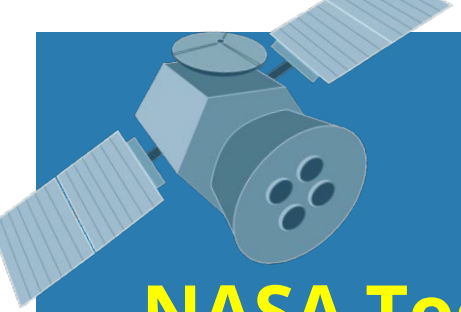


NASA Tools for Your Agriculture Applications

Nevada farmer Denise Moyle will use an open data platform, OpenET, to plan irrigation of her alfalfa fields

Elizabeth Joyner
Community Coordinator
Earth Science Data Systems

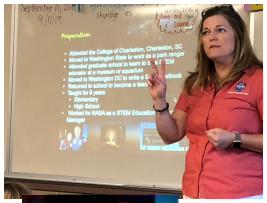
About Elizabeth Joyner

1. From SC
2. Marine Geologist
3. Government: NOAA, NASA
4. Former Teacher & Researcher
5. Proud Wife and Mom of Two
6. Community Coordinator

VIRGINIA SPACE GRANT CONSORTIUM

NASA SC Space Grant Consortium

Sea Grant



EARTH SCIENCE DATA SYSTEMS

Goddard SPACE FLIGHT CENTER

NASA Langley Research Center

Let’s Learn about You…

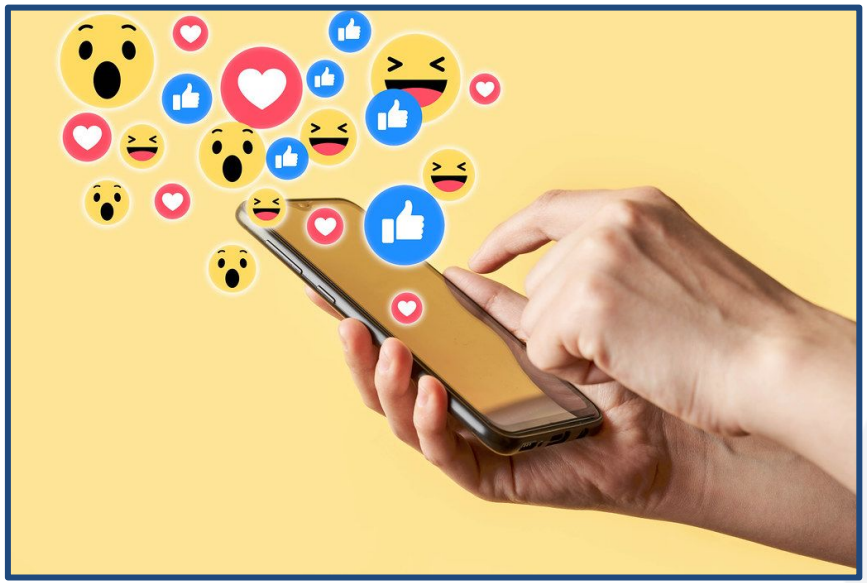


Image Credit: Creative Commons 2.0 original photo and the license

How do you rate your knowledge/skills in the following areas:

Go to

www.menti.com

Enter the code

2297 0202

Or use QR code

[Mentimeter Results]

Audience Participation: ***www.menti.com***

1. Onset of Workshop

Code:

2297 0202

2. Parking Lot for Questions

Code:

