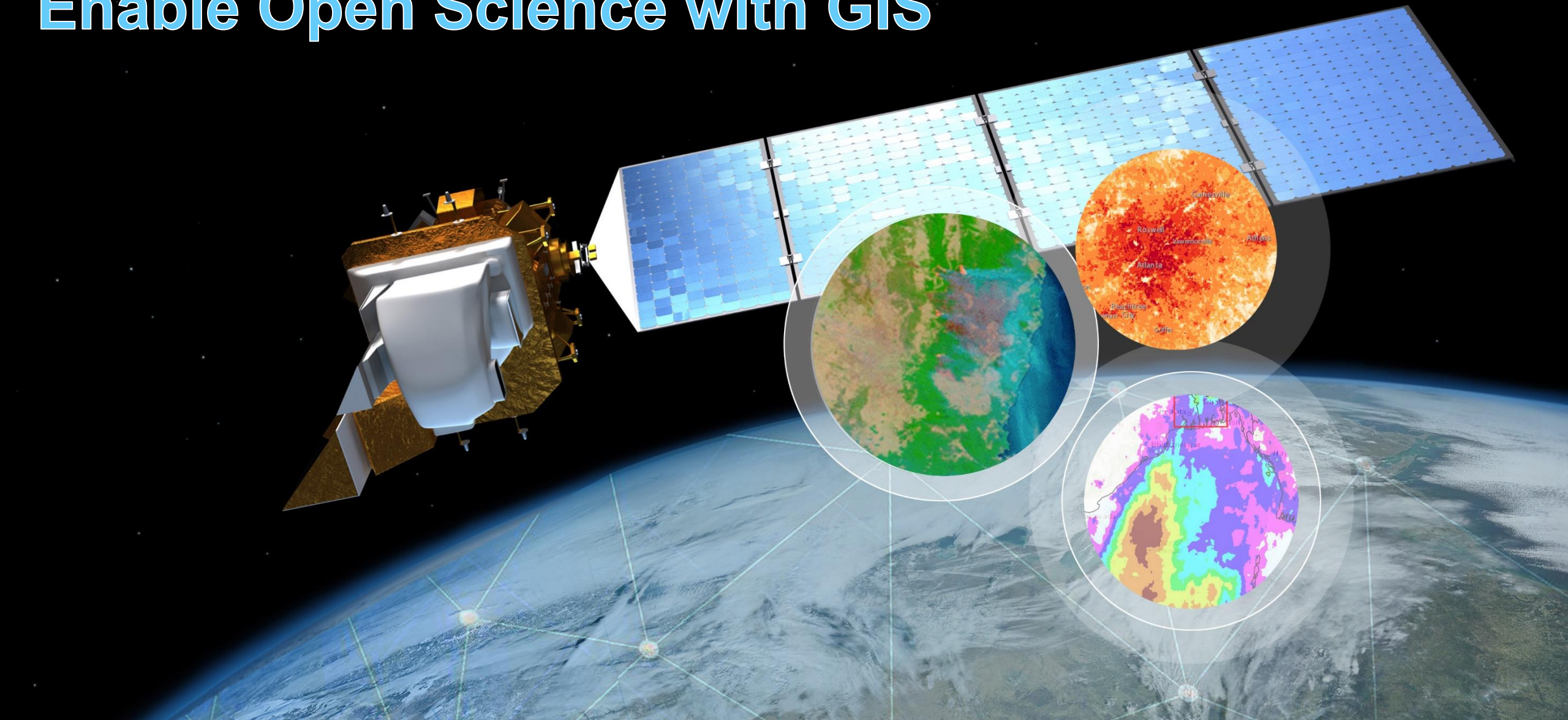
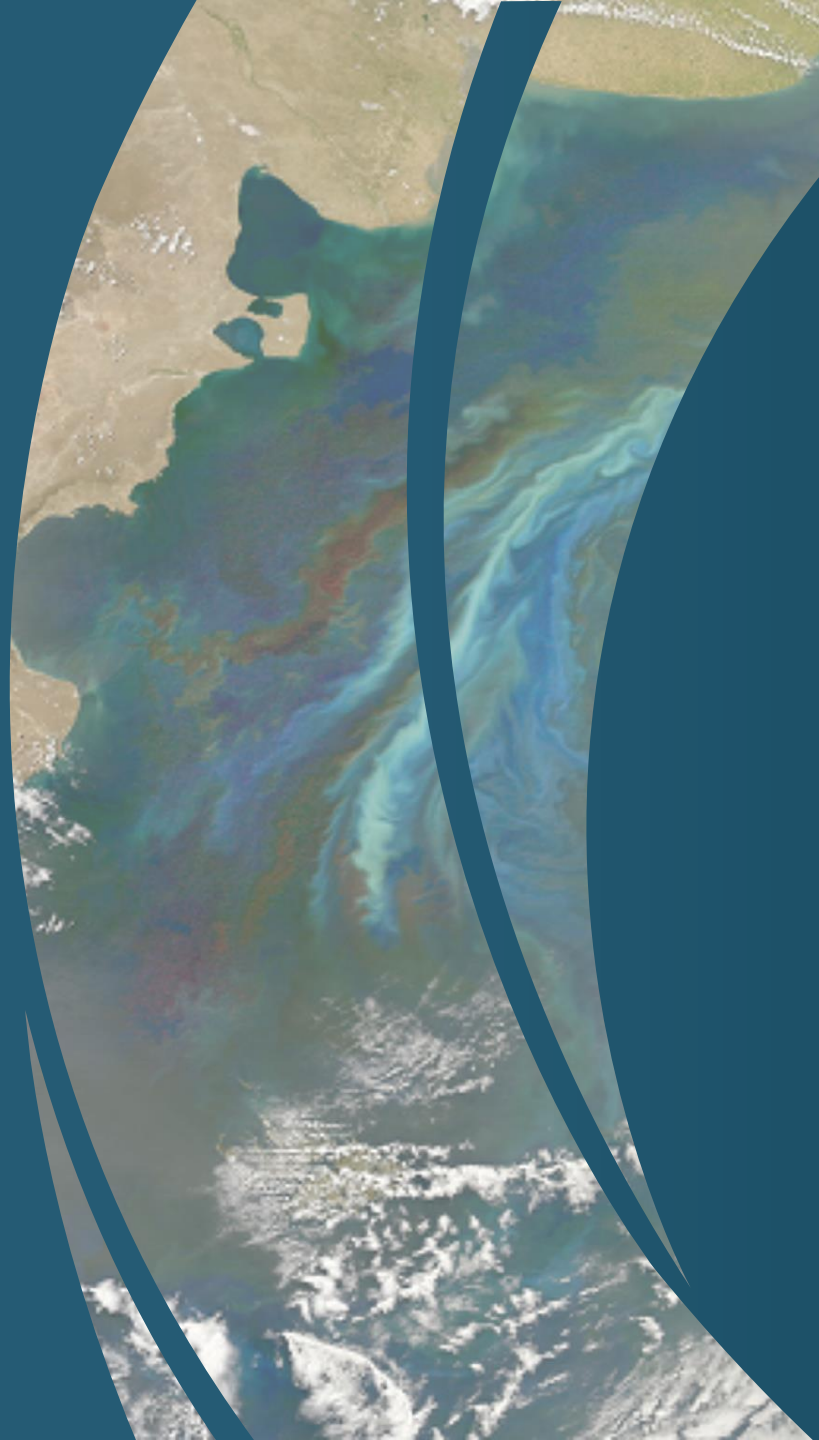
Using NASA Earth Observations to Enable Open Science with GIS

National Aeronautics and Space Administration





Agenda

Intro to Earth Science

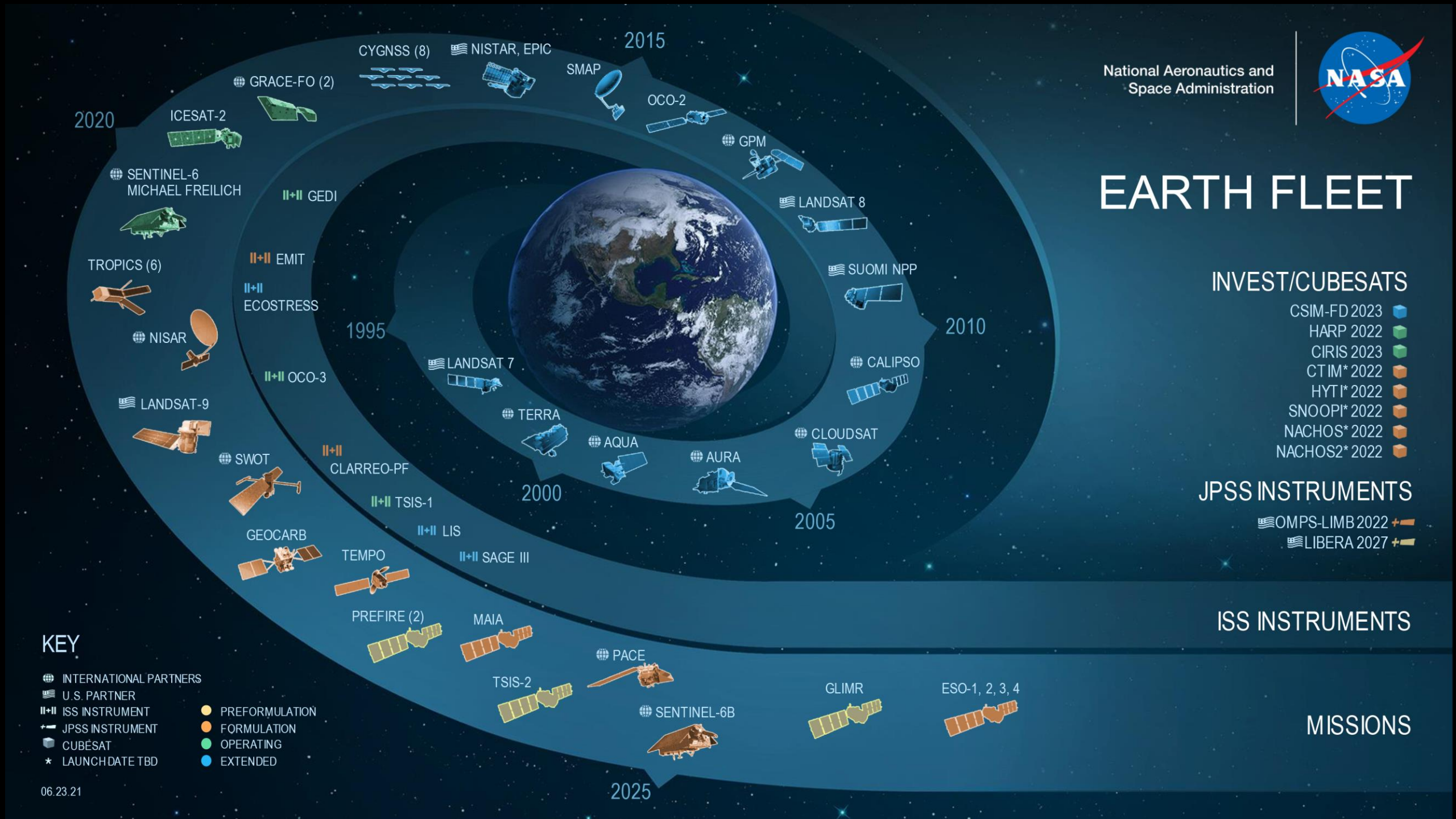
Data & Content

Discovery, Access and Use

Applications with Earth observations

Resources

Engagement & Feedback!

