Welcome to NASA Applied Remote Sensing Training (ARSET) Program

- We will begin shortly.
- Please ensure you have created your Earth Data account: https://urs.earthdata.nasa.gov/.
- All training materials for this workshop can be found on the training webpage:
  - https://www.earthdata.nasa.gov/learn/trainings/nasa-satellite-observations-tools-conservation-management-workshop-series

National Aeronautics and Space Administration



NASA Satellite Observations and Tools for Conservation Management Workshop Series

Session 1: Introduction to NASA Remote Sensing Tools and Observations for Minnesota Conservation Districts

Kait Lemon (Lead Agriculture Trainer)

December 1st, 2026



About ARSET

About ARSET

- **ARSET provides accessible, relevant, and cost-free training on remote sensing satellites, sensors, methods, and tools.**

- Trainings include a variety of applications of satellite data and are tailored to audiences with a variety of experience levels.



About ARSET Trainings

- Online or in-person
- Live and instructor-led or asynchronous and self-paced
- Cost-free
- Bilingual and multilingual options
- Only use open-source software and data
- Accommodate differing levels of expertise

- Visit the ARSET website to learn more.

Today's Agenda

- Introduction
- Section 1. NASA's Earth Action in Agriculture
- Section 2. Introduction to Remote Sensing
- Section 3. NASA Earth Observation Missions and their Conservation Applications
- Break
- Section 4. NASA Earth Observations Visualization and Data Access
- Section 5. Land Surface Disturbance Demo in Worldview, Worldview Exercise, and Discussion
- Training Conclusion
- Q&A

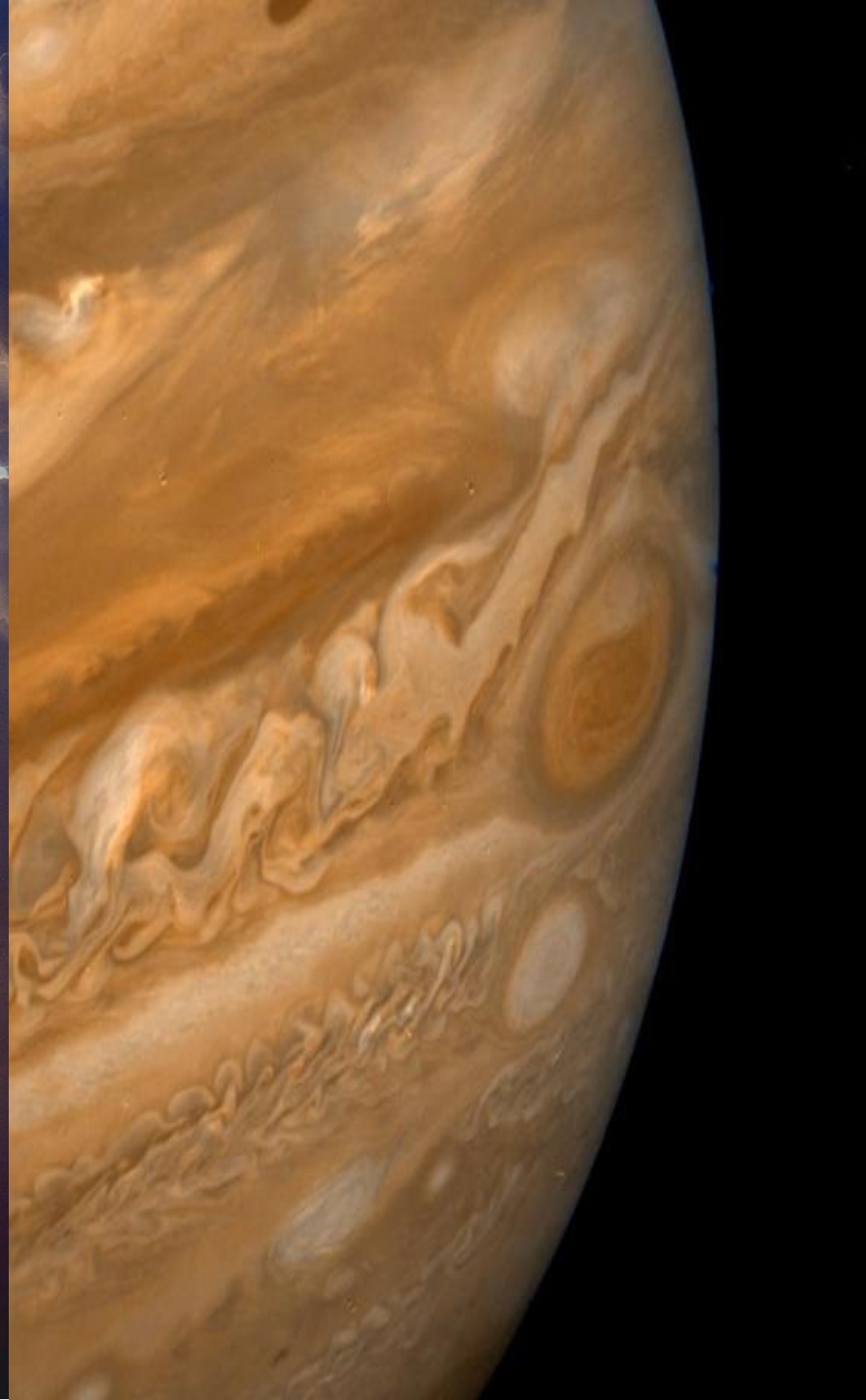
Learning Objectives