15 28 44 2

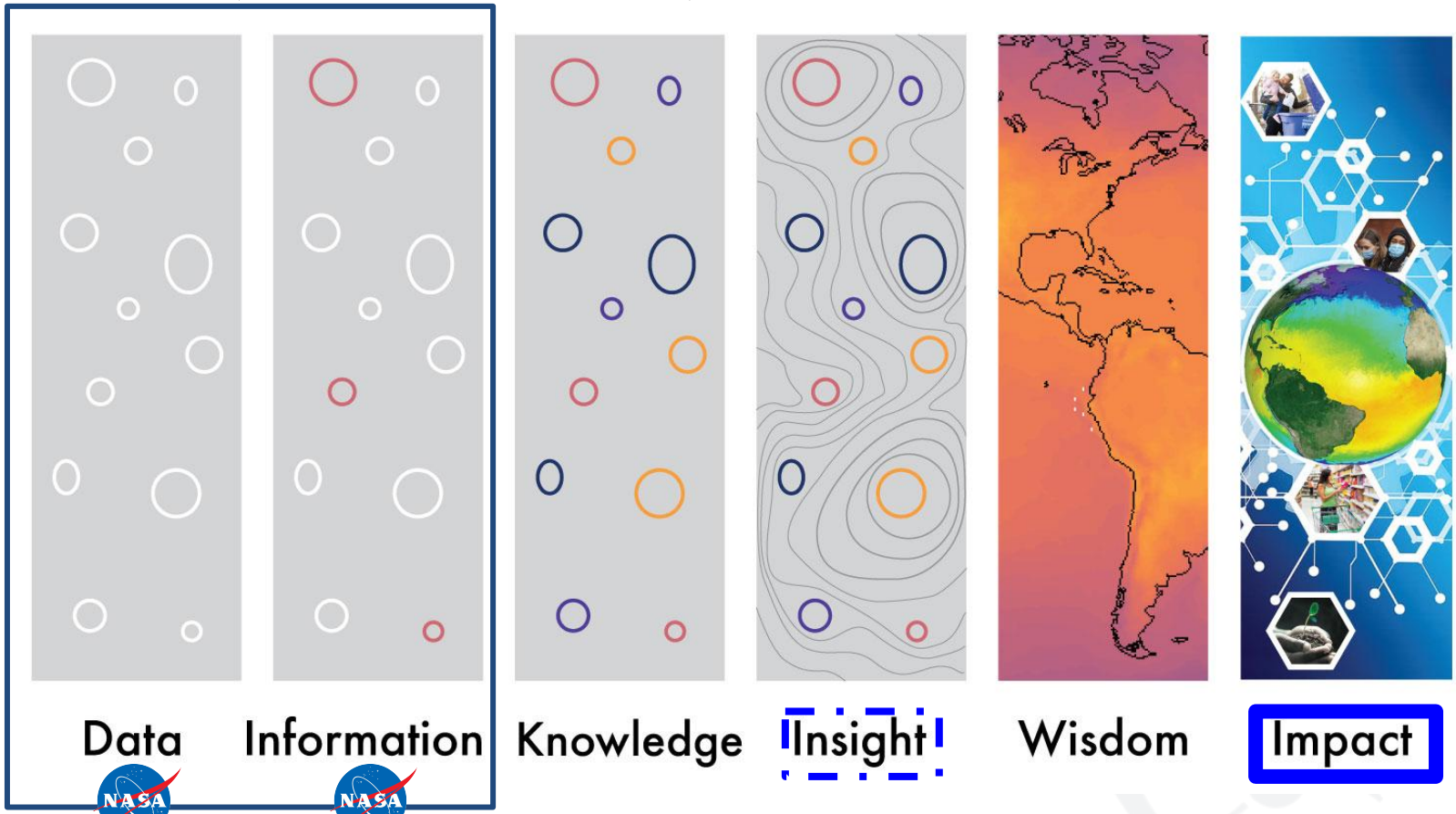
3. At the End

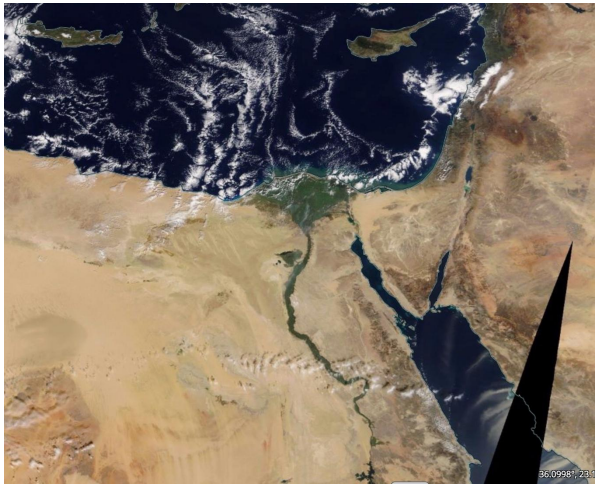
Code:

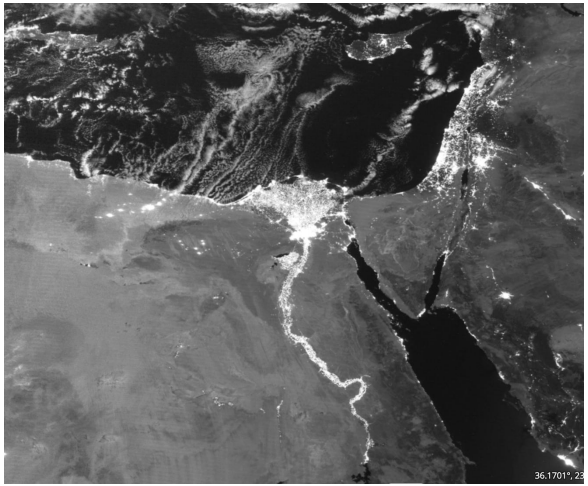
3231 7921

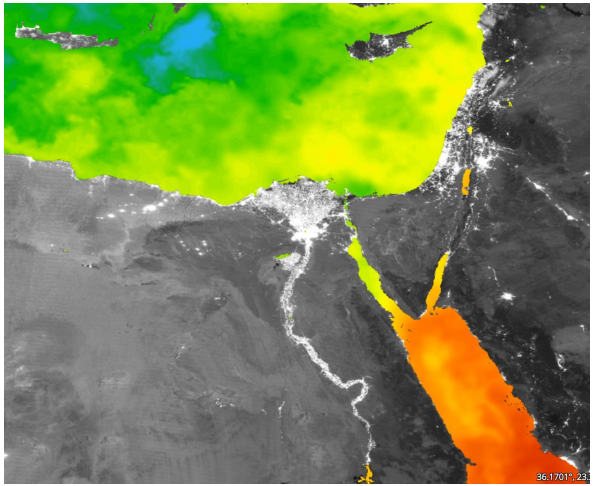
What is NASA's relationship with Agriculture?

Data-Information-Knowledge-Wisdom Hierarchy (DIKW Hierarchy)