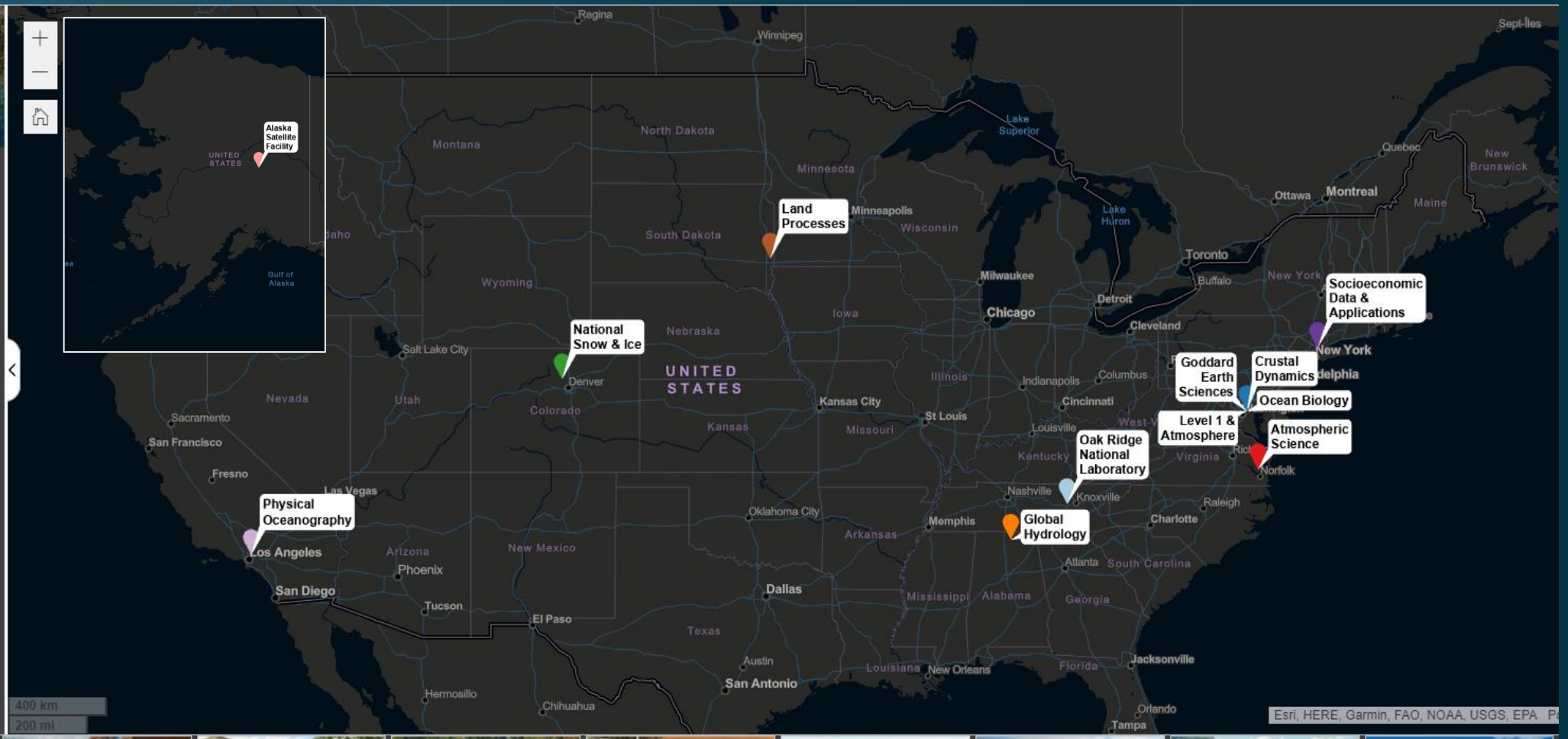

National Aeronautics and Space Administration
NASA
EARTH FLEET
2015
2020
1995
2010
2000
2005
2025
CYGNSS (8)
NISTAR, EPIC
SMAP
GRACE-FO (2)
ICESAT-2
OCO-2
GPM
SENTINEL-6 MICHAEL FREILICH
GEDI
LANDSAT 8
EMIT
SUOMI NPP
TROPICS (6)
ECOSTRESS
NISAR
LANDSAT 7
CALIPSO
OCO-3
LANDSAT-9
TERRA
CLOUDSAT
AQUA
AURA
SWOT
CLARREO-PF
TSIS-1
LIS
GEOCARB
TEMPO
SAGE III
PREFIRE (2)
MAIA
PACE
TSIS-2
SENTINEL-6B
GLIMR
ESO-1, 2, 3, 4
INVEST/CUBESATS
CSIM-FD 2023
HARP 2022
CIRIS 2023
CTIM* 2022
HYTI* 2022
SNOOPI* 2022
NACHOS* 2022
NACHOS2* 2022
JPSS INSTRUMENTS
OMPS-LIMB 2022
LIBERA 2027
ISS INSTRUMENTS
MISSIONS
KEY
INTERNATIONAL PARTNERS
U.S. PARTNER
ISS INSTRUMENT
JPSS INSTRUMENT
CUBESAT
LAUNCH DATE TBD
PREFORMULATION
FORMULATION
OPERATING
EXTENDED
06.23.21

EARTHDATA
Powered by EOSDIS

EOSDIS Distributed Active Archive Centers

NASA's Earth Observing System Data and Information System (EOSDIS) is designed as a distributed system, with major facilities at NASA's Distributed Active Archive Centers (DAACs) located throughout the United States. These institutions are custodians of EOS mission data and ensure that data will be easily accessible to users. EOSDIS DAACs process, archive, document, and distribute data from NASA's past and current Earth-observing satellites and field measurement programs. Acting in concert, the DAACs provide reliable, robust services to users whose needs may cross the traditional boundaries of a science discipline, while continuing to support the particular needs of users within the discipline communities. User services include:

- Assistance in selecting and obtaining data
- Access to data-handling and visualization tools
- Notification of data-related news
- Technical support and referrals



Alaska Satellite Facility DAAC

Website

Atmospheric Science Data Center

Website

Crustal Dynamics Data Information System

Website

Global Hydrology Resource Center

Website

Goddard Earth Sciences Data & Information Services Center

Website

Land Processes DAAC

Website

Level 1 & Atmosphere Archive & Distribution

Website

National Snow & Ice Data Center

Website

Oak Ridge National Laboratory

Website

Ocean Biology DAAC

Website

Open Data to fuel Open Science

Building a new ecosystem to…

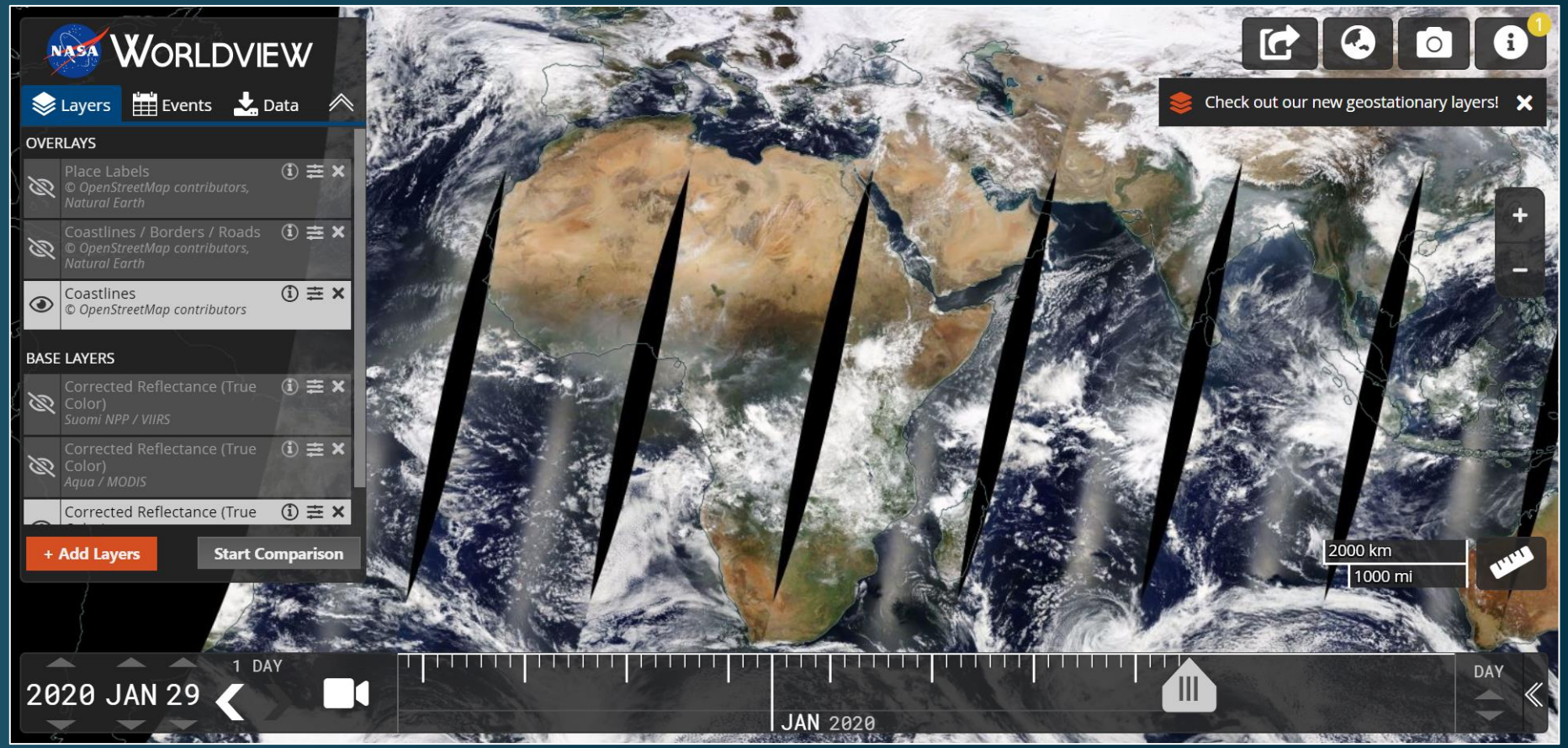
- ***Shorten the time*** it takes for a new user to find and learn how to use data
- ***Increase community contributions*** with hands-on engagement
- ***Explore and exploit data*** in new ways - share knowledge!
- ***Incentivize and energize*** innovation
- ***Complement efforts and enhance integration*** with uniquely designed, holistic, Earth-focused missions

Accessing and Using NASA Earth Observations

https://worldview.earthdata.nasa.gov/

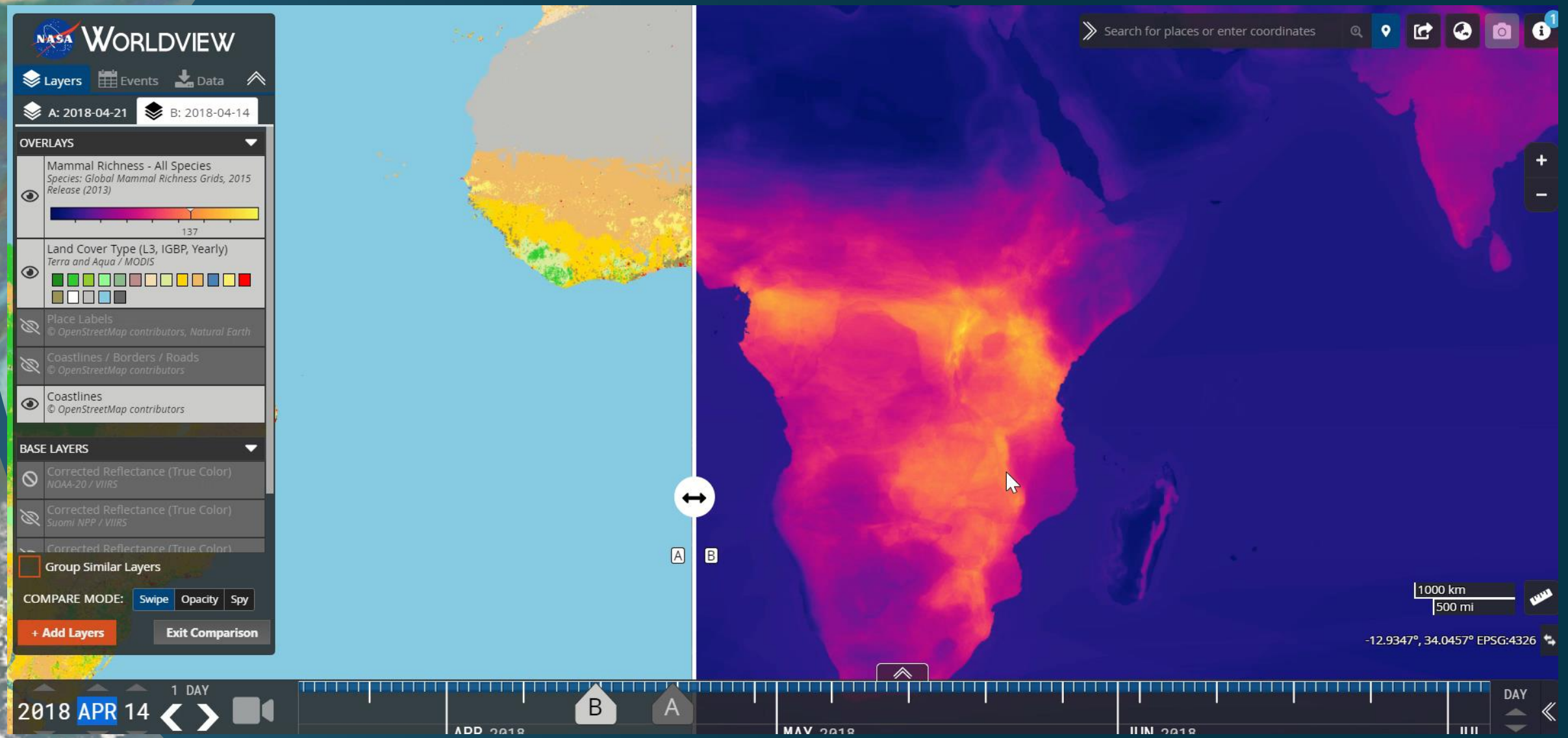
NASA Worldview

Interactively browse ~**900 global, full-resolution satellite imagery layers** (GIBS)



