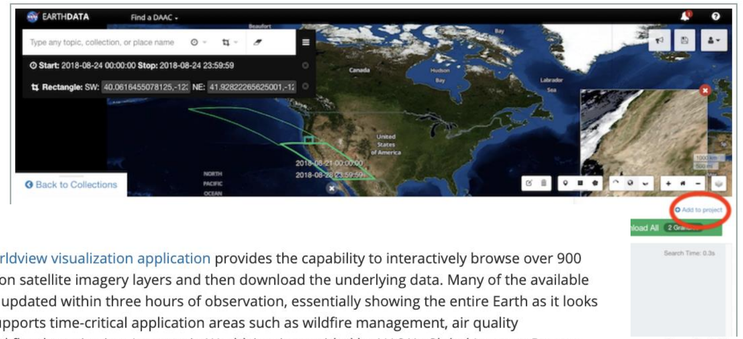
Data products can be visualized as a time-averaged map, an animation, seasonal maps, scatter plots, or a time series through an online interactive tool, Giovanni. Follow these steps to plot data in Giovanni: 1) Select a map plot type. 2) Select a date range. Data are in multiple temporal resolutions and multiple temporal coverages, so be sure to note the start and end date to ensure you access the desired dataset. 3) Check the box of the variable in the left column that you would like to include and then plot the data. For more information on choosing a type of plot, see the Giovanni User Manual.

- Aqua MODIS SST data from Giovanni
  Data products from MODIS on the Aqua satellite at 4 km resolution are provided at both 8-day and monthly temporal resolutions.

Earthdata Data Pathfinders

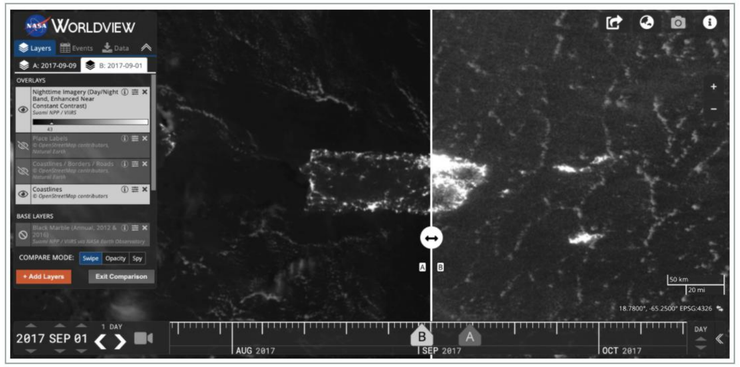
Earthdata Search

Earthdata Search is a tool for data discovery of Earth Observation data collections from NASA's Earth Observing System Data and Information System (EOSDIS), as well as U.S and international agencies across the Earth science disciplines. Users (including those without specific knowledge of the data) can search for and read about data collections, search for data files by date and spatial area, preview browse images, and download or submit requests for data files, with customization for select data collections.



Worldview

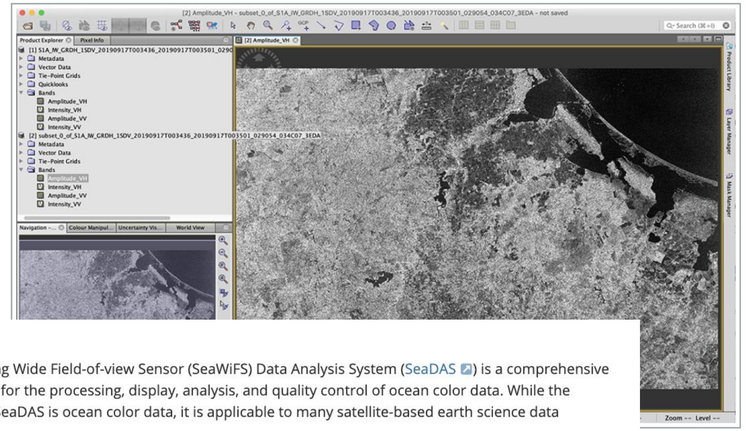
NASA's EOSDIS Worldview visualization application provides the capability to interactively browse over 900 global, full-resolution satellite imagery layers and then download the underlying data. Many of the available imagery layers are updated within three hours of observation, essentially showing the entire Earth as it looks "right now." This supports time-critical application areas such as wildfire management, air quality measurements, and flood monitoring. Imagery in Worldview is provided by NASA's Global Imagery Browse Services (GIBS). Worldview now includes nine geostationary imagery layers from GOES-East, GOES-West and Himawari-8 available at ten minute increments for the last 30 days. These layers include Red Visible, which can be used for analyzing daytime clouds, fog, insolation, and winds; Clean Infrared, which provides cloud top temperature and information about precipitation; and Air Mass RGB, which enables the visualization of the differentiation between air mass types (e.g., dry air, moist air, etc.). These full disk hemispheric views allow for almost real-time viewing of changes occurring around most of the world.



Worldview Suomi NPP/VIIRS nighttime lights comparison image showing power outages caused by Hurricane Irma in September 2017. The right image (acquired 1 September 2017) shows the island before Hurricane Irma. The left image (acquired 9 September 2017) shows power outages across island after Hurricane Irma. NASA Worldview image.

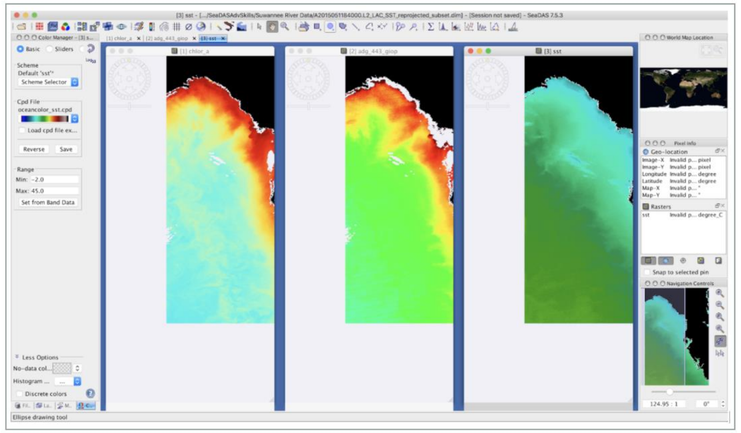
Flood Inundation Mapping

Once you have downloaded the needed SAR data product, it must be calibrated to account for distortion in the data. The objective in performing calibration is to create an image where the value of each pixel is directly related to the backscatter of the surface. So calibration takes into account radiometric distortion, signal loss as the wave propagates, saturation, and speckle. This process is critical for analyzing images quantitatively; it is also important for comparing images from different sensors, modalities, processors, and different acquisition dates.