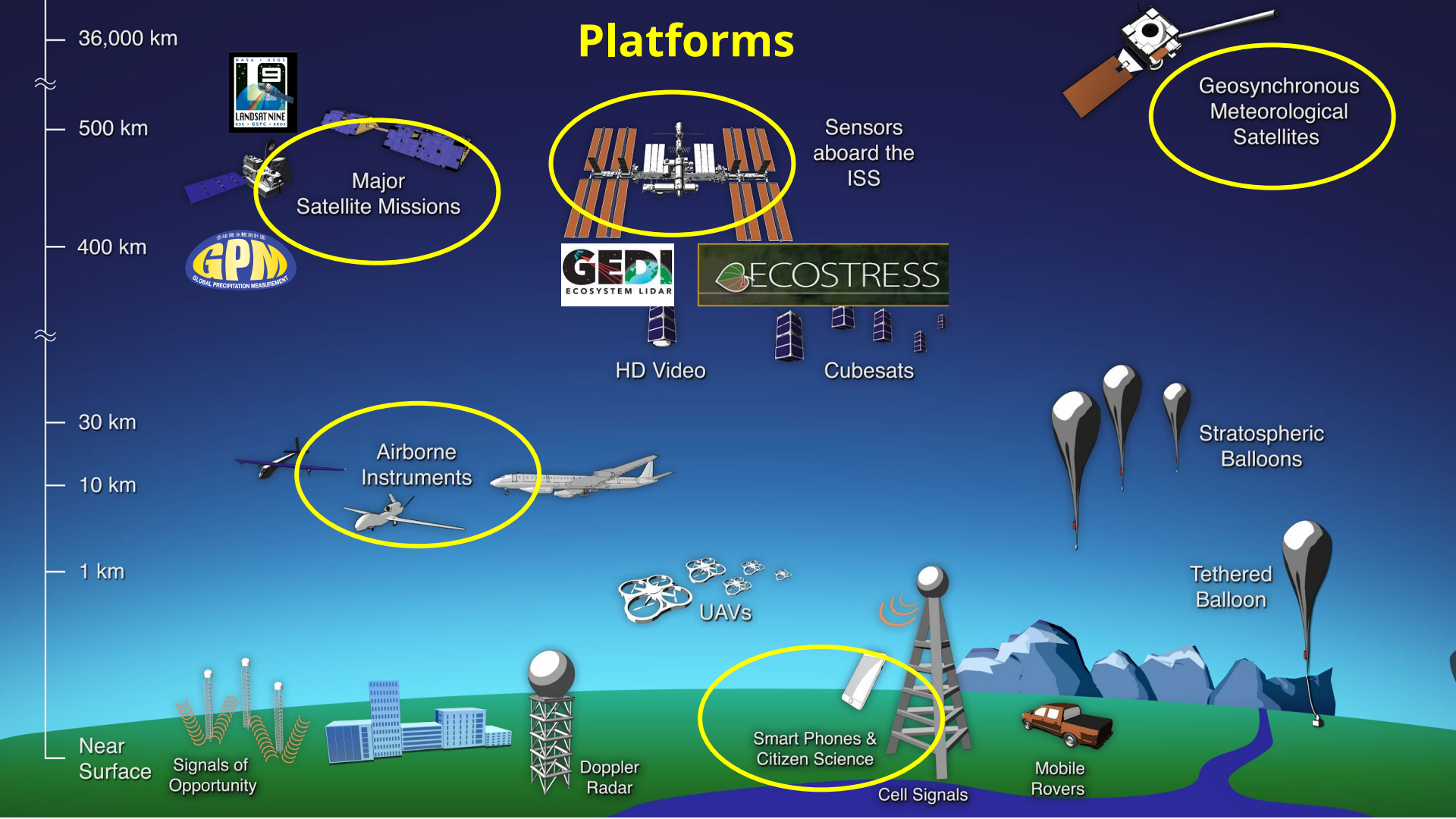




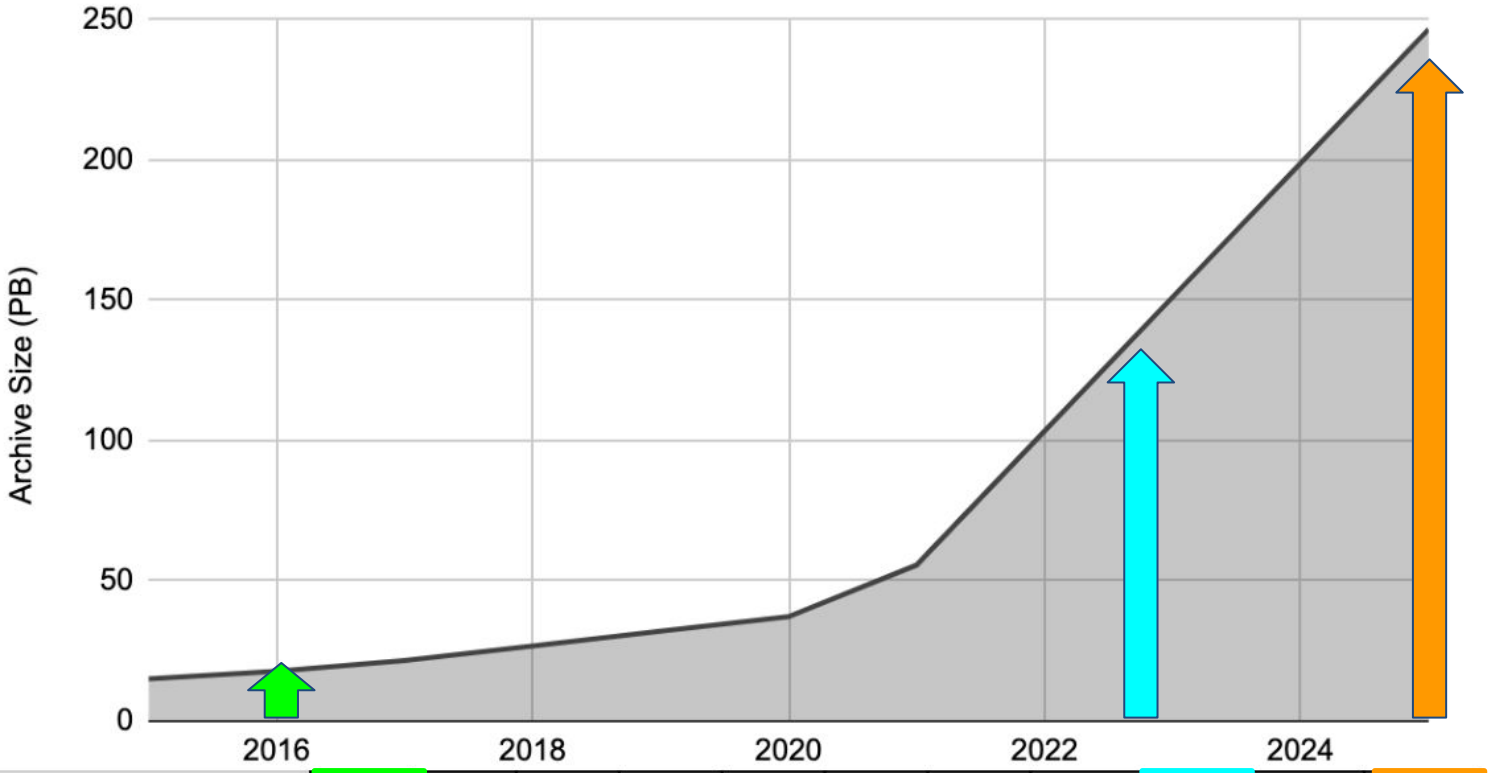


EARTHDATA
EOSDIS NASA'S EARTH OBSERVING SYSTEM DATA AND INFORMATION SYSTEM

Single largest repository of Earth science **multivariate & heterogeneous** data from diverse observational platforms.