https://worldview.earthdata.nasa.gov/

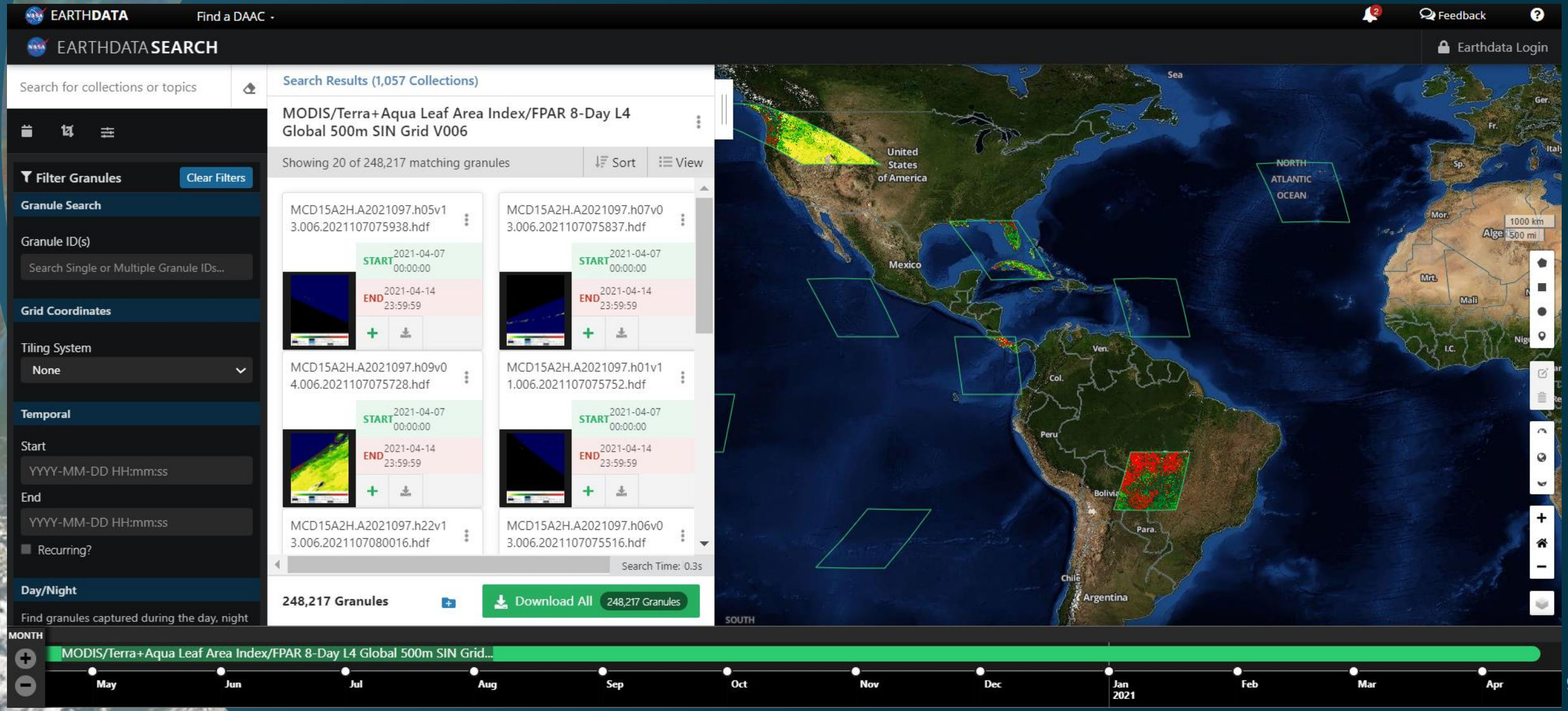
More than viewing… Interacting!



https://search.earthdata.nasa.gov/

Earthdata Search

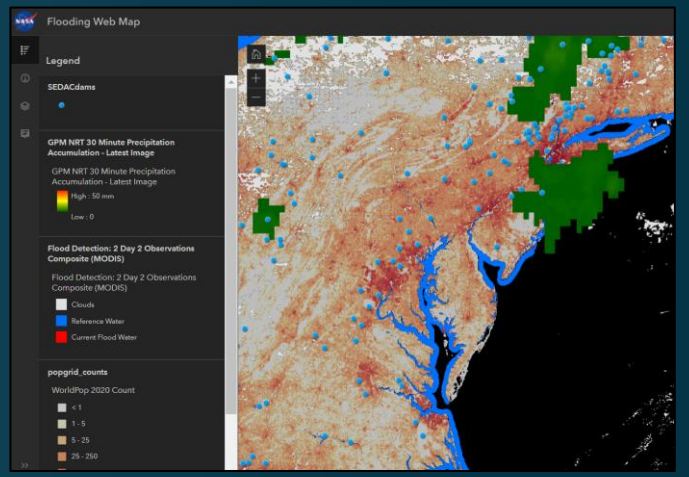
Download Data Files

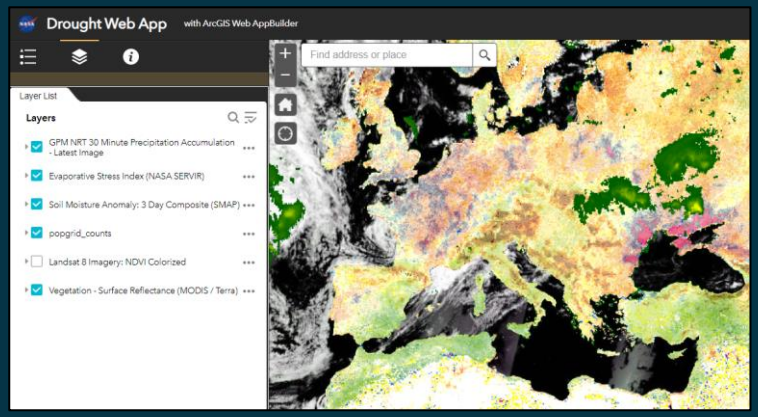


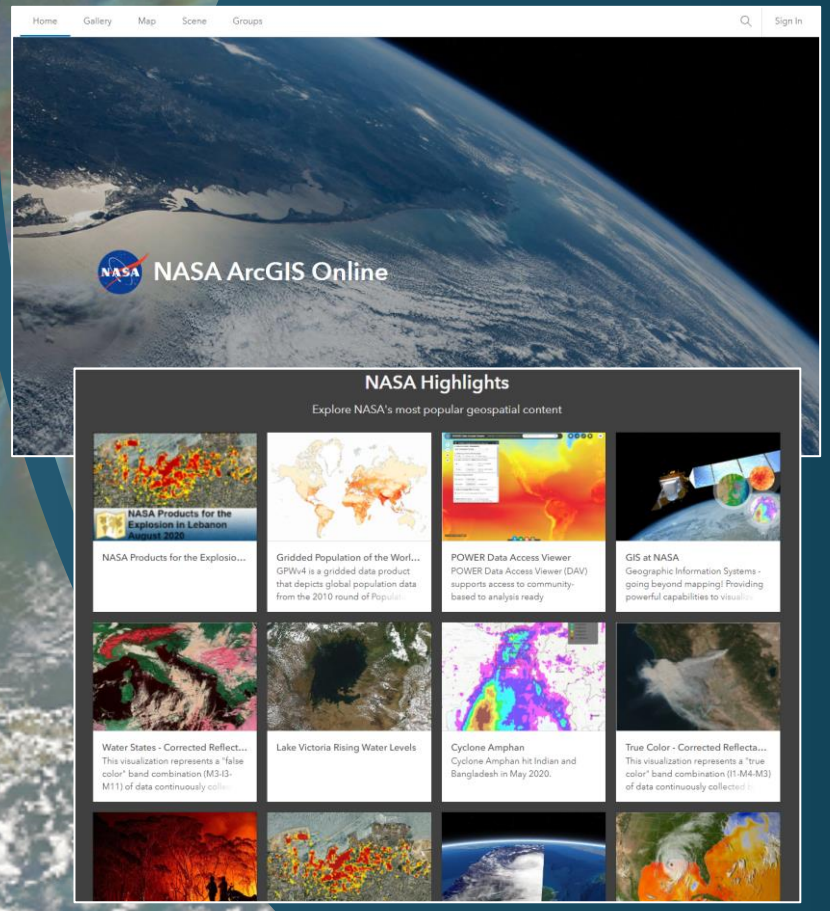
https://nasa.maps.arcgis.com/home/index.html

NASA's ArcGIS Online (AGOL)

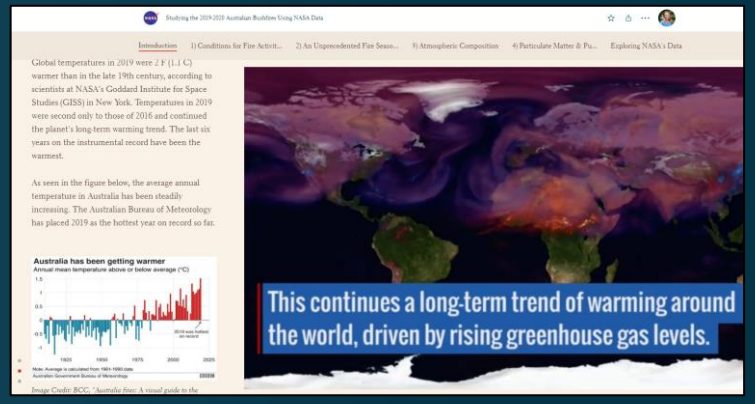
Publicly Available Collaborative Web Maps