SeaDAS

NASA's Sea-viewing Wide Field-of-view Sensor (SeaWiFS) Data Analysis System (SeaDAS) is a comprehensive software package for the processing, display, analysis, and quality control of ocean color data. While the primary focus of SeaDAS is ocean color data, it is applicable to many satellite-based earth science data analyses.



SeaDAS is a comprehensive software package for the processing, display, analysis, and quality control of ocean color data. This image shows ocean color, sea surface temperature and non-algal material plus colored dissolved organic matter.

AppEEARS

AppEEARS, from LP DAAC, offers a simple and efficient way to access and transform geospatial data from a variety of federal data archives. AppEEARS enables users to subset geospatial datasets using spatial, temporal, and band/layer parameters. Two types of sample requests are available: point samples for geographic coordinates and area samples for spatial areas via vector polygons.

Performing Area Extractions

hoosing to request an area extraction, you will be taken to the Extract Area Sample page where you will a series of parameters that are used to extract data for your area(s) of interest.

Subsetting

your region of interest in one of these three ways:

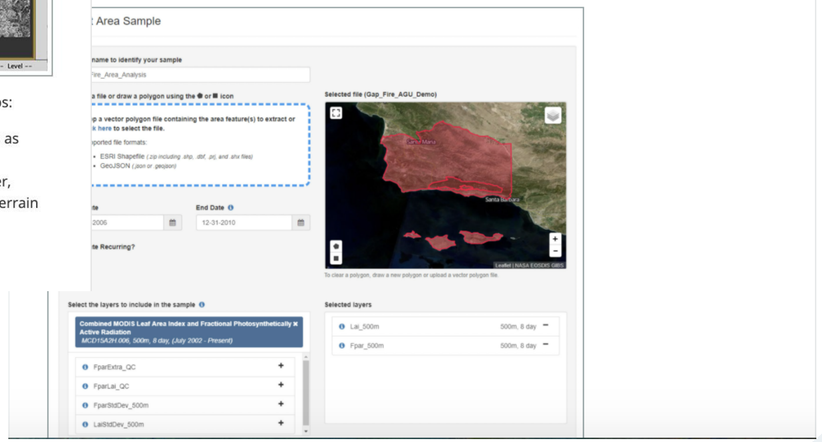
oad a vector polygon file in shapefile format (you can upload a single file with multiple features or tipart single features). The .shp, .shx, .dbf, or .prj files must be zipped into a file folder to upload.
oad a vector polygon file in GeoJSON format (can upload a single file with multiple features or multipart le features).
w a polygon on the map by clicking on the Bounding box or Polygon icons (single feature only).

the date range for your time period of interest.

the range of dates for which you wish to extract data by entering a start and end date (MM-DD-YYYY) licking on the Calendar icon and selecting a start and end date in the calendar.

Data Layers

he product short name (e.g., MOD09A1, ECO3ETPTJPL), keywords from the product long name, a resolution, a temporal extent, or a temporal resolution into the search bar. A list of available products ng your query will be generated. Select the layer(s) of interest to add to the Selected layers list. Layers nultiple products can be added to a single request. Be sure to read the list of available products le through AppEEARS.



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Earthdata Learn Resources

Discover Fire and Related Data

Active Fire/Thermal Anomalies

NASA provides data that can be used to detect active fires and thermal anomalies, such as volcanoes, and gas flares. These data are useful for studying the spatial and temporal distribution of fire, to locate persistent hot spots such as volcanoes and gas flares, and to locate the source of air pollution from smoke that may have adverse human health impacts.

- Discover Fires/Thermal Anomalies Data in Fire Information for Resource Management System (FIRMS)
- Discover Fires/Thermal Anomalies Data in Earthdata Search
- Fire Carbon Emissions Estimates at NASA's Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC)
- Fire Extent/Severity Data at ORNL DAAC
- Fire/Thermal Anomalies Data at NASA's Land Processes DAAC (LP DAAC)
- Visualize Fires/Thermal Anomalies Data in Worldview

Data Tutorials/Recipes

- Getting Started with Moderate Resolution Imaging Spectroradiometer (MODIS) Thermal
- Anomalies and Fire Data: All About Accessing Data
- Getting Started with MODIS Thermal Anomalies and Fire Data: Interpreting Quality Information
- Getting Started with MODIS Thermal Anomalies and Fire Data: Using the Data
- Learn about Satellite Detections of Fire in Worldview
- Tutorials/Recipes for LP DAAC Data
- Tutorials/Recipes for ORNL DAAC Data

Data User Guides

- MODIS Active Fires Data User Guide
- Visible Infrared Imaging Radiometer Suite (VIIRS) Active Fires Data User Guide

Explore Fire Events in Worldview

- California and British Columbia Wildfires (Summer 2018)
- Camp Fire (November 2018)

lightning strikes have been the cause of some of the worst wildfires in the western United States and around the world. Wildfires caused by lightning often occur in remote locations that are not easily accessible.

- Discover Lightning Data in Earthdata Search
- Lightning Data at NASA's Global Hydrometeorology Resc (GHRC DAAC)
- Visualize Lightning Data in Worldview

Data Tutorials/Recipes

- ISS LIS Lightning Flash Location Quickview using Python
- Using ArcGIS to Convert LIS Very High Resolution Gridde Climatology NetCDF Data to GeoTIFF Format

Webinars

- Discover International Space Station (ISS) Lightning and Validation Data from Geostationary Operational Environme (GOES-16)
- Learn How to Subset Ozone Monitoring Instrument (OM Goddard Earth Sciences Data and Information Services Cen Level 2 Data Subsetter
- Striking New Spatial Bounds Using ISS Lightning Imaging Data

Precipitation

By monitoring seasonal variations in precipitation (rain and snow) fire managers are better able to predict and evaluate when and where a wildfire may develop, how severe the fire may become, and the rate at which a wildfire spreads.

- Citizen Science on Snow
- Discover Rain/Snow Data in Earthdata Search
- Precipitation Data at GES DISC
- Rain/Snow Data at GHRC DAAC
- Snow Data at NASA's National Snow and Ice Data Center DAAC)
- Visualize Rain/Snow Data in Worldview

Backgrounders

Backgrounders are informational articles providing a deeper explanation of key topics in Earth science to aid in understanding data and data use.