Platforms
36,000 km
500 km
400 km
30 km
10 km
1 km
Near Surface
LANDSAT NINE
Major Satellite Missions
GPM
GLOBAL PRECIPITATION MEASUREMENT
Sensors aboard the ISS
GEDI
ECOSYSTEM LIDAR
ECOSTRESS
HD Video
Cubesats
Geosynchronous Meteorological Satellites
Airborne Instruments
Stratospheric Balloons
UAVs
Tethered Balloon
Signals of Opportunity
Doppler Radar
Smart Phones & Citizen Science
Cell Signals
Mobile Rovers

NASA Earth Data Archive Size (PB)



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Archive Size (PB)	**15**	**17.7**	**21.6**	**26.8**	**32**	**37.2**	**55.6**	**103.4**	**151.1**	**198.9**	**246.6**
Annual Growth (PB)	2.6	2.7	3.9	5.2	5.2	5.2	18.4	47.8	47.7	47.8	47.7

Not all data are made the same.

- **Availability:** Data are generally not available in real time.
- **Time (Temporal) Coverage:** Varies depending upon the platform, sensor, campaign and/or data product. Historical satellite datasets dating back several decades are available for some products.
- **Spatial coverage:** Varies by platform, sensor and/or data product. Global coverage is available for many data products.

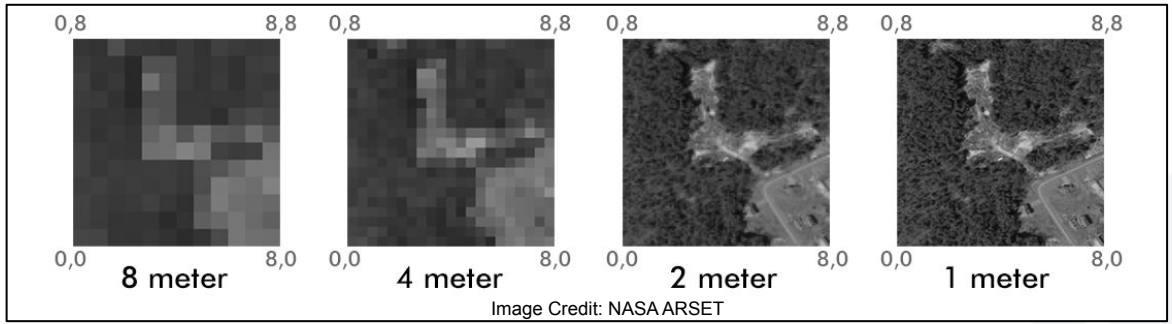


Image Credit: NASA ARSET

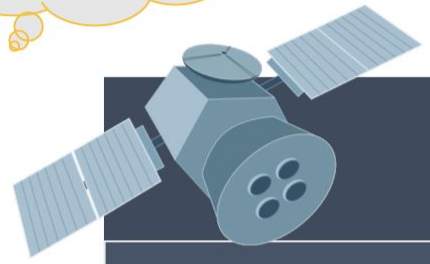
- **Format:** Many of NASA's EOS satellite datasets are in either Hierarchical Data Format (HDF) or HDF-EOS format. Other data format output options are available, including but not limited to: NetCDF, GeoTIFF, CSV, Binary, KML, and more.
- **Tools and Services:** A variety of data discovery, access, visualization, subsetting, and GIS and cloud computing tools and services are available.