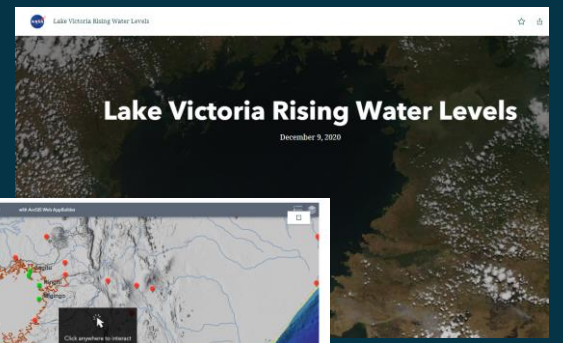


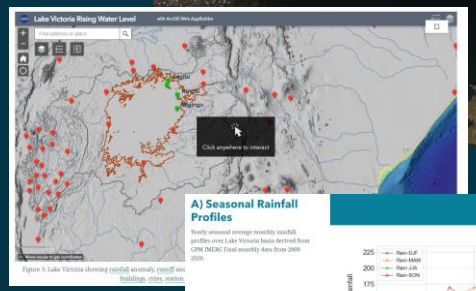


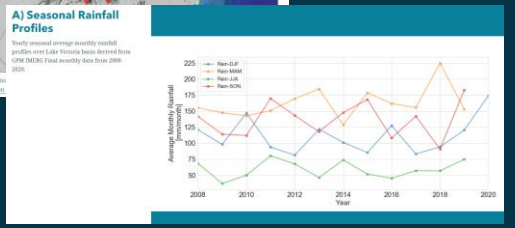


Publicly Available Story Maps





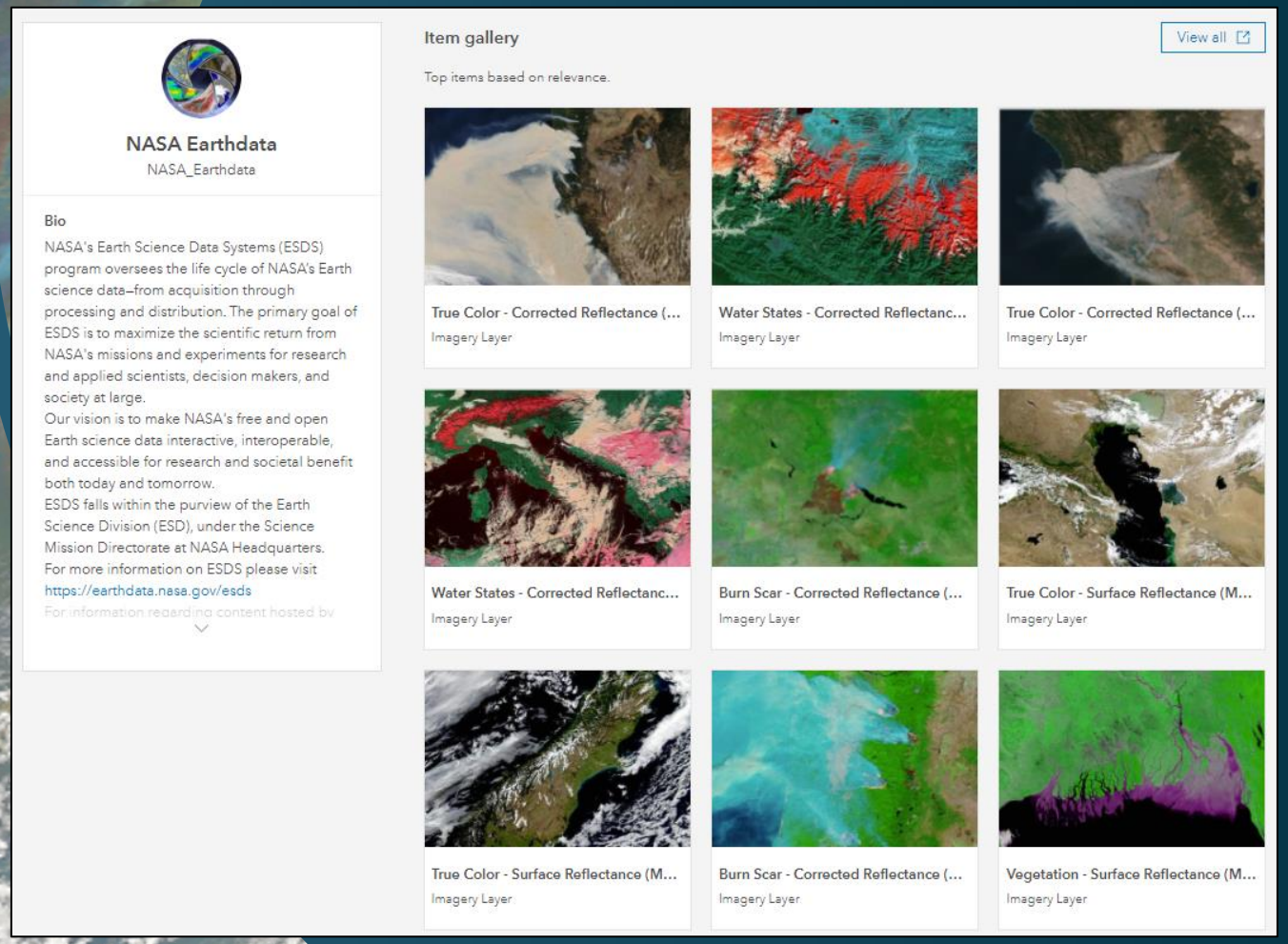




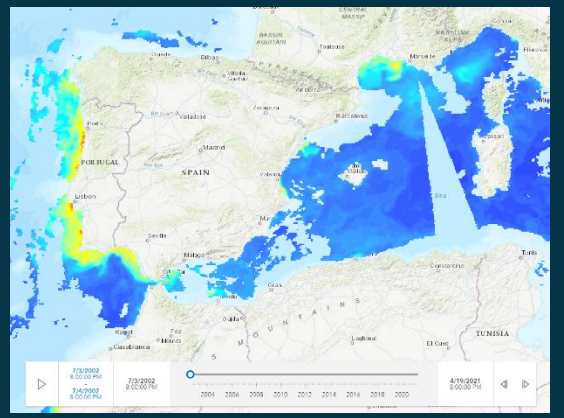
https://livingatlas.arcgis.com/

Living Atlas of the World

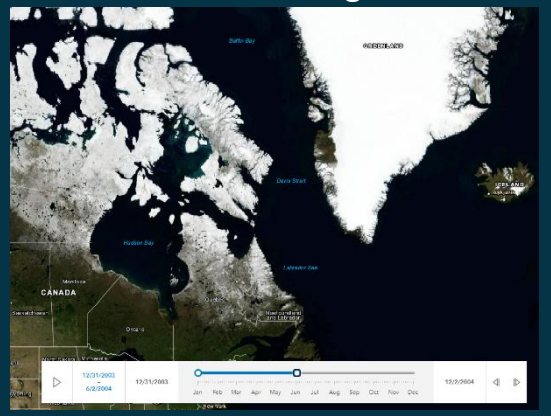
By NASA_Earthdata



Chlorophyll

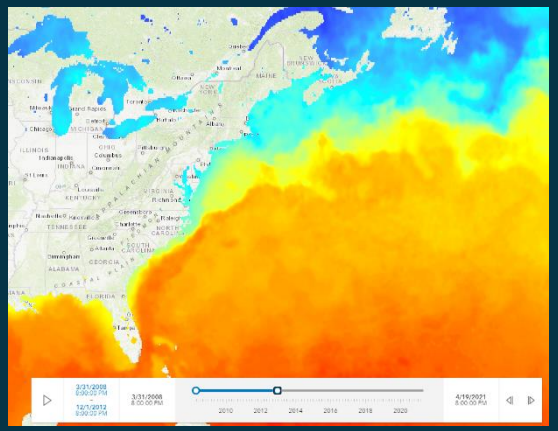


Seasonal Changes



Earth at Night

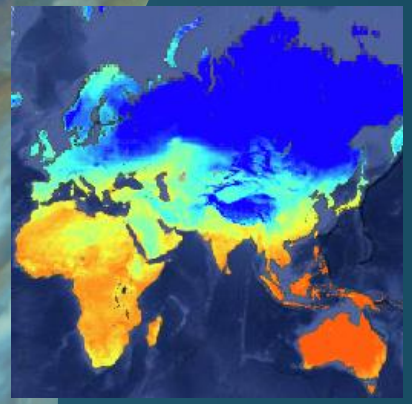
Sea Surface Temp



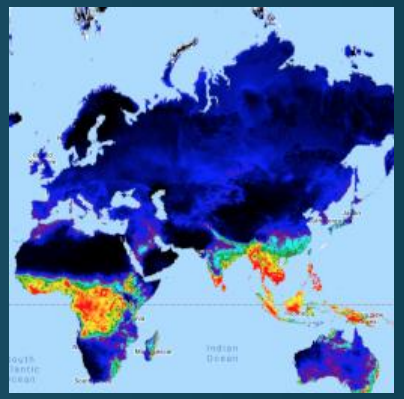
https://earthengine.google.com/

Google Earth Engine

Global Land Data Assimilation System



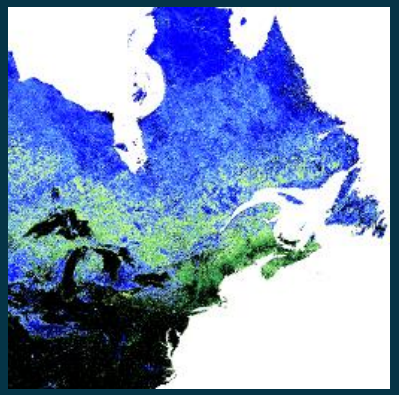
FEWS NET LDAS

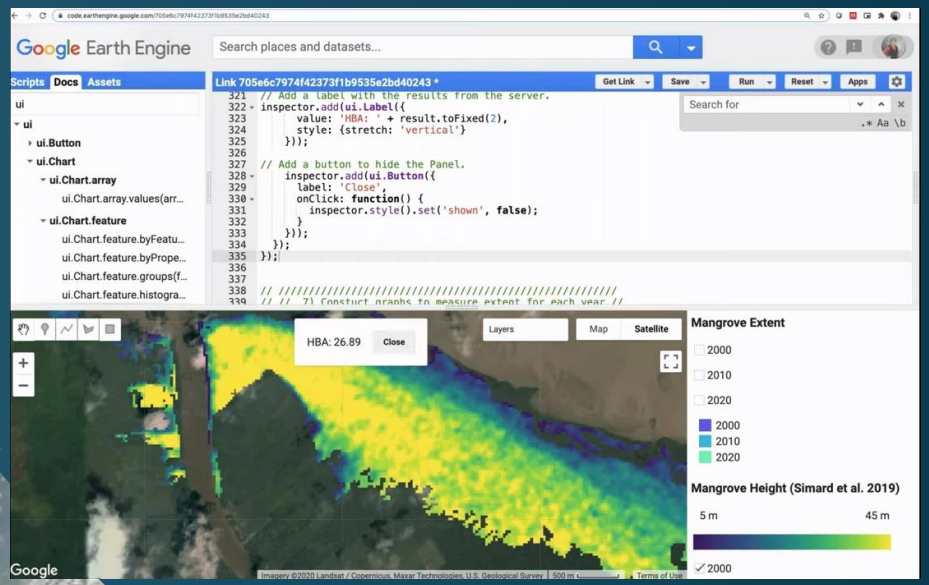


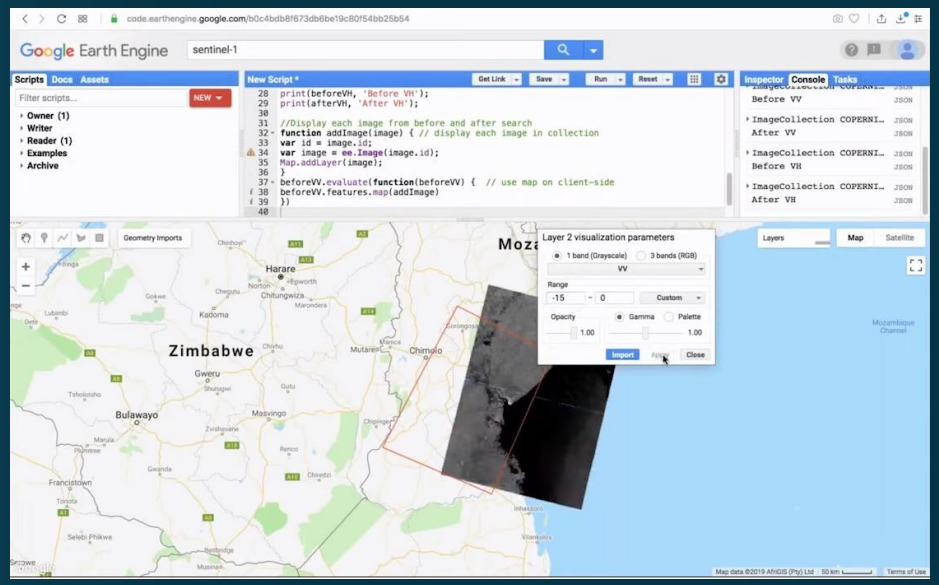
SRTM Digital Elevation Data

MODIS Leaf Area Index

Terra Snow Cover Daily







NASA Applied Remote Sensing Training (ARSET) Program

https://lpdaac.usgs.gov/tools/appeears/

Application for Extracting and Exploring Analysis Ready Samples (AppEEARS)

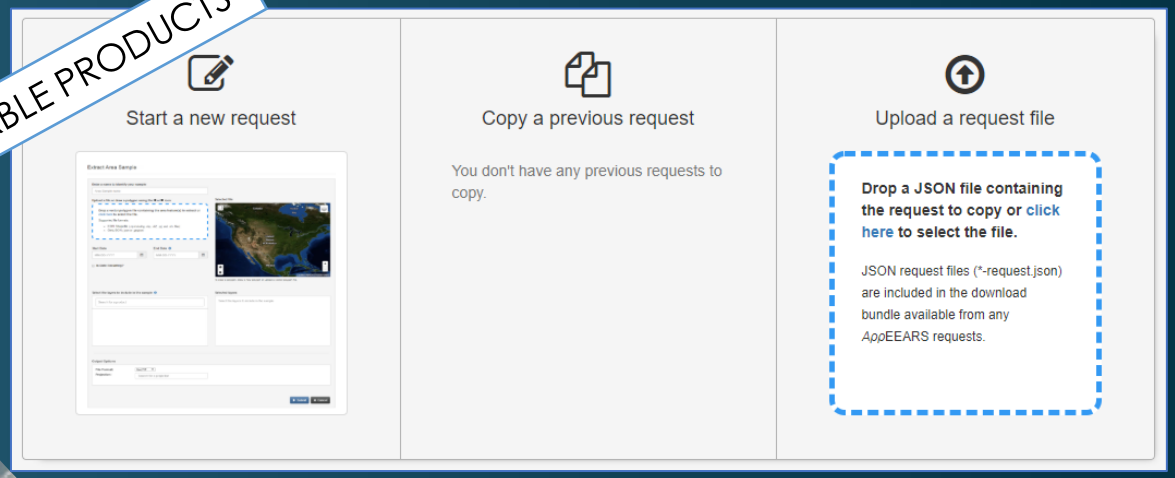
Offers a simple and efficient way to access, extract, and transform geospatial data from a variety of federal data archives

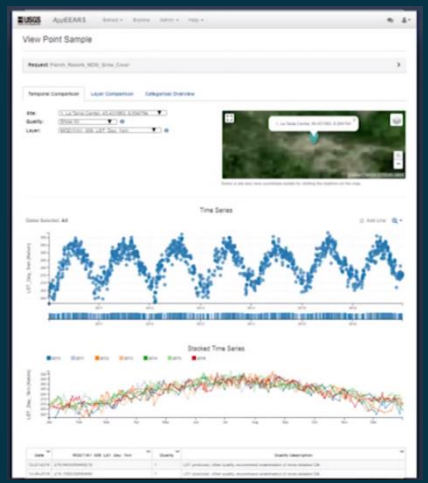
Point(s) and area(s) of interest extraction capabilities