Most Recent

Nighttime Lights
Remote sensing of nighttime light emissions offers a unique perspective to monitor human behaviors, such as electrification of remote areas, disaster recovery, and more. (May 2021)

All Backgrounders

What is Data Latency?
Several factors affect the speed at which data are processed and made available to users. Here's how NASA's Earth Observing System Data and Information System (EOSDIS) defines data latency. (August 2020)

Sustainable Development Goals
Sustainable Development Goals (SDGs) serve as an aspiration, what United Nations member countries hope to ideally achieve in the future. Earth observations can be used in monitoring progress towards reaching each goal. (June 2020)

What is Synthetic Aperture Radar (SAR)?
Learn more about SAR, a type of active data collection where a sensor produces its own energy and then records the amount of that energy reflected back after interacting with the Earth. (April 2020)

Essential Variables
Essential variables are variables known to be critical for observing and monitoring a given facet of the Earth system. Learn how they ensure the usability of data across multiple platforms and agencies. (March 2020)

What is Remote Sensing?
Remote sensing is the acquiring of information from a distance. Read about how remote sensors enable data-informed decision-making based on the current and future state of our planet. (September 2019)

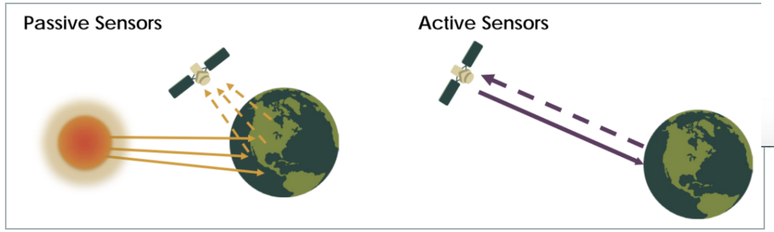
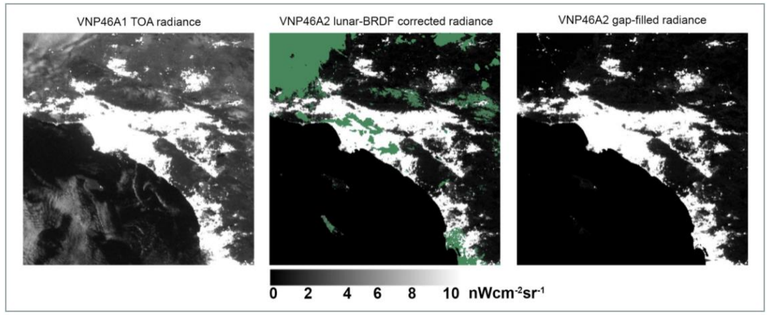


Diagram of a passive sensor versus an active sensor. Credit: NASA Applied Remote Sensing Training Program

Choosing the Right Black Marble Product

Since lunar effects have not been removed from the VNP46A1 NTL product, sky-illumination and environmental conditions can impact imagery. For detecting changes in human activities and processes linked to artificial lights at night, the VNP46A2 product, which "turns off the moon," is a better choice.



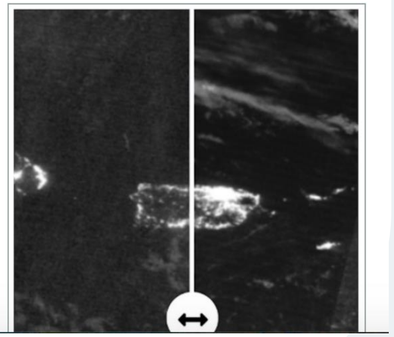
Comparison of NASA's Black Marble data products over Los Angeles, CA. **(Left image)** VNP46A1-TOA provides a Top of Atmosphere perspective. Note the hazy areas caused by cloud cover; **(center image)** VNP46A2 – Daily has been moonlight adjusted, but still is hindered by cloud cover (green colored areas); **(right image)** VNP46A2 – GapFilled fills in gaps due to cloud cover. NASA image.

It's important to understand which NTL are captured by VIIRS DNB and which NTL are not (e.g., outdoor lights, building lights, traffic, etc.). Understanding the composition of the sources making up NTL signals enables better use of the data in Earth system science and urban applications.

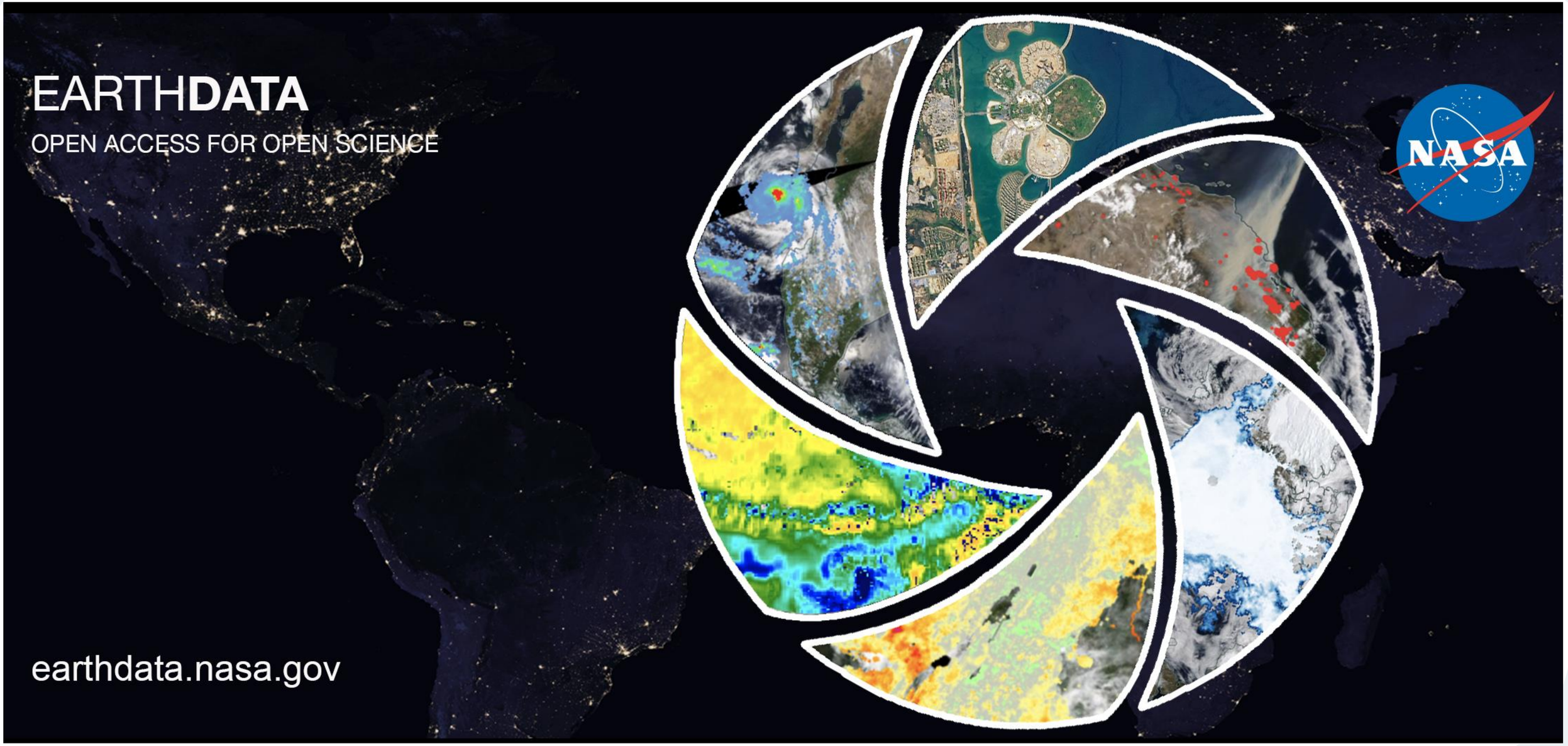
References:

- Black Marble Data Products at NASA's Level-1 and Atmosphere Archive and Distribution System Distributed Active Archive Center (LAADS DAAC)
- Black Marble User Guide
- A Framework for the Validation of Global Nighttime Environmental Products

Applications of Nighttime Lights Data



NTL contribute to a variety of Earth science studies and applications. By "subtracting" moonlight and other extraneous sources, researchers can systematically monitor artificial lights like street and building lighting, fishing boats, gas flares, fires, aurora, and many human activities. In addition, Black Marble data are helping assess progress towards meeting many of the United Nation's Sustainable Development Goals (SDGs), specifically addressing the needs of conflict-affected populations (SDG-1); quantifying the effectiveness of local electrification projects in the developing world (SDG-7); building infrastructure resilient to disasters, promoting inclusive and sustainable industrialization, and fostering innovation (SDG-9); and ensuring that cities and human settlements are inclusive, safe, resilient, and



Cynthia Hall | cynthia.r.hall@nasa.gov

Ten Years of NASA Space Apps

Sarah Hemmings


NASA
SPACE APPS
CHALLENGE

Space Apps is the world's largest annual global hackathon

2020

Over 250 local events in 87 countries

Event Location Live Streaming Location

What is a hackathon?

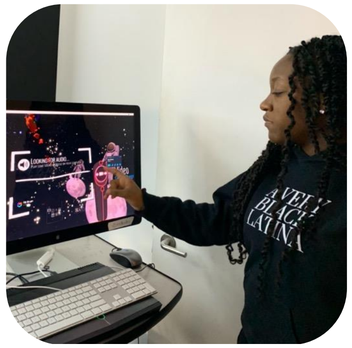
- Innovation competition
- Roots in cyber security
- Local and virtual events
- Sprint/marathon over 48hr

NASA SPACE APPS CHALLENGE

How does it work?

- NASA issues challenge statements (with related data)
- Teams create solutions Oct 2-3
- Solutions are judged, winners are selected

Space Apps Highlights



- Began in 2012, with focus on space tech
- Moved to Earth Science Division in 2017
- Over 150K participants to date