EARTH SCIENCE DATA SYSTEMS

Researchers

Practical Data Users

GIS Professionals

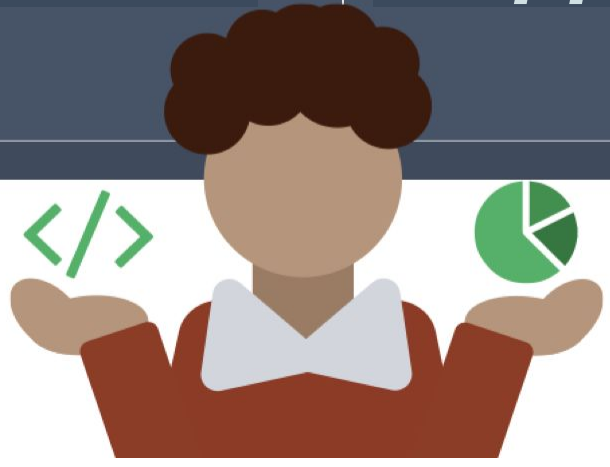


NASA Earth Science data
to benefit our planet

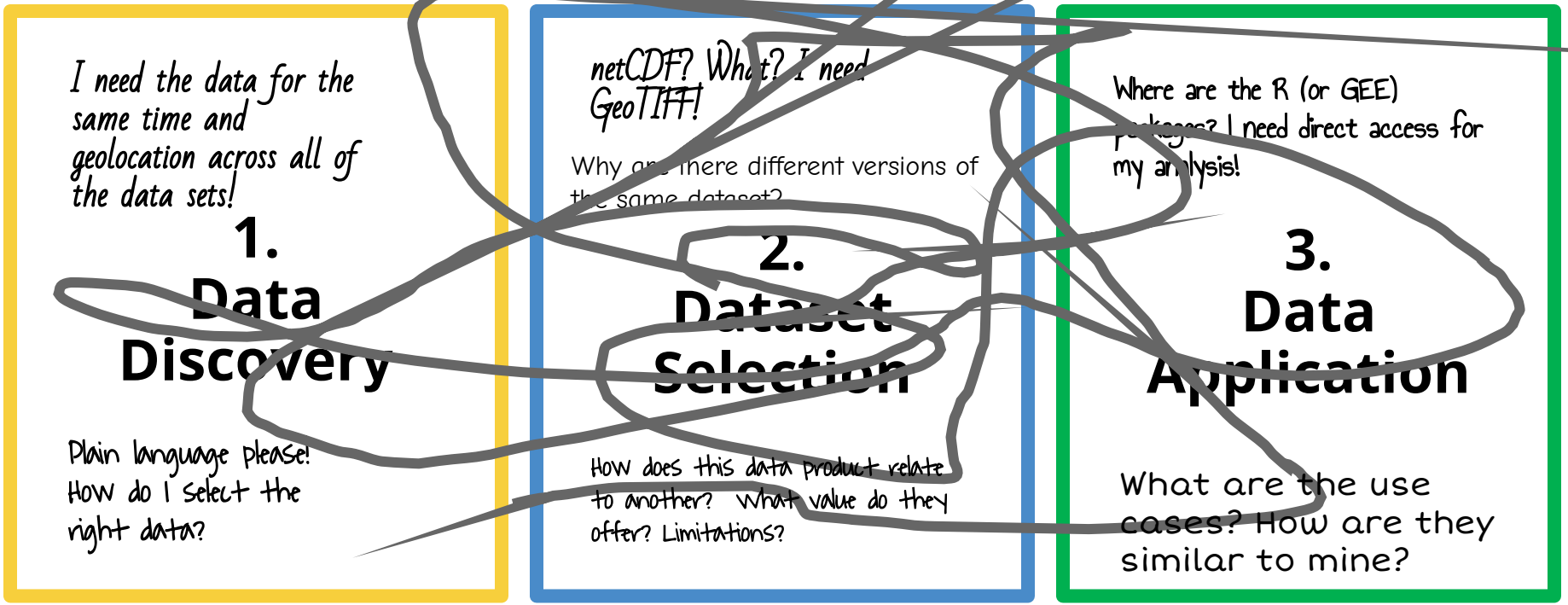
Find	Use	Apply

Scientists

Modelers



Needs & Challenges for Data Users



Audience Participation: ***www.menti.com***

Code:
2297 0202

Word Cloud

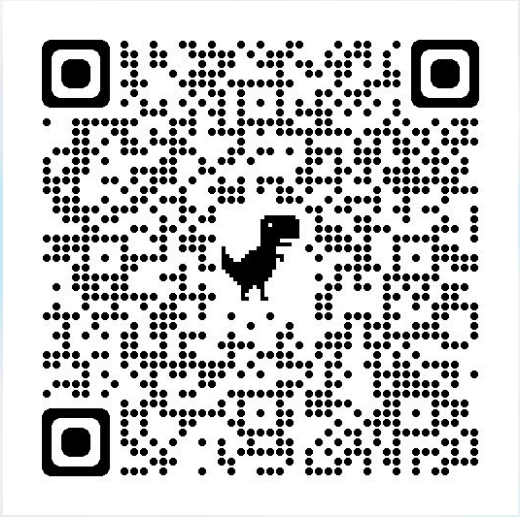
Mentimeter Results

discover * select * use * apply * solve

Data Pathfinders

https://earthdata.nasa.gov/learn

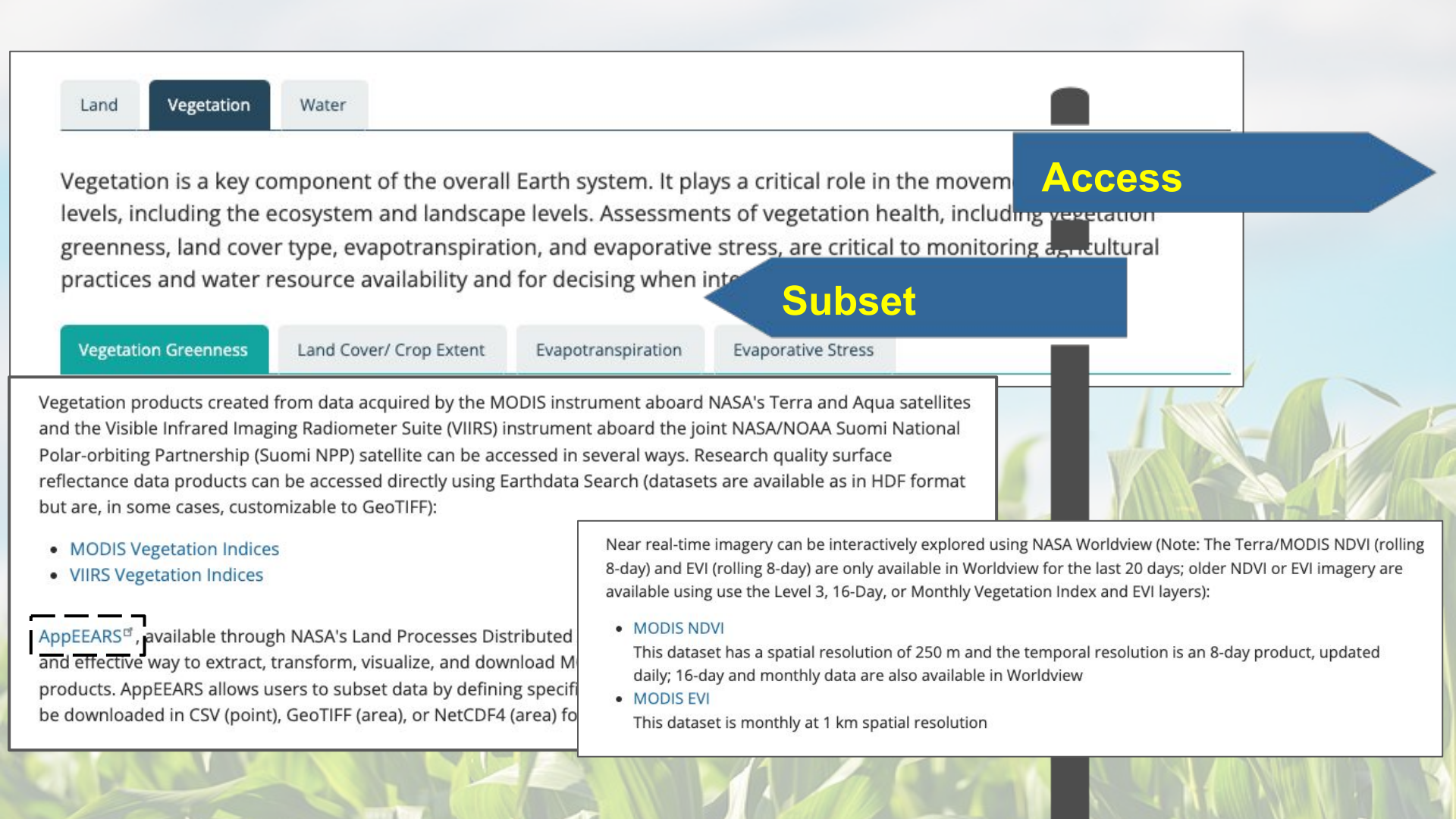
Highlights of the Agriculture & Water Resources Data Pathfinder