Returns data values and associated quality values

Provides interactive visualizations with summary statistics

86 AVAILABLE PRODUCTS

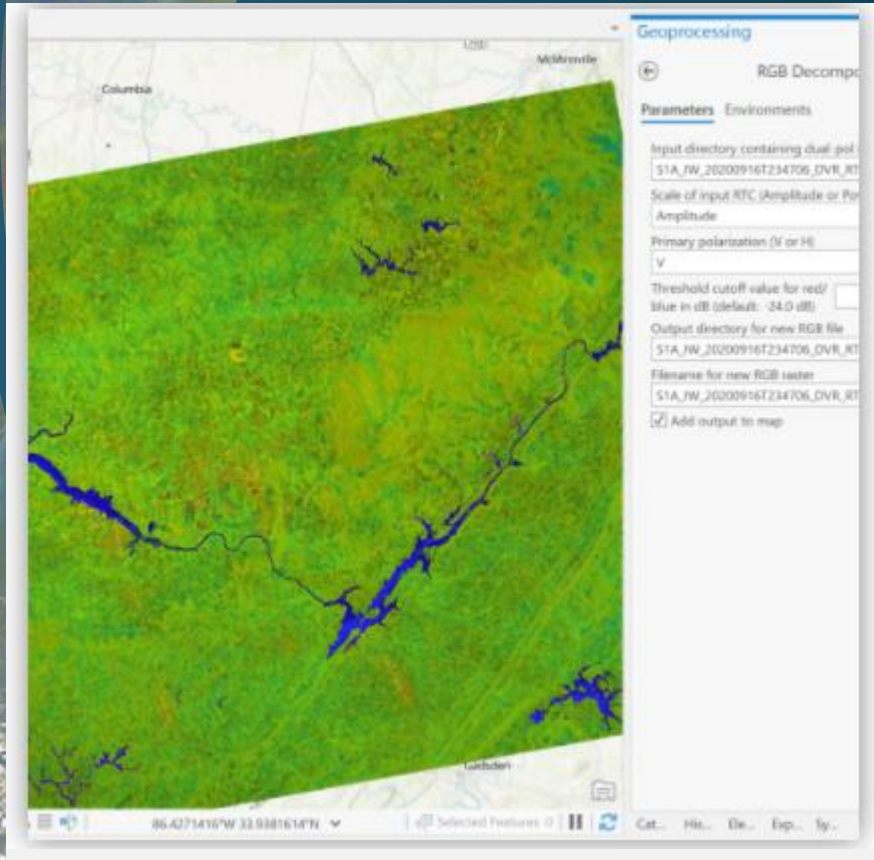




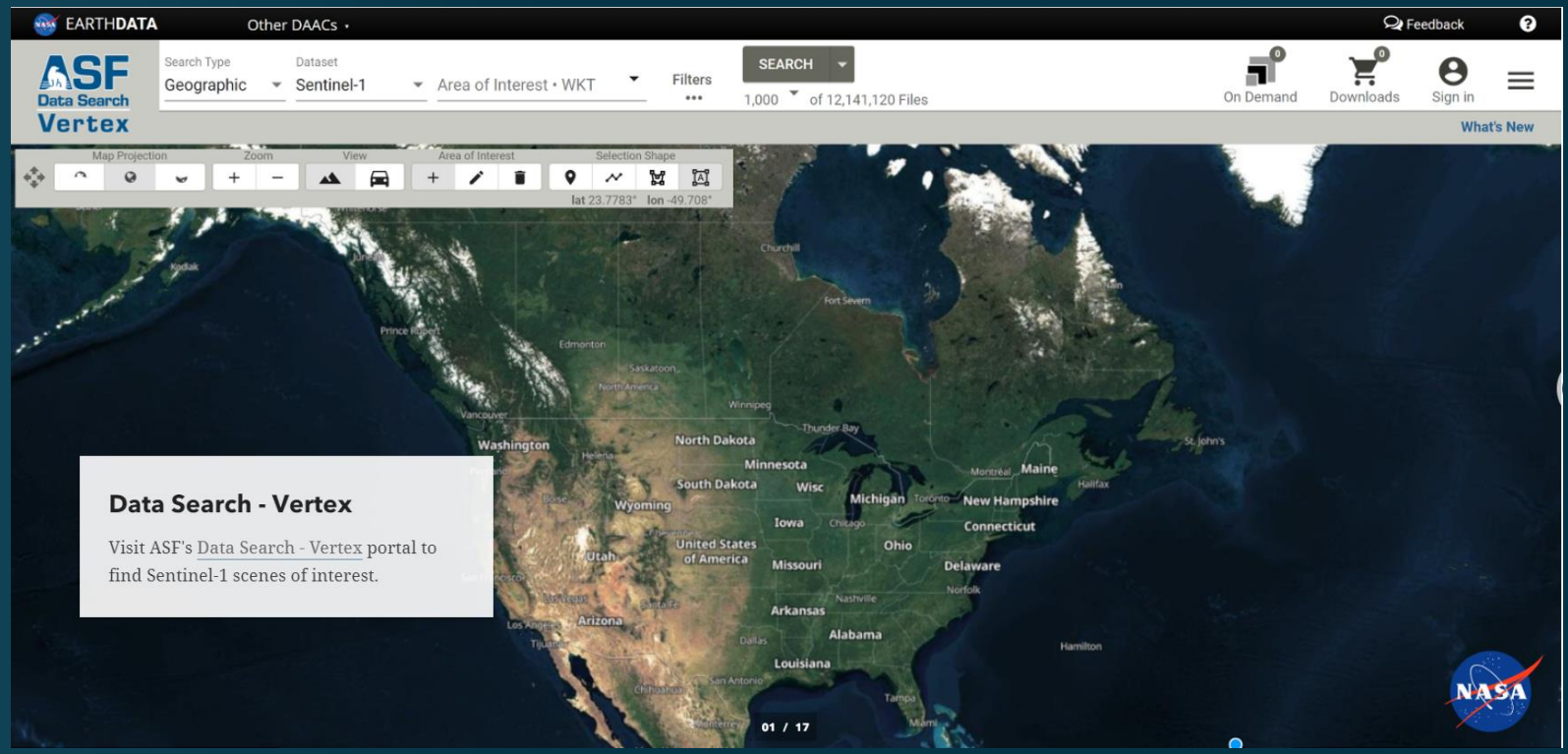
Vertex: https://search.asf.alaska.edu/
On-Demand RTC:
https://hyp3-docs.asf.alaska.edu/using/vertex/
ArcGIS Toolbox:
https://asf.alaska.edu/how-to/data-tools/gis-tools/

Alaska Satellite Facility - Synthetic Aperture Radar (SAR)

Radiometric Terrain Correction (RTC) Imagery



Python Toolbox used with either ArcGIS Desktop or ArcGIS Pro, and contains tools that perform geoprocessing tasks useful for working with SAR data.



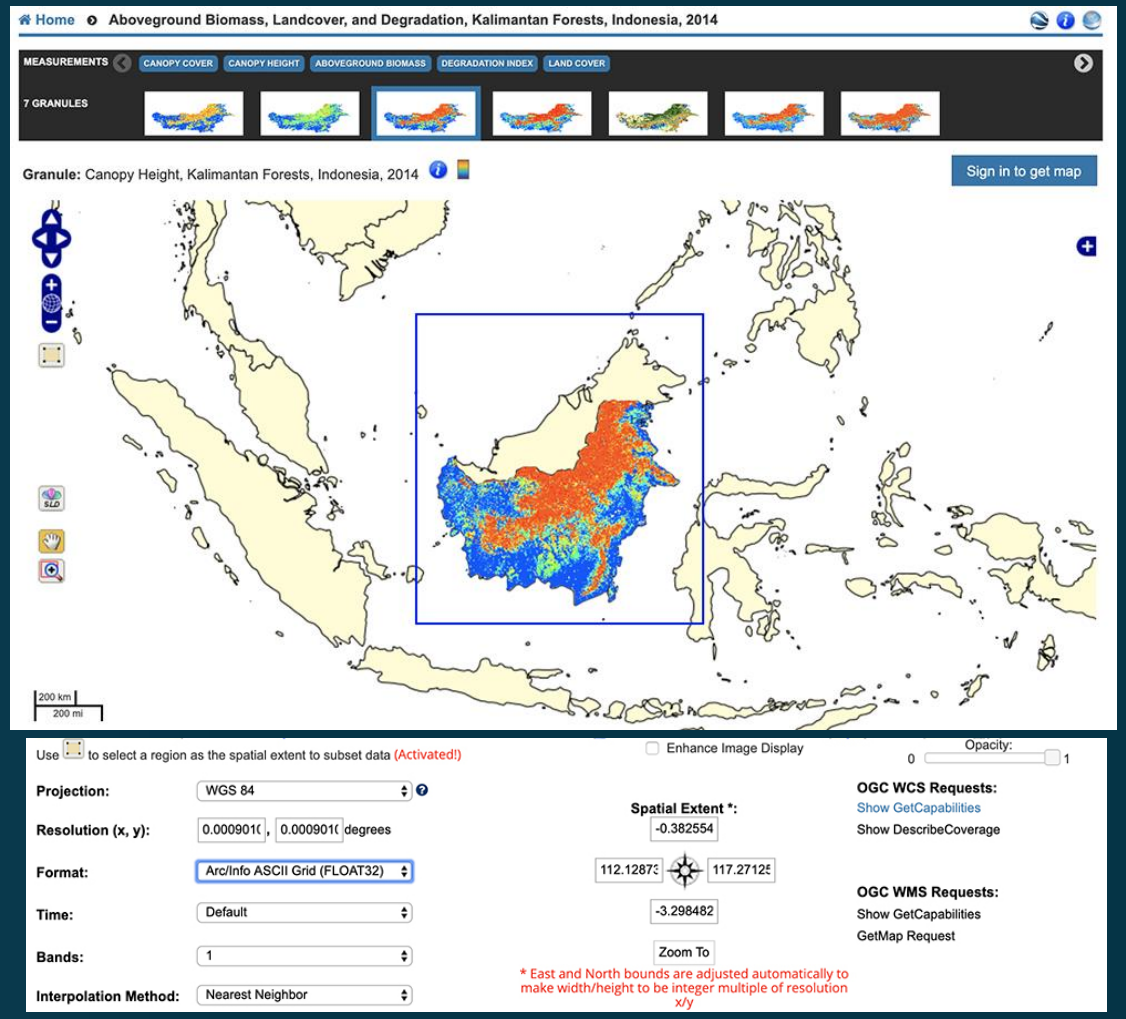
https://webmap.ornl.gov/ogc

Oak Ridge National Laboratory (ORNL) DAAC

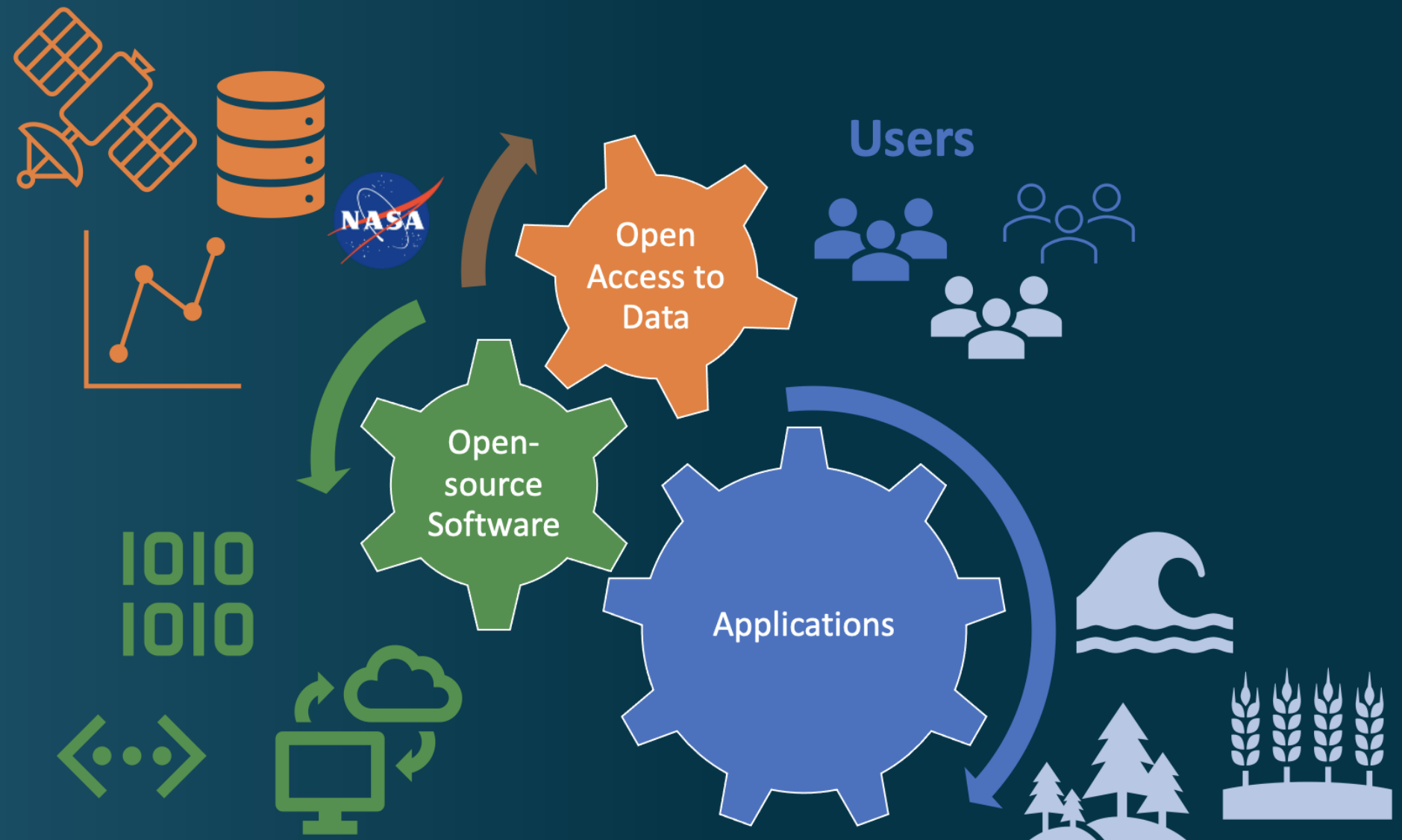
Spatial Data Access Tool (SDAT)

Disciplines:

- Agriculture (7)
- Atmosphere (46)
- Biological Classification (1)
- Biosphere (124)
- Climate Indicators (4)
- Cryosphere (5)
- Field Investigation (6)
- Human Dimensions (28)
- Land Surface (109)
- Land Surface (109)
- Oceans (5)
- Spectral/Engineering (5)
- Terrestrial Hydrosphere (21)



Open Science – Applying the Data



https://appliedsciences.nasa.gov/

Earth Applied Sciences

The Program supports projects that enable innovative uses of NASA Earth science data in organizations' policy, business and management decisions. The project results and enhanced decision making to improve quality of life and strengthen economies.