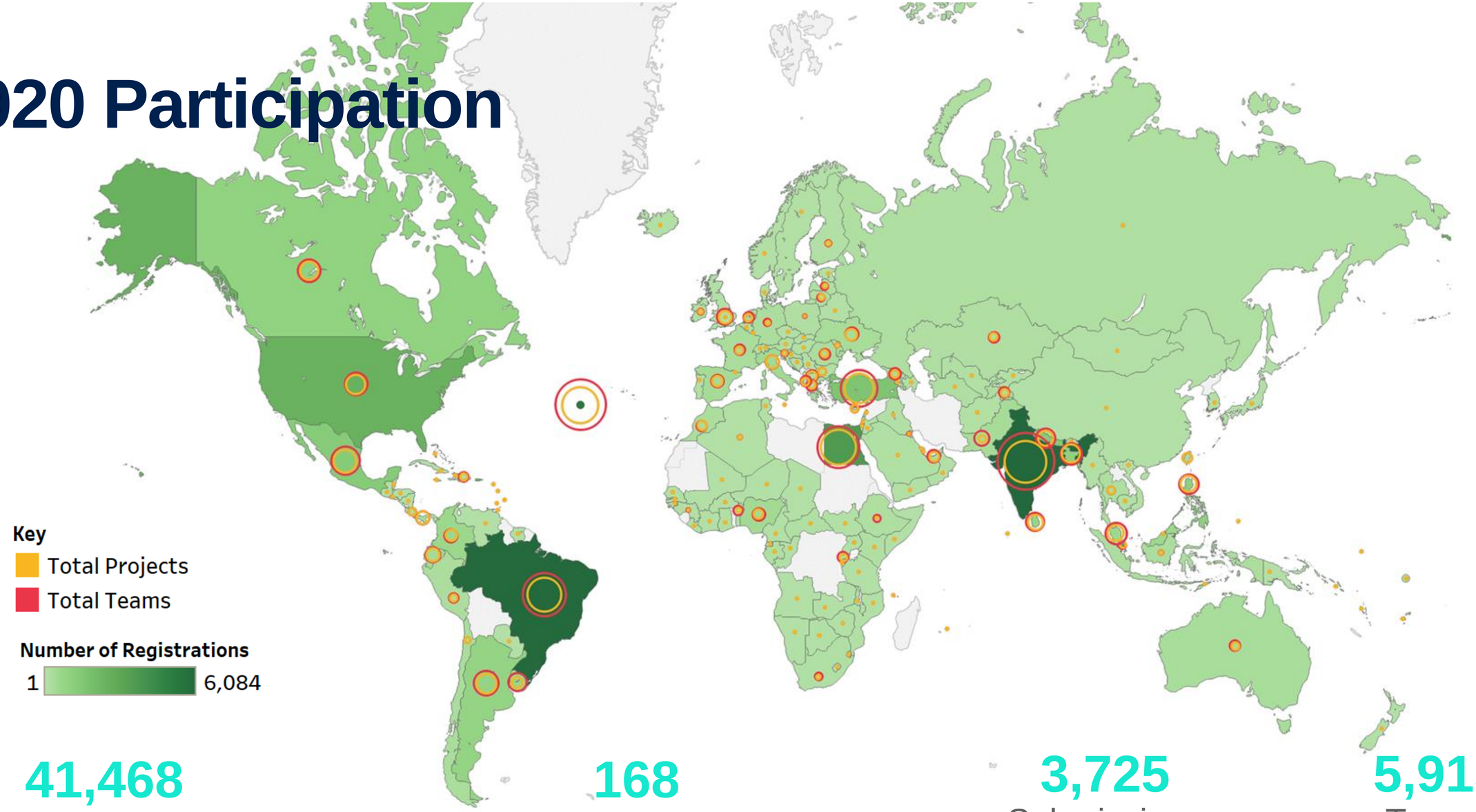
Space Apps Goals

- Raise awareness of NASA open data
- Encourage growth, diversity of next generation
- Foster interest in Earth and space science/tech
- Inspire collaboration, creativity, critical thinking

Winners and Prizes

- NASA invites winners to attend rocket launch

2020 Participation



41,468
Registrations

168
Countries/Territories*

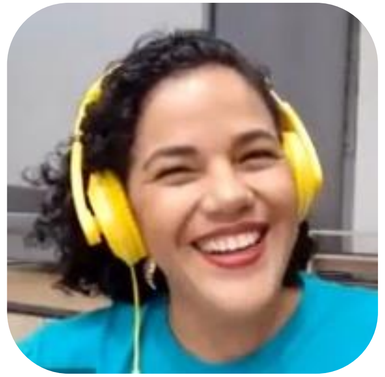
3,725
Submissions

5,915
Teams

*These 168 Countries/Territories are based on participants self-reporting their location.

Local Leads are key

- STEAM & open data ambassadors worldwide
- Local hubs of innovation
- New communities of collaboration
- Professional development and networking
- 37.5% female



Apply to host in 2022!

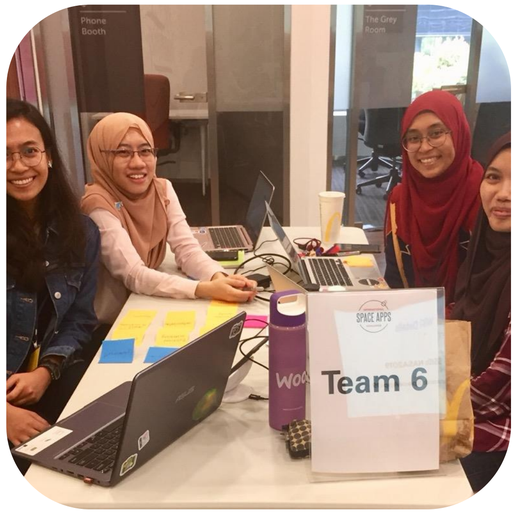
We are not alone in thinking Space Apps is great ☺

71 million+

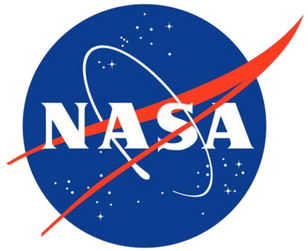
#SpaceApps

Social Media Reach

(29% increase over 2019)



2021 Space Agency Partners



https://www.spaceappschallenge.org

At Space Apps, There's Always Space For One More...