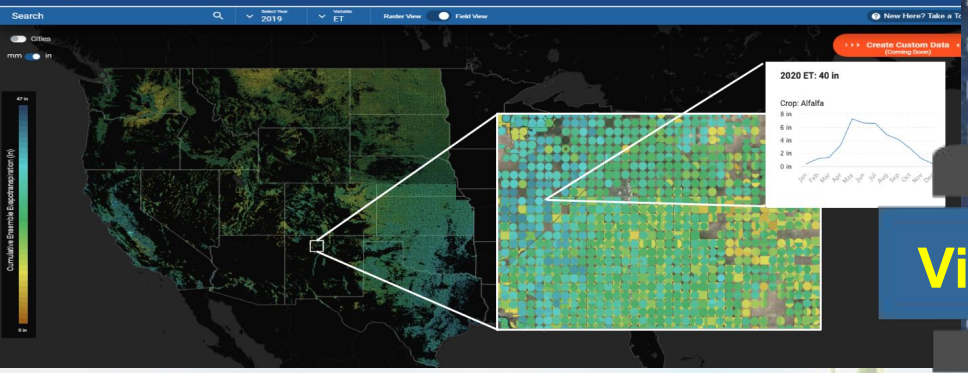
Scope

Identify

Measurement	Satellite	Sensor	Spatial Resolution	Temporal Resolution
Elevation		Shuttle Radar Topography Mission (SRTM)	30 m	
Evaporative Stress Index, Evapotranspiration	International Space Station	ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS)	70 x 70 m, 30 x 30 m	Target areas every 1-7 days
Evapotranspiration, Land Cover Type, Land Surface Temperature, Snow Cover, Surface Reflectance, Vegetation Indices	Terra and Aqua	Moderate Resolution Imaging Spectroradiometer (MODIS) *	250 m, 500 m, 1 km	1-2 days
Groundwater	Gravity Recovery and Climate Experiment (GRACE)		0.125°	Giovanni: daily Earthdata: 7-day
Land Surface Temperature, Snow Cover, Surface Reflectance, Vegetation Indices	Joint NASA/NOAA Suomi National Polar-orbiting Partnership (Suomi NPP)	Visible Infrared Imaging Radiometer Suite (VIIRS) *	325-750 m	1-2 days
Land Surface Temperature, Surface Reflectance	Landsat 8	Operational Land Imager (OLI) Thermal Infrared Sensor (TIRS)	15, 30, 60 m	16 days
Precipitation	Integrated multi-satellite data	Tropical Rainfall Measuring Mission (TRMM) Multi-satellite	0.1° x 0.1° or 0.25° x 0.25°	half hourly, daily,

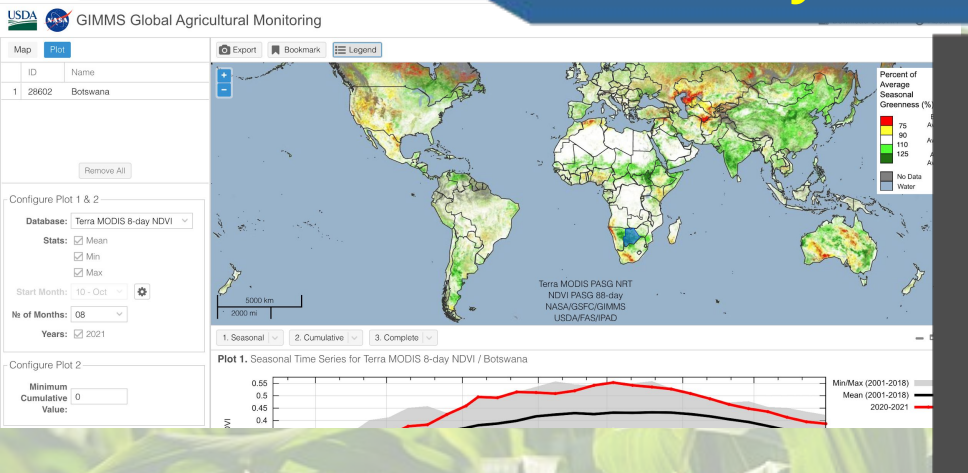

Land
Vegetation
Water
Vegetation is a key component of the overall Earth system. It plays a critical role in the movem
levels, including the ecosystem and landscape levels. Assessments of vegetation health, including vegetation
greenness, land cover type, evapotranspiration, and evaporative stress, are critical to monitoring agricultural
practices and water resource availability and for decising when int
Access
Subset
Vegetation Greenness
Land Cover/ Crop Extent
Evapotranspiration
Evaporative Stress
Vegetation products created from data acquired by the MODIS instrument aboard NASA's Terra and Aqua satellites and the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument aboard the joint NASA/NOAA Suomi National Polar-orbiting Partnership (Suomi NPP) satellite can be accessed in several ways. Research quality surface reflectance data products can be accessed directly using Earthdata Search (datasets are available as in HDF format but are, in some cases, customizable to GeoTIFF):
MODIS Vegetation Indices
VIIRS Vegetation Indices
AppEEARS, available through NASA's Land Processes Distributed
and effective way to extract, transform, visualize, and download M
products. AppEEARS allows users to subset data by defining specifi
be downloaded in CSV (point), GeoTIFF (area), or NetCDF4 (area) fo
Near real-time imagery can be interactively explored using NASA Worldview (Note: The Terra/MODIS NDVI (rolling 8-day) and EVI (rolling 8-day) are only available in Worldview for the last 20 days; older NDVI or EVI imagery are available using use the Level 3, 16-Day, or Monthly Vegetation Index and EVI layers):
MODIS NDVI
This dataset has a spatial resolution of 250 m and the temporal resolution is an 8-day product, updated daily; 16-day and monthly data are also available in Worldview
MODIS EVI
This dataset is monthly at 1 km spatial resolution