Program Areas:

- Capacity Building
- Disasters
- Ecological Forecasting
- Health and Air Quality
- Water & Agriculture Resources

NASA Applied Remote Sensing Training (ARSET)

Free, online and in-person remote sensing trainings!

Check us out on YouTube

NASA Video

Search “ARSET”

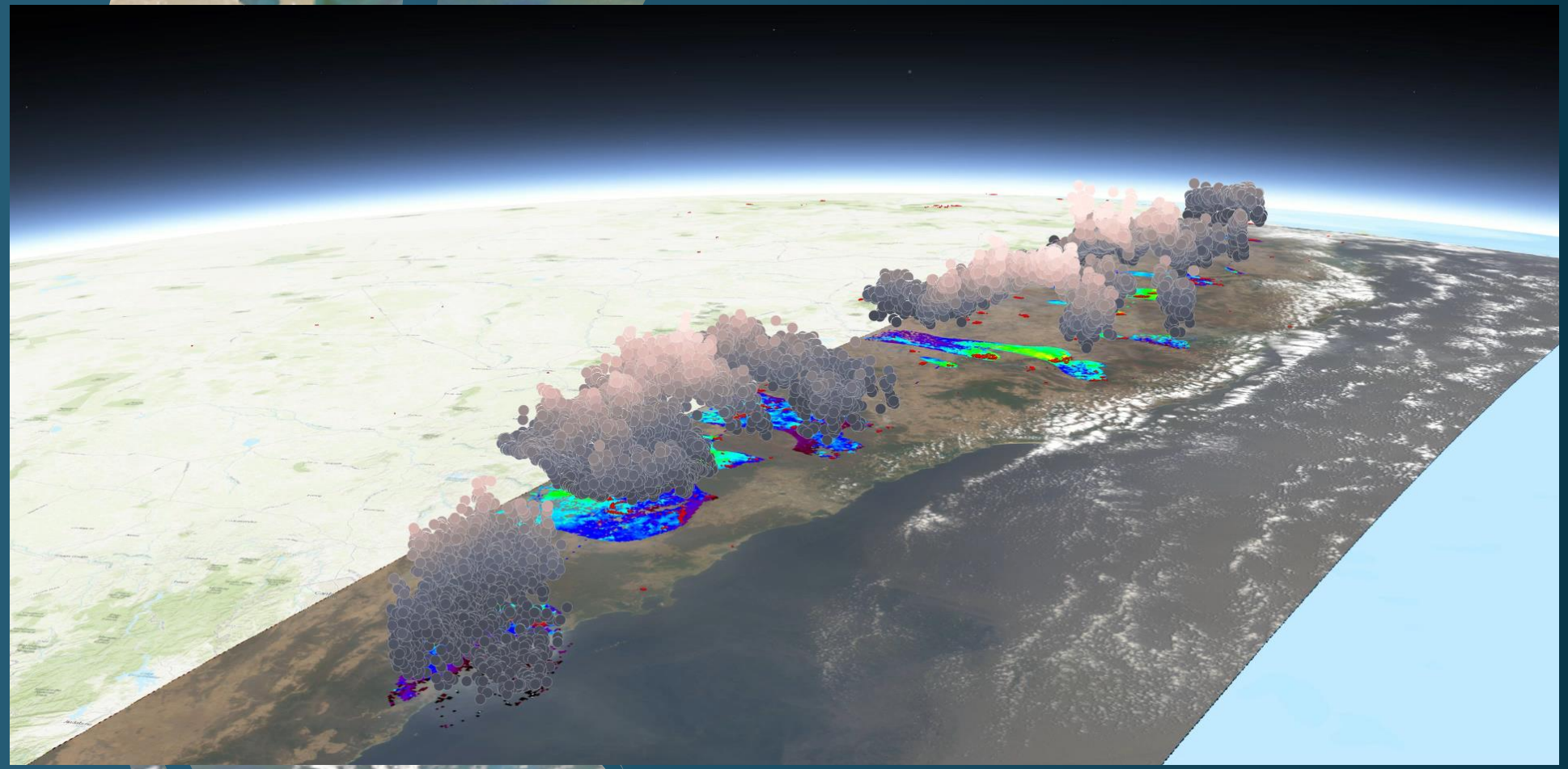
And on Twitter

@nasaarset

NASA Earth Science DISASTERS PROGRAM

Event-Based Products

Exaggerated (20x) Australia Fire Smoke Plume Height (MISR) 12/16/19



GIS Products

- Free and openly available GIS Products
- Esri REST and WMS Endpoints
- Event-based and Near Real-Time Products

Learn More:
https://disasters.nasa.gov

GIS Portal:
https://maps.disasters.nasa.gov

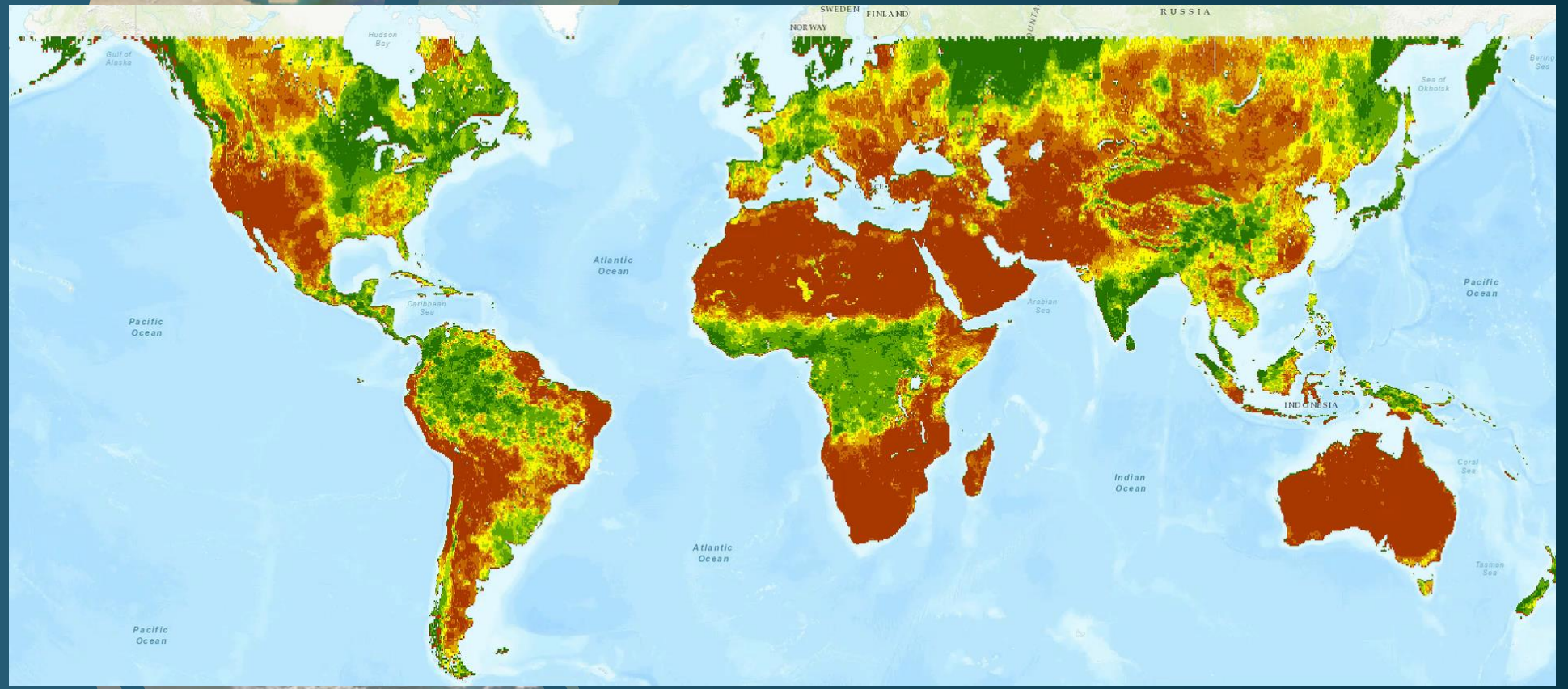
Contact:
HQ-Disasters-GIS@mail.nasa.gov

View this web app in the Disasters GIS Portal
https://maps.disasters.nasa.gov

NASA Earth Science DISASTERS PROGRAM

Near Real-Time Products

SMAP-Based Soil Moisture



Near Real-Time Products

- Soil Moisture
- Flood Extent
- Thermal Hot Spots
- Global Precipitation
- Landslide Nowcast
- Evaporative Stress Index

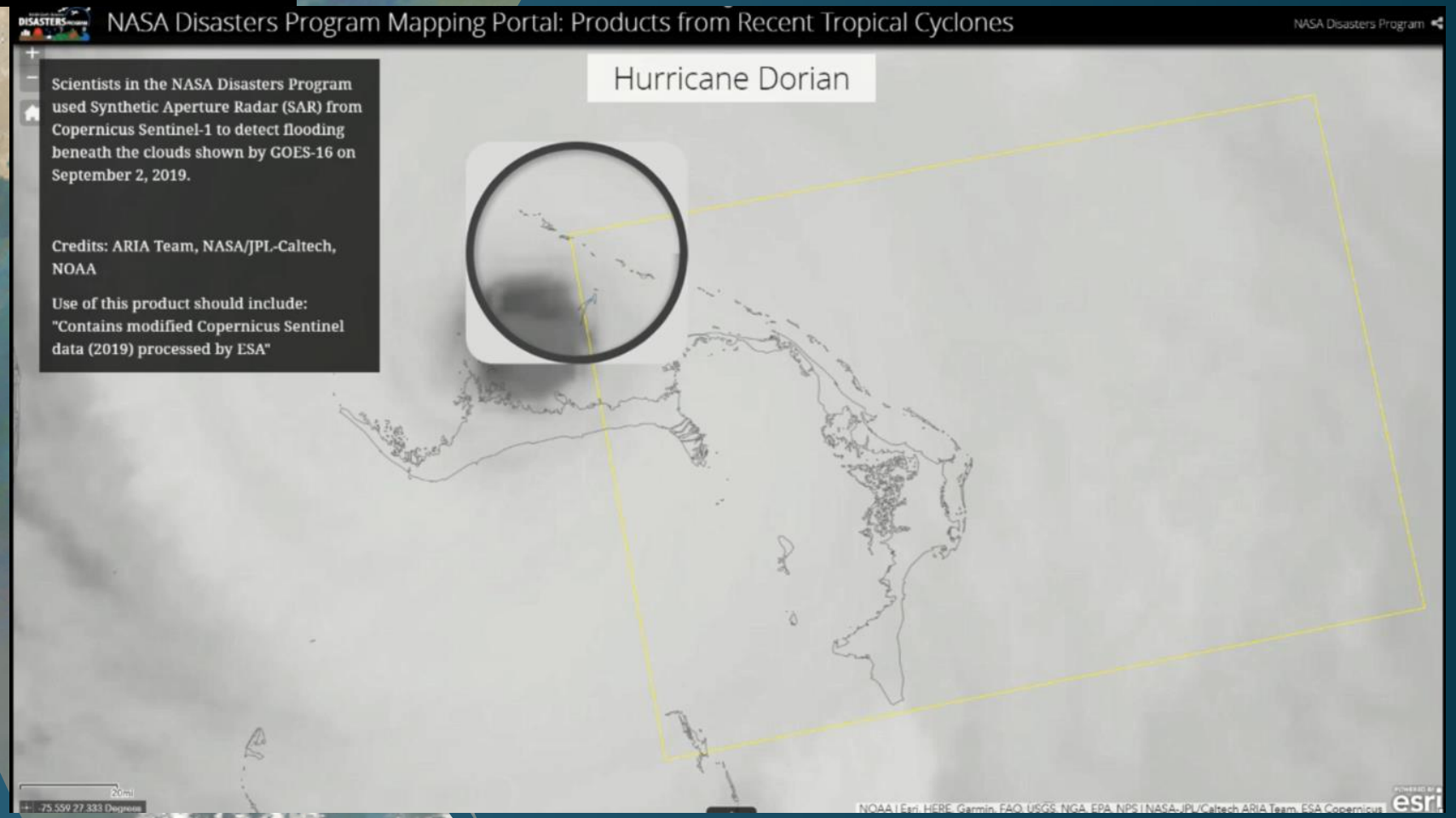
Learn More:
https://disasters.nasa.gov

GIS Portal:
https://maps.disasters.nasa.gov

Contact:
HQ-Disasters-GIS@mail.nasa.gov

View this soil moisture product and more
in the Disasters GIS Portal
https://maps.disasters.nasa.gov

Interactive Story Maps and Apps



View the Hurricane Dorian Story Map and more in the Disasters GIS Portal
https://maps.disasters.nasa.gov

Showing What Is Possible

- Story Maps
- Dashboards
- 3D Web Apps

Learn More:
https://disasters.nasa.gov

GIS Portal:
https://maps.disasters.nasa.gov

Contact:
HQ-Disasters-GIS@mail.nasa.gov

Prediction of Worldwide Energy Resources (POWER)

Objective is to integrate environmental data, analysis, and modeling from NASA research to enhance decision support in three user communities 1) Renewable Energy, 2) Sustainable Buildings, and 3) Agroclimatology with community specific geospatially enabled Analysis Ready Data (ARD) for use in decision support tools and in research.