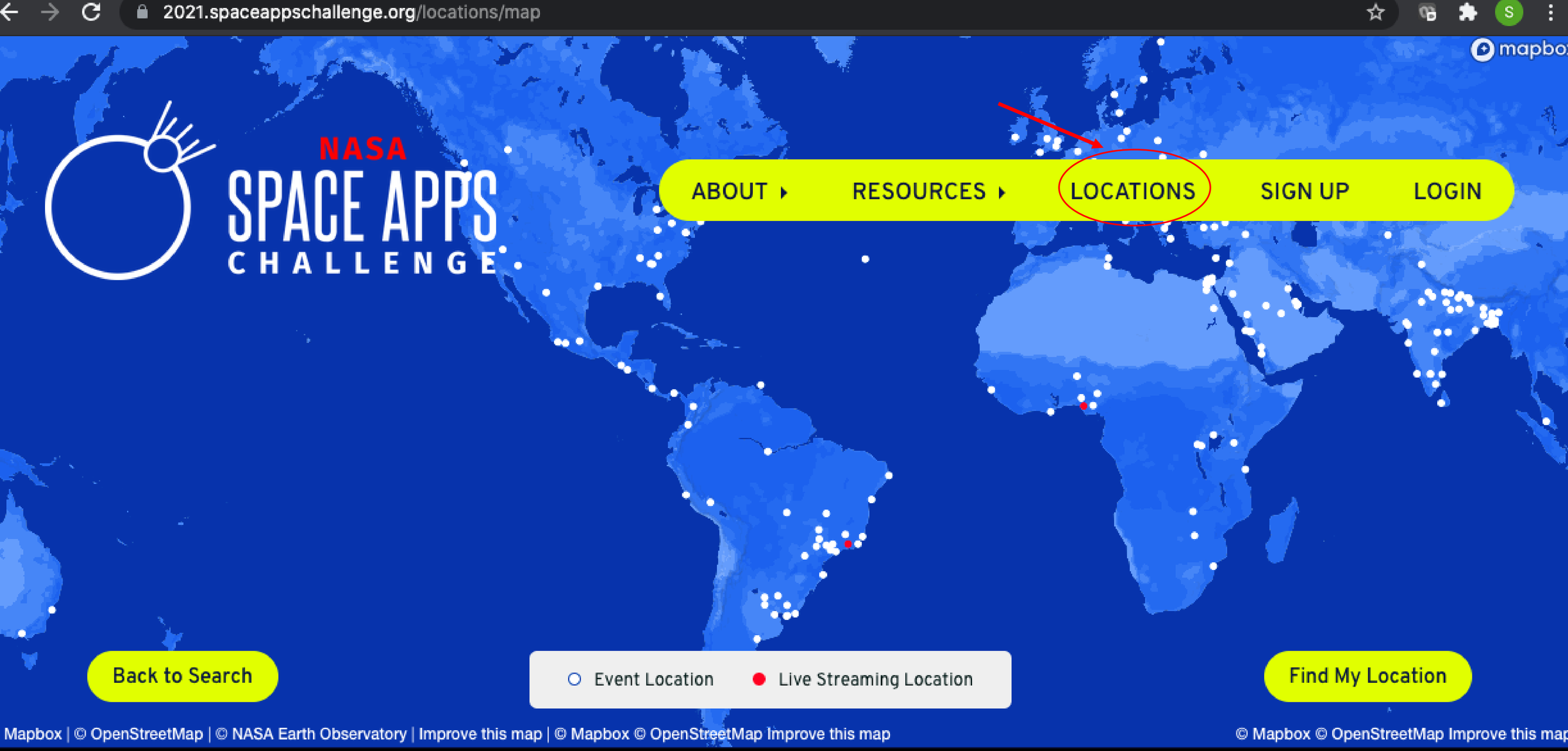
NASA SPACE APPS CHALLENGE

ABOUT RESOURCES LOCATIONS SIGN UP LOGIN

OCTOBER 2–3, 2021

Tenth Annual Event

Register Now



Space Apps is managed by the

PRIVACY POLICY LEGAL CONTACT

Connect with #SpaceApps

Join us as a SME/judge, local lead, or participant!

www.spaceappschallenge.org

Propose a challenge for 2022:

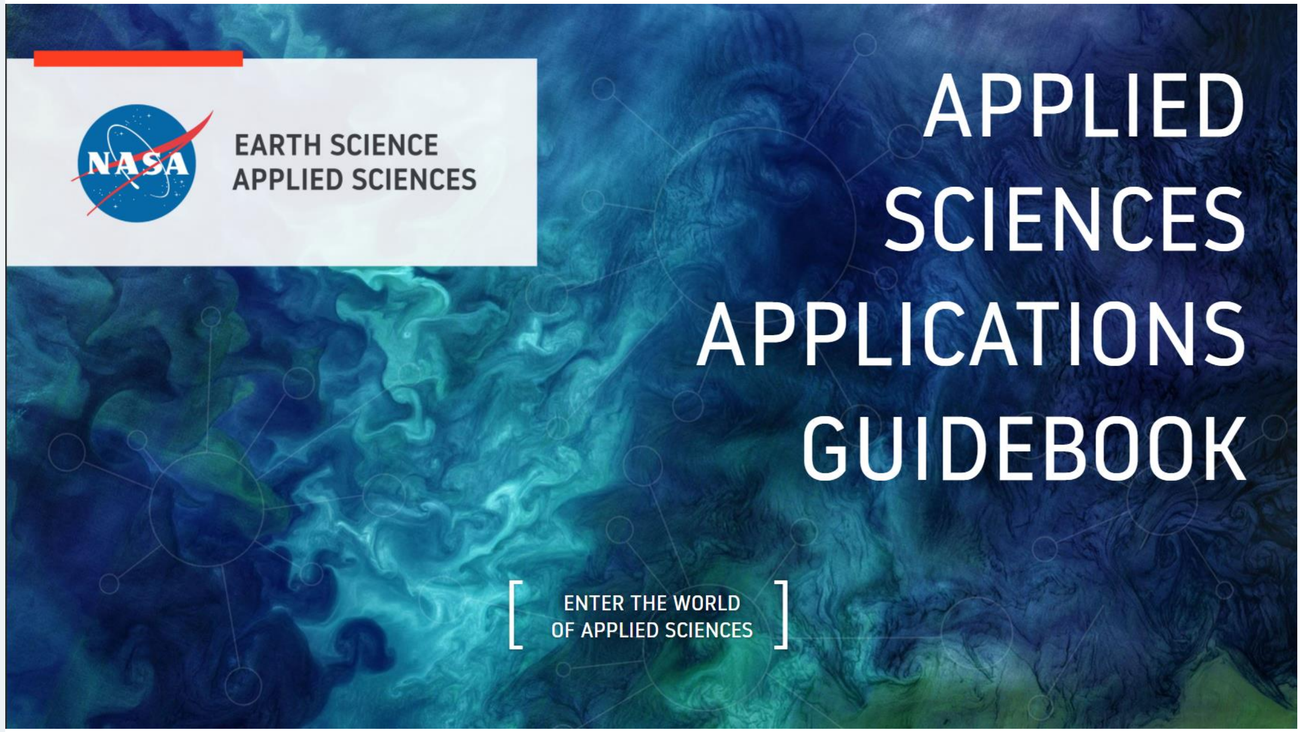
jessica.chau@nasa.gov

The Applied Sciences Applications Guidebook

Leveraging Decades of Experience and Best Practice

Erin Martin & Sterling Riber

Web-based product to synthesize and share best practices in developing EO applications



- Audiences: emerging applied scientists, basic research scientists considering applied work, PIs new to NASA
- Format: mixes interactive, e-learning approaches
- Sources: desk review, survey, 25 interviews and 2 design consultations – so far!
- Content: diverse representation of ASP program areas, geographies and PIs
- Timing: launch in late November

Main sections of the guidebook

EARTH SCIENCE
APPLIED SCIENCES

APPLIED SCIENCES APPLICATIONS GUIDEBOOK

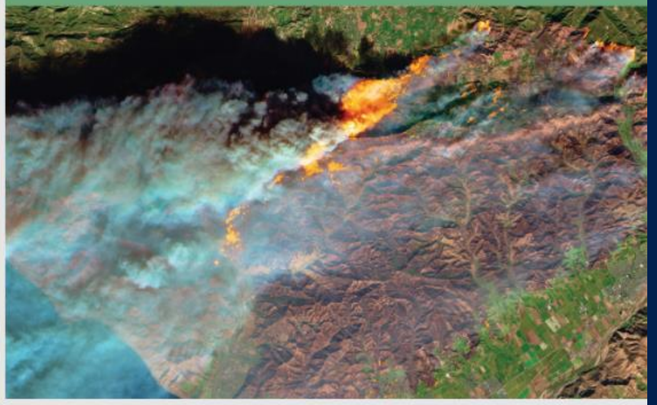
This guidebook is a place to explore the many, diverse ways that scientists are using satellite data to help people at home and abroad make important decisions about water, agriculture, fisheries, disaster response, health and the environment. It offers insights, lessons and recommendations – all from the point of view of individuals who have devoted their careers to using science to make the world a better place.