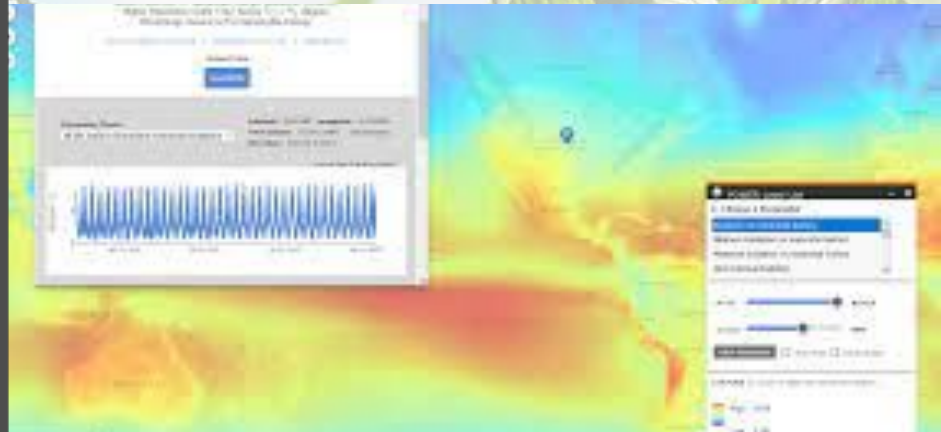
OpenET: Filling the Biggest Data Gap in Water Management



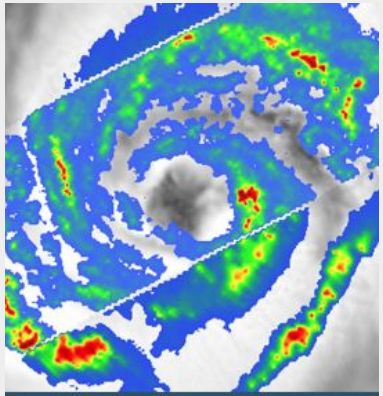
Visualize

Analyze





Data Tools



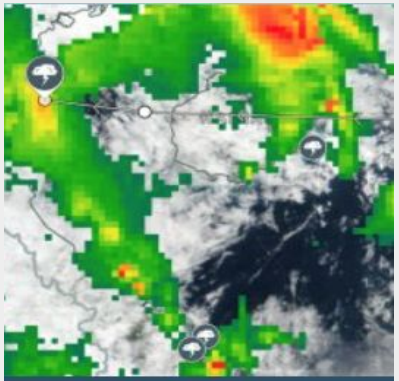
Data Tools

Find tools for searching and ordering data; data handling; subsetting and filtering; geolocation, reprojection and mapping; and data visualization and analysis.

Access

Filter

Earthdata APIs



Earthdata APIs

NASA's Earthdata Developer Portal is for application developers who wish to build applications that search, access, and browse EOSDIS Earth science data.

When problems/questions arise for you today...go to ***www.menti.com***

Parking Lot for Questions

Code:

15 28 44 2

Mentimeter Results

Contact Me

elizabeth.r.joyner@nasa.gov

Elizabeth Joyner
Community Coordinator
Earth Science Data Systems

When problems/questions arise for you today...go to ***www.menti.com***

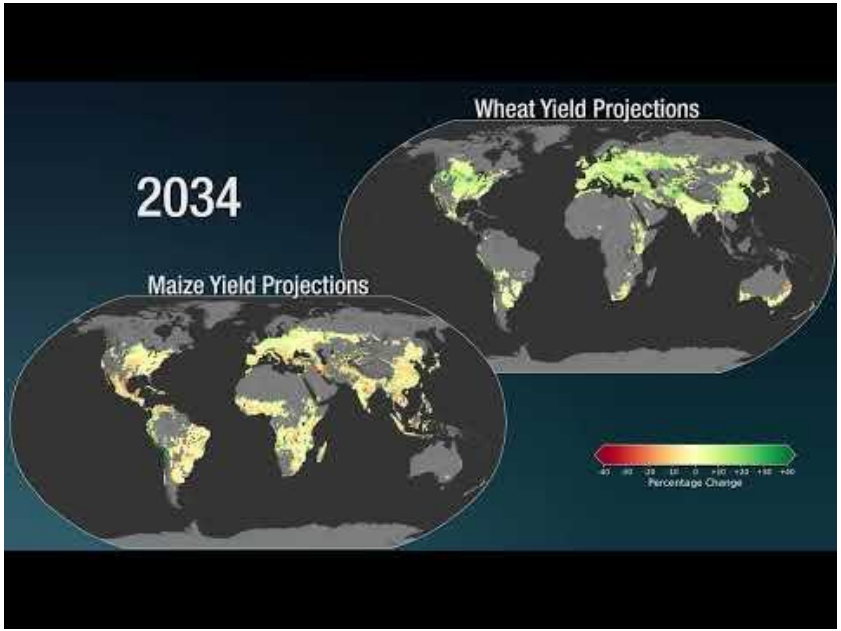
At the End

Code:

3231 7921

Mentimeter Results

Addressing Wicked Problems with NASA Data



Since 2015, the number of “food insecure” people who do not have sufficient access to consistent, good quality nutrition continues to increase.

We know that climate change will affect agricultural production worldwide.