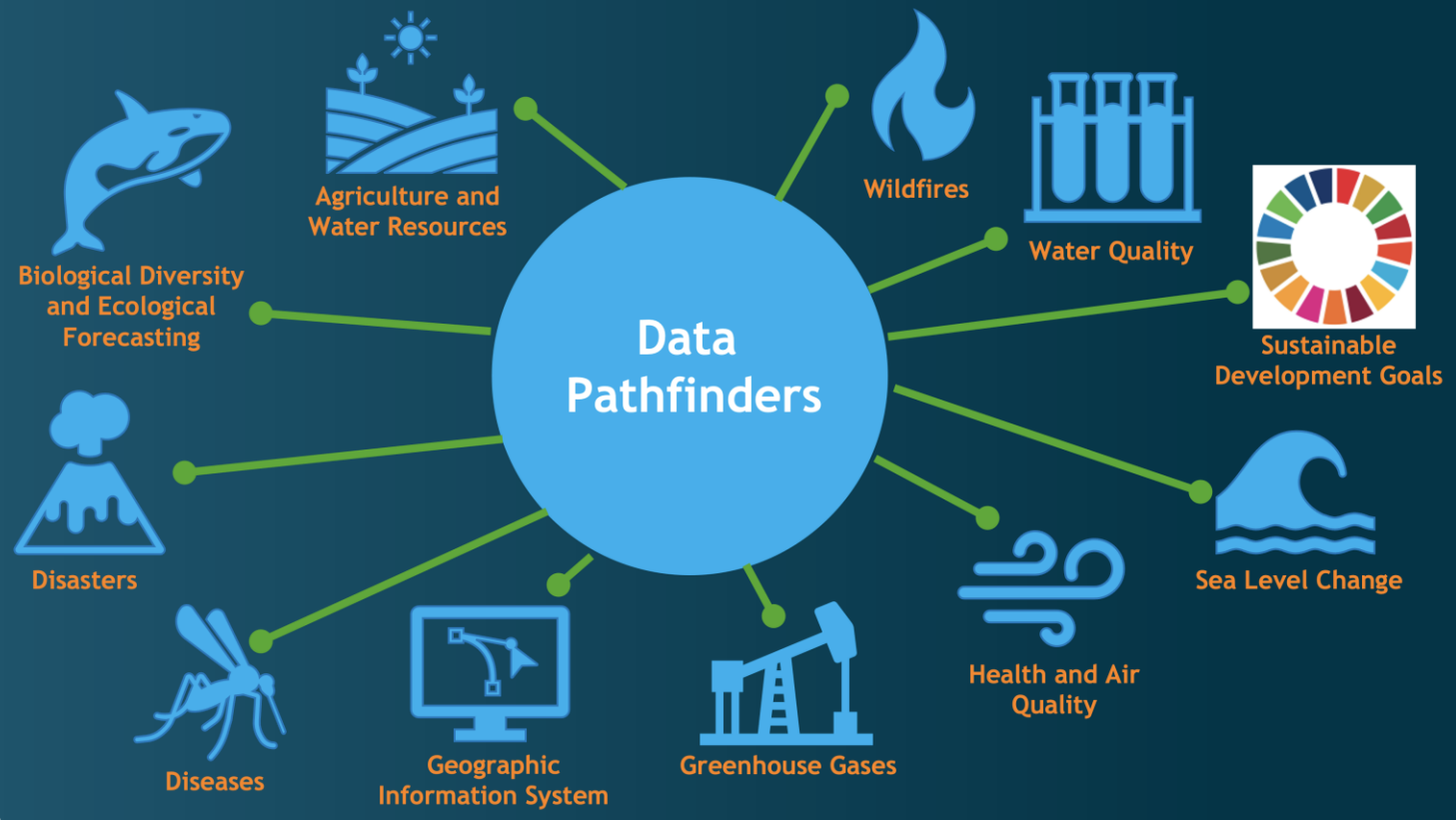
Type: Solar and Meteorological Data
Spatial: Global Availability (0.5° x 0.5° grid)
Temporal: Daily, Interannual, Climatology
Time Series: Up to 38 Years of daily data
Availability: 3-5 Days of Near Real Time (NRT)
Parameters: 275+ Solar and Meteorological
Access: WEB, API, ArcGIS Services, OPeNDAP
Formats: JSON, NetCDF, CSV, ASCII, ICASA

Contact: power-project@lists.nasa.gov

https://power.larc.nasa.gov/data-access-viewer/


Resources to Get Started

Pathfinders and Toolkits



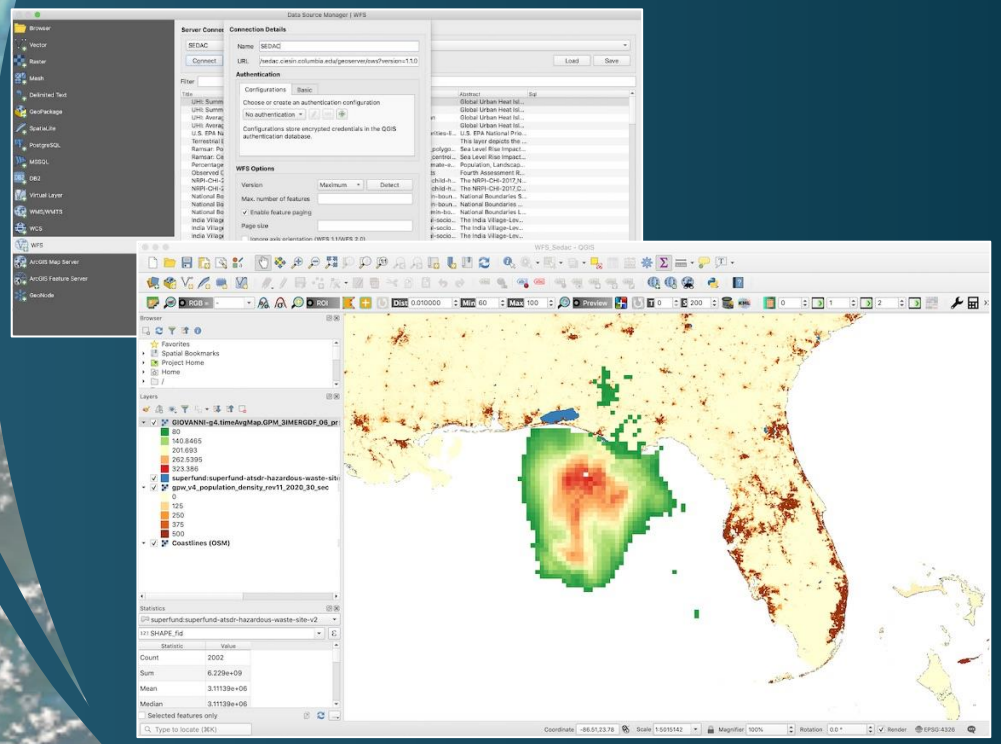
Pathfinders are data product selection guides focused on a science discipline or application areas. They help users find, visualize and use the data.

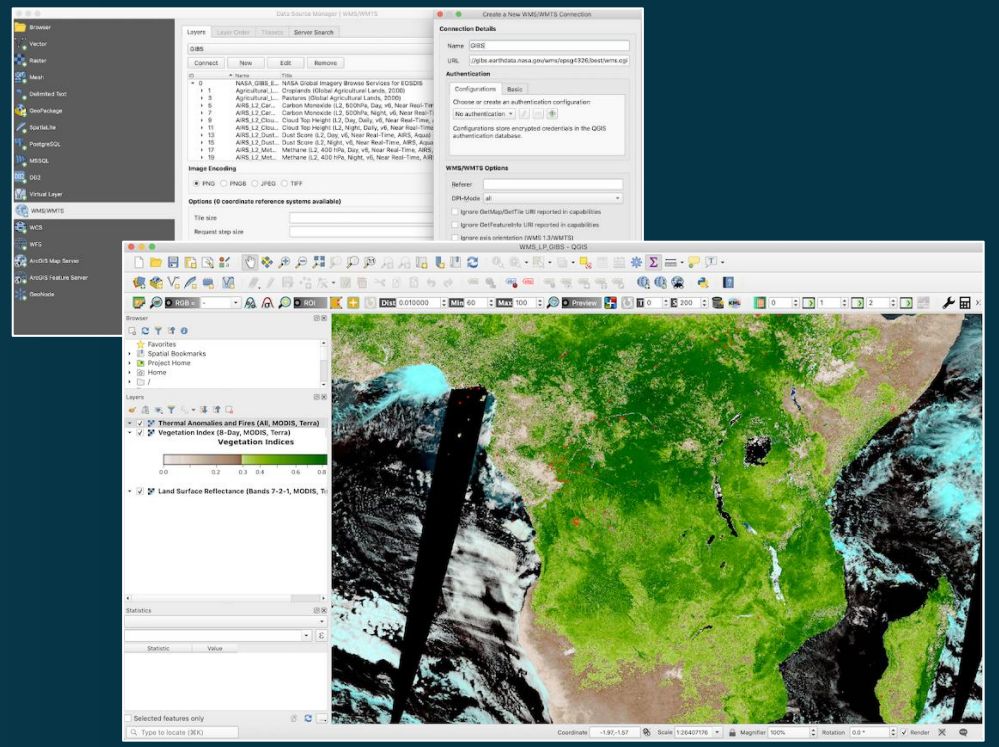
Data Toolkits provide links to datasets, tutorials and how-tos, feature articles and Data User Profiles, as well as other useful information.

https://earthdata.nasa.gov/learn/pathfinders/gis-pathfinder

GIS Pathfinder

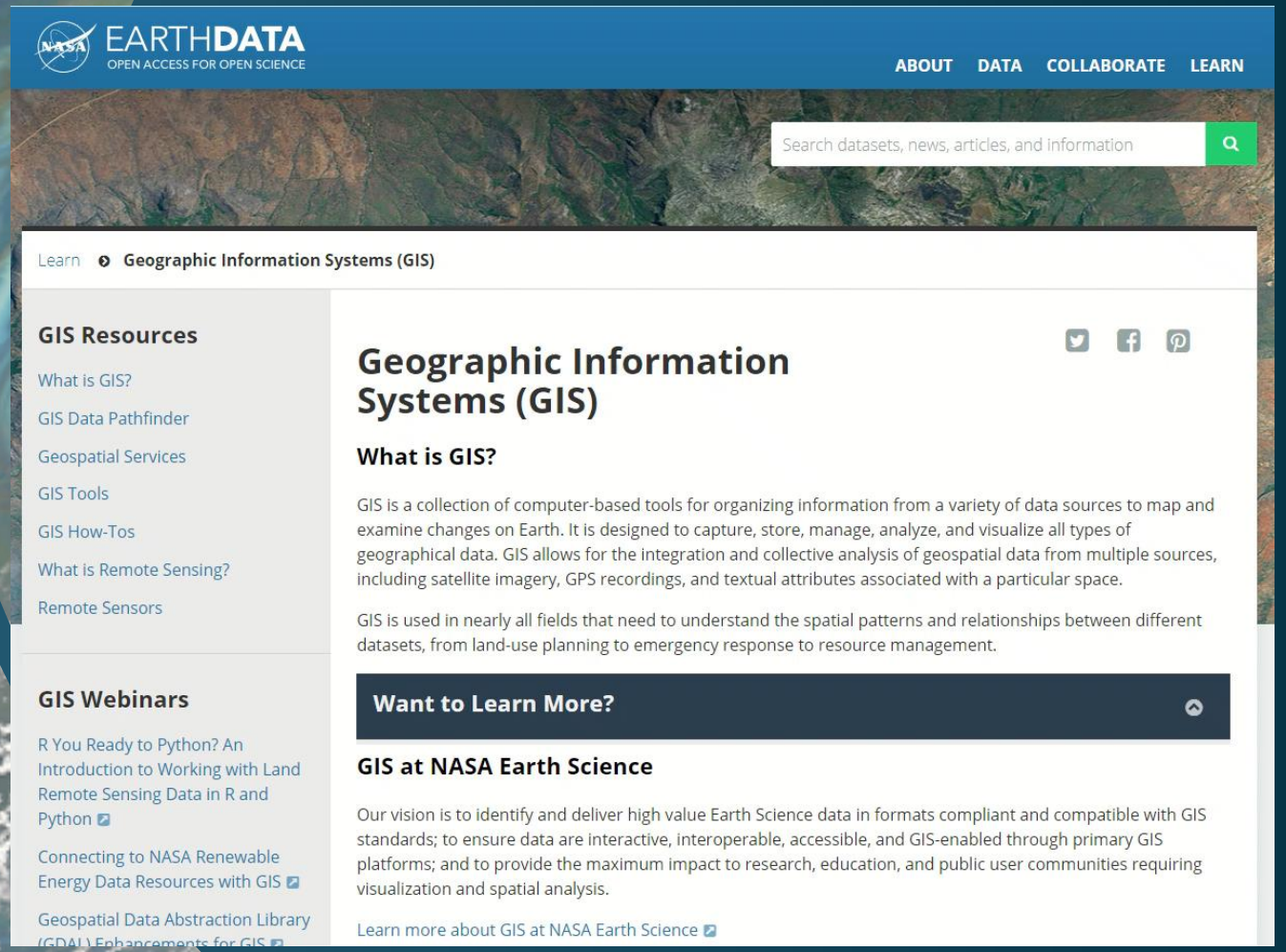
Multidimensional Data in GIS | NASA Data in GIS | Use Cases for Web Services | Tools and Platforms for Data Discovery | Resources