Select a topic and begin exploring...

APPLIED SCIENCE: WHAT IT TAKES

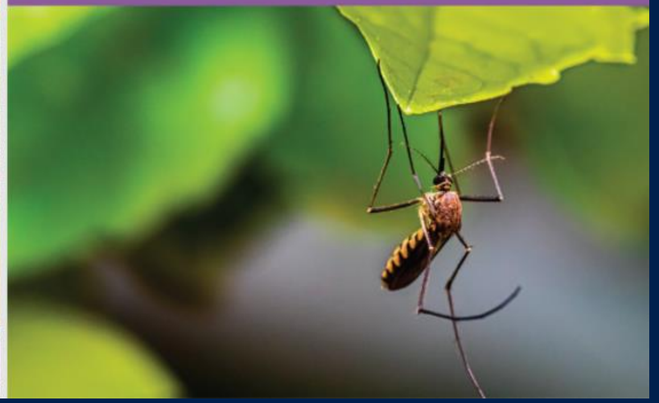
Applied sciences require a particular combination of technical, managerial and people skills. Learn more about what it takes to succeed, and why many scientists working on applied research think they have the best job in the world.

USING APPLIED SCIENCE TO TACKLE CRITICAL CHALLENGES

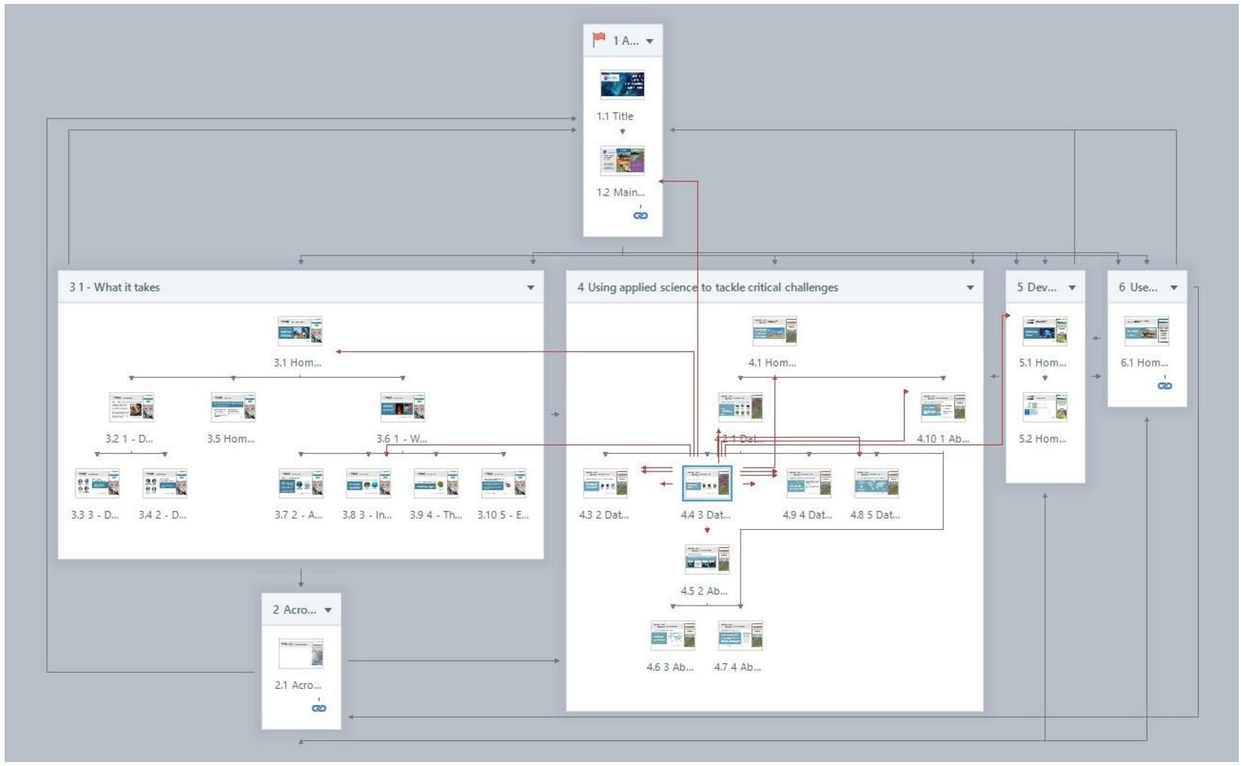


DELIVERING SUSTAINABLE APPLICATIONS

USE CASES



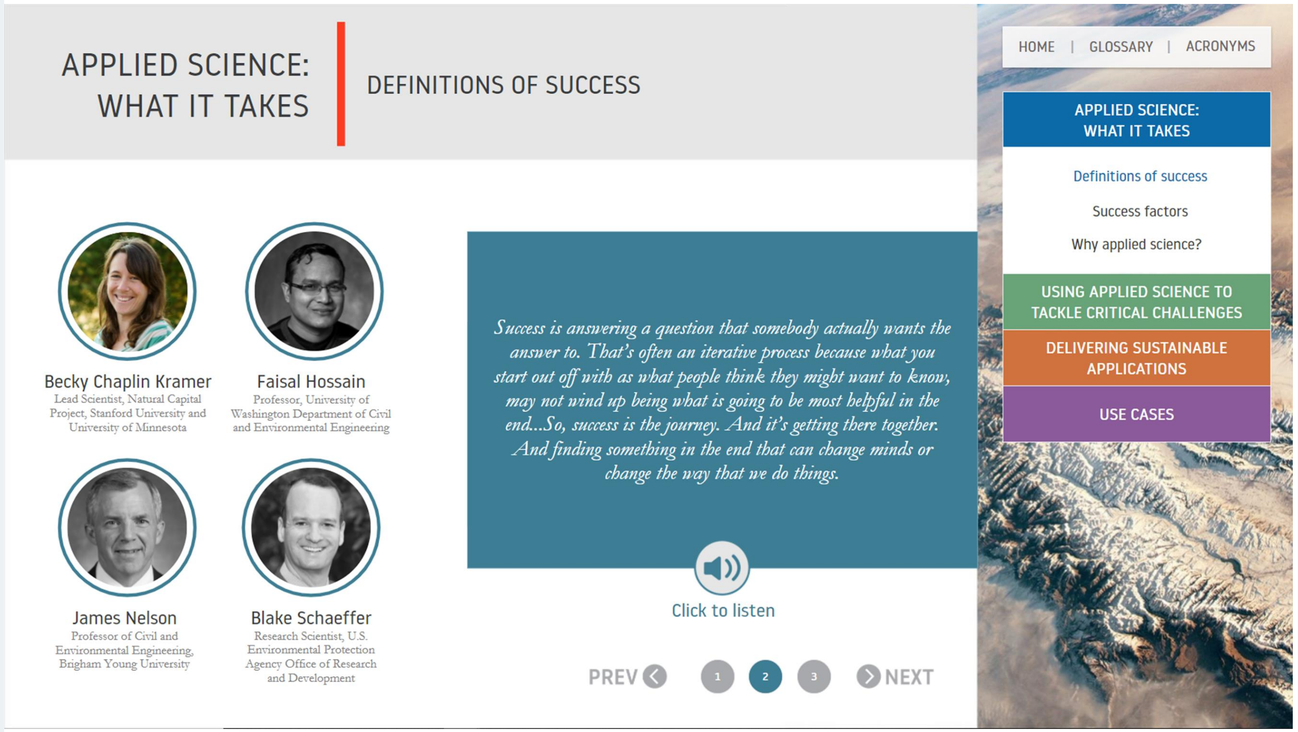
Creating engaging content through interactivity