Turning

Needs

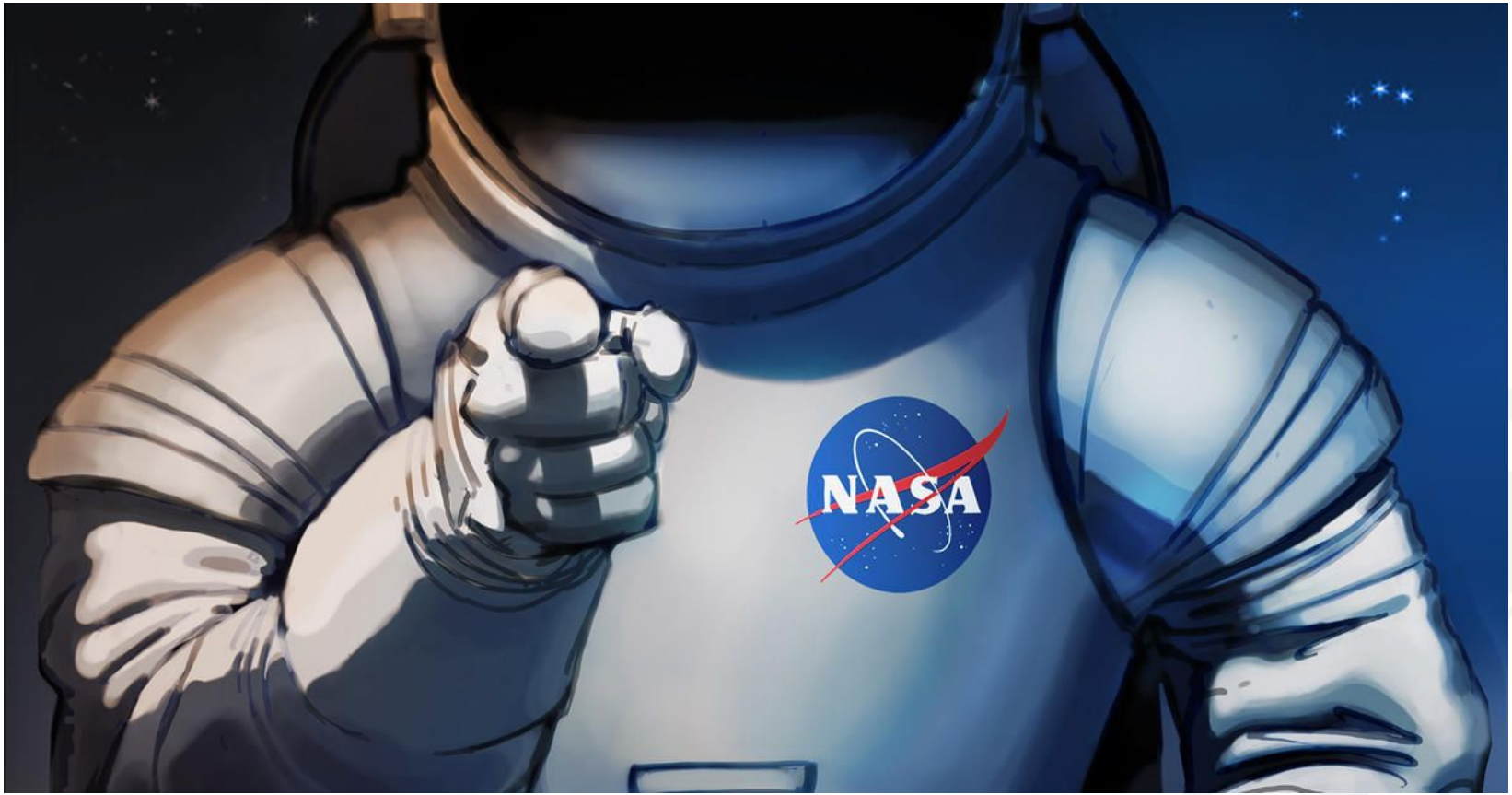
into

Opportunities

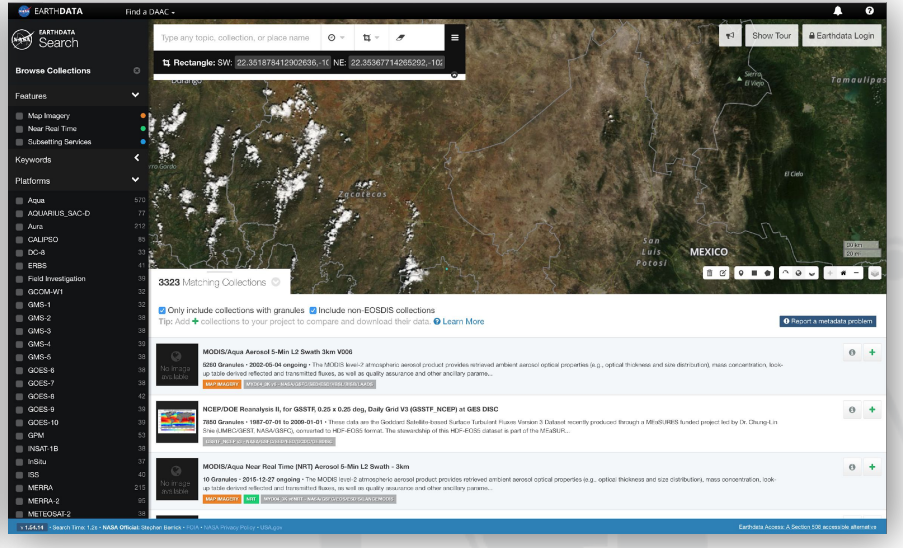
Data Saturation

- Rise in ability to collect data hasn't been matched by ability to support, filter, and manage them. (Forbes Magazine, U.S. Air Force)
- Increase in the number of different measurements required to address the key science questions. (The Fourth Paradigm: Editors -Hey, Tansley, Tolle)

*Earth Science is **evolving** and we must keep up.*



Data Tools

Imagery-centric users
https://worldview.earthdata.nasa.gov

Data-centric users
https://search.earthdata.nasa.gov