https://earthdata.nasa.gov/learn/gis

Resources for New Users

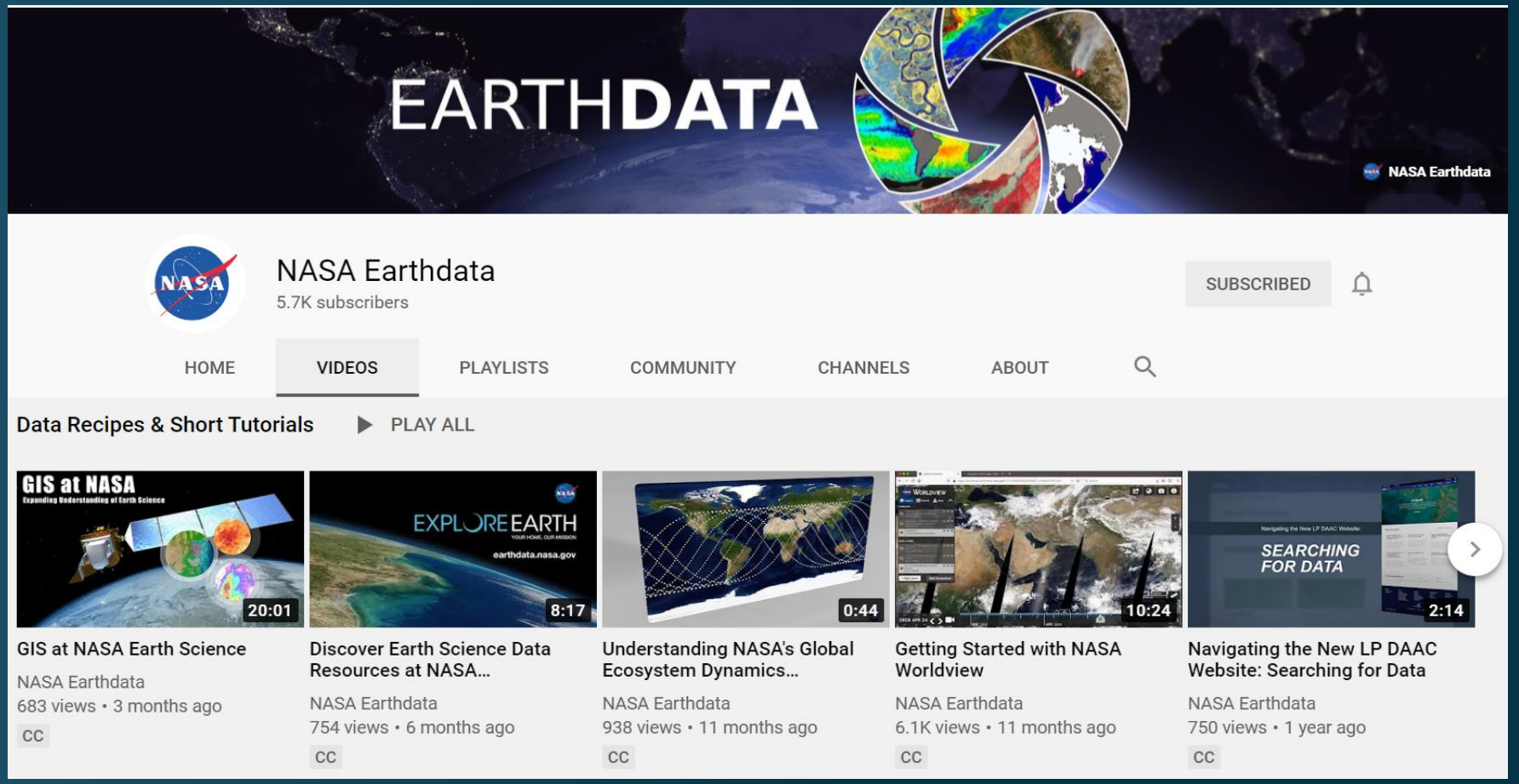


Earthdata GIS page provides links to EOSDIS GIS resources, from webinars to data recipes to story maps.

https://earthdata.nasa.gov/learn/user-resources/webinars-and-tutorials

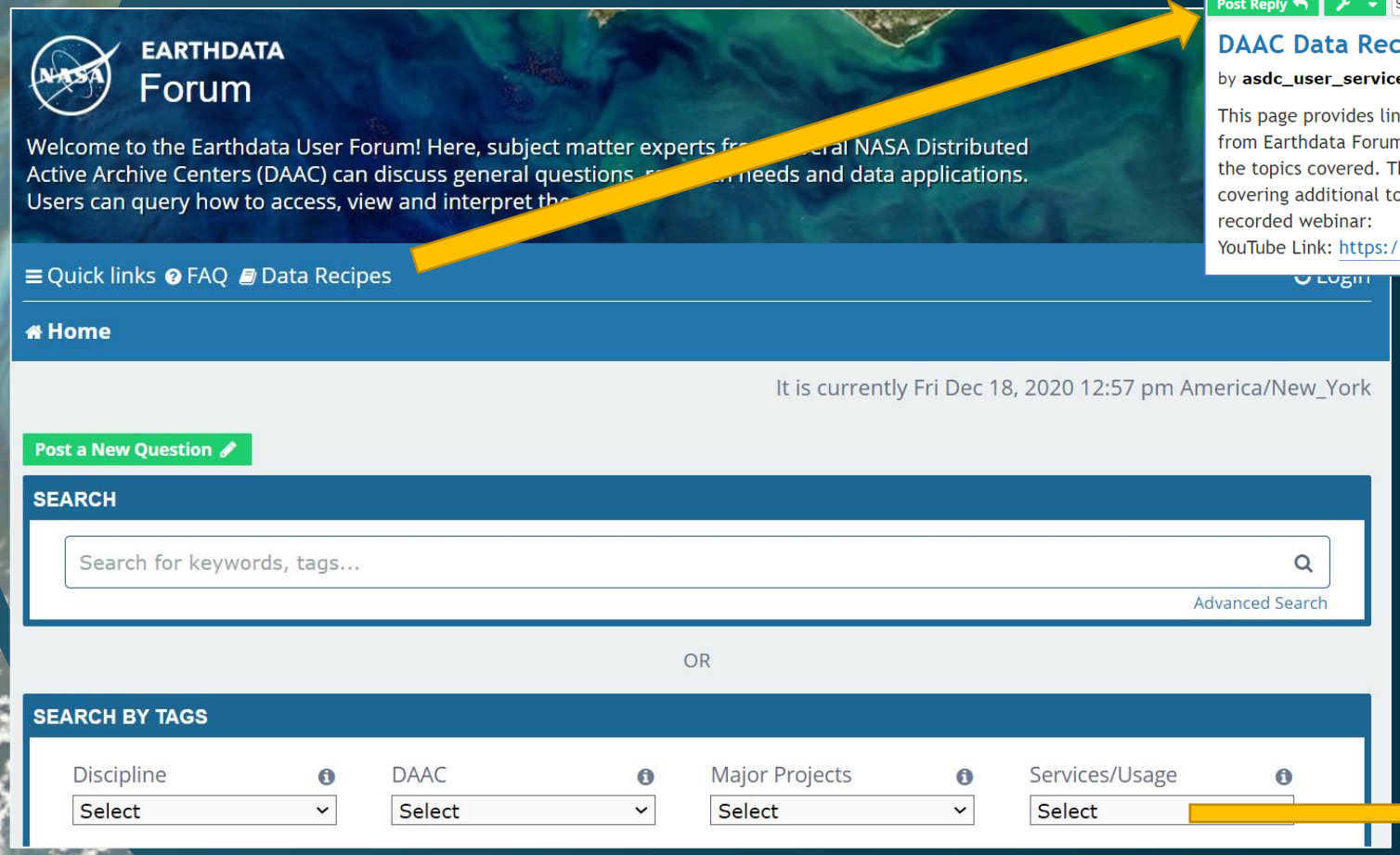
https://www.youtube.com/c/NASAEarthdata

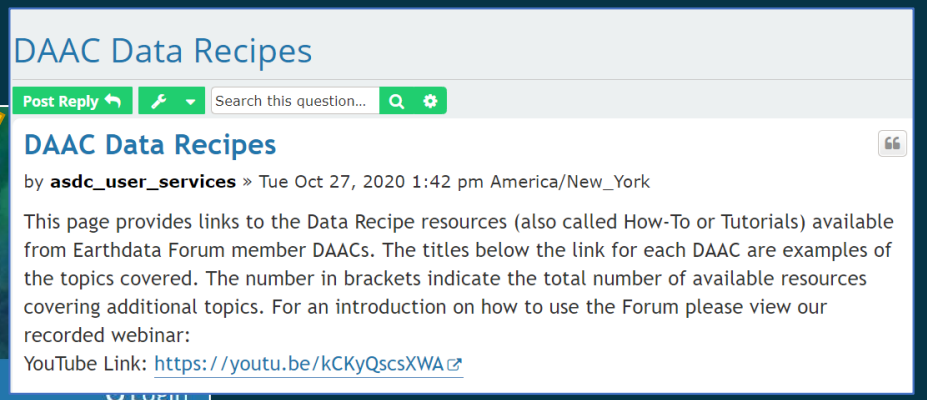
Webinars & Tutorials

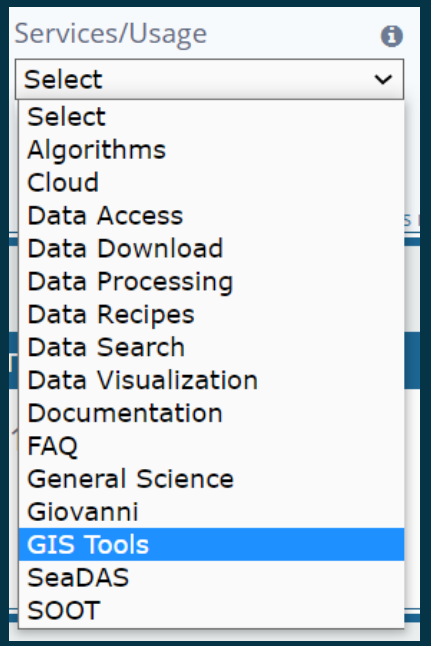


https://forum.earthdata.nasa.gov/

Earthdata Forum







egist@lists.nasa.gov

Engage!

Feedback is ***critical*** **-** https://go.nasa.gov/32sYa1g

- What data product?
- What format?
- What distribution method (files vs. services)?
- What tool does the data need to ‘work’ in?

Uncovering Needs to Broaden Outside Use of NASA Data (UNBOUND)

Research Opportunities

- Citizen Science for Earth Systems Program (CSESP)
- ACCESS, ROSES, AIST


ACCESSIBILITY TO SCIENTIFIC PROCESS AND KNOWLEDGE
OPEN DATA AND SOFTWARE
PUBLIC PARTICIPATION AND PARTNERSHIPS
OPEN ACCESS LITERATURE
MAKE RESEARCH AND KNOWLEDGE SHARING MORE EFFICIENT
EMPOWERING INFRASTRUCURE
UNDERSTANDING SCIENTIFIC IMPACT
IMPACT MEASUREMENTS
OPEN SCIENCE

Thank you!

References

NASA Worldview (Imagery)	https://worldview.earthdata.nasa.gov/
Earthdata Search (Data)	https://search.earthdata.nasa.gov/
GIS Data Pathfinder	https://earthdata.nasa.gov/learn/pathfinders/gis-pathfinder
Data Toolkits	https://earthdata.nasa.gov/learn/toolkits
NASA ArcGIS Online (AGOL)	https://nasa.maps.arcgis.com/
Earthdata Forum	https://forum.earthdata.nasa.gov/
NASA Earth Science GIS - User Feedback	https://go.nasa.gov/32sYa1g