The guidebook is developed using an e-learning authoring tool called Articulate Storyline. Some benefits to this approach include:

- Ability for users to choose their own path
- Built-in interactivities (e.g., rollovers, quizzes, soundbites)
- Graphics and animation
- Responsive full screen display
- Fast loading HTML5 output

Vision: guidebook catalyzes greater engagement in Applied Sciences



The plan is for the guidebook to be a focal point for learning, sharing and exchange on applied sciences applications. Possible activities may include:

- New cases studies and fresh content
- Annual lessons learned symposium
- Applied sciences community interaction

How you can get involved

- Share your suggestions, ideas and experience
- Volunteer for BETA testing (planned for September)

Contact: Erin Martin
eemartin08@yahoo.com

CLOSING REMARKS

Lawrence Friedl, Director
Applied Sciences Program

THANK YOU TO OUR PLENARY SPEAKERS, PANELISTS, AND EMCEES!

Day 1

Milagros Becerra
Lawrence Friedl
Katie Lange
Laura Lorenzoni
Monica Namo
Teresa Purello
Gavin Schmidt
Nicole Ramberg-Pihl
Karen St. Germain
Emily Sylak-Glassman
Nikki Tulley
Tanner Yess

Day 2

Alix Bakke
Kris Bedka
Sandra Cauffman
Becky Chaplin Kramer
Brendan Crowell
Megan Donahue
Robert Emberson
Keith Gaddis
David Green
Charlie Huyck
Jeremy Kirkendall
Erica Kriner
Kyle Pecsok
Ricardo Quiroga
Ellen Ramirez
Stephanie Spera
Rochelle Williams

Day 3

Britnay Beaudry
Inbal Becker-Reshef
John Bolten
Brad Doorn
Stephanie Granger
Mehdi Hosseini
John Keniston
Venkat Lakshmi
Christine Lee
Amber McCullum
Joel McClure
Ethan McGee
Milton Munoz-Hincapie
Catherine Nakalembe
Hayley Pippin
Nancy Searby

Day 4

Assad Anyamba
Lawrence Friedl
Julia Gohlke
Pawan Gupta
Cyndi Hall
Ryan Hammock
John Haynes
Sarah Hemmings
Tracey Holloway
Oded Holzinger
Adriana Le Compte
Erin Martin
Sterling Riber
Emily Sylak-Glassman
Jilian Walechka
Thomas Zurbuchen

THANK YOU TO OUR SYMPOSIA SESSION SPEAKERS AND EMCEES!

DAY 2

Porter Abbey
Jacob Abramowitz
Britnay Beaudry
Biplov Bhandari
McKenna Brahler
Madison Broddle
Trista Brophy
Cecil Byles
Erica Carcelan
Marc Coudert
Sativa Cruz
Jacob Frankel
Emily Gelbart
Madeleine Gregory
Shobhana Gupta
Ella Haugen
David Hondula
Nelson Huffaker
Paxton LaJoie
Zachary Leslie
Alexa Lopez
Bradley Macpherson
Jay Mrazek
Monica Namo
Brandy Nisbet-Wilcox
Jonathan O'Brien
Caden O'Connell
Kristen O'Shea
Hayley Pippin
Paul Stackhouse
Kezang Tshering
Katie Walker
Thinley Wangden
Sophie Webster
Hannah Wetzel

DAY 3

Emily Adams
Arlin Arpero
Daniel Babin
Rebecca Bernat
Catherine Buczek
Philip Casey
Laura Cooper
Karissa Courtney
Rachel Darling
Michael Enz
Jose Fernandez
Alex Gunnerson
Georgia Hartman
Shilpa Kannan
Yusuke Kuwayama
Ryan Lam
Bethany Mabee
Allison Nguyen
Tyler Pantle
Helen Parache
Kyle Paulekas
Addison Pletcher
Teresa Purello
Tamara Rudic
Madelyn Savan
Yeshey Seldon
Ekapol Sirichaovanichkarn
Justine Spore
Sophia Stonebrook
Amanda Weigel
Ila White

MANY THANKS TO OUR PLANNING COMMITTEE!

Sydney Neugebauer

Amanda Clayton

Lauren Childs-Gleason

Jonathan O’Brien

Sarah Brennan
Cecil Byles
Helena Chapman
Kathleen Cutting
Robin Ford
Celeste Gambino
Michael Goodman
Shobhana Gupta
Madeleine Gregory

Ryan Hammock
Laura Judd
Erica Kriner
Adriana Le Compte
McRae Lent
Alexa Lopez
Tim Mayer
Sara Miller
John Murray

Monica Namo
Brandy Nisbet-Wilcox
Teresa Purello
Nicole Ramberg-Pihl
Mike Ruiz
Cindy Schmidt
Jeff Walter
Rochelle Williams

EARTH SCIENCE
APPLIED SCIENCES

EARTH SCIENCE APPLICATIONS WEEK 2021

Monday, August 9th -
Thursday, August 12th

12pm - 4pm ET

EARTH SCIENCE
APPLIED SCIENCES

THANK YOU!

EARTH SCIENCE APPLICATIONS WEEK 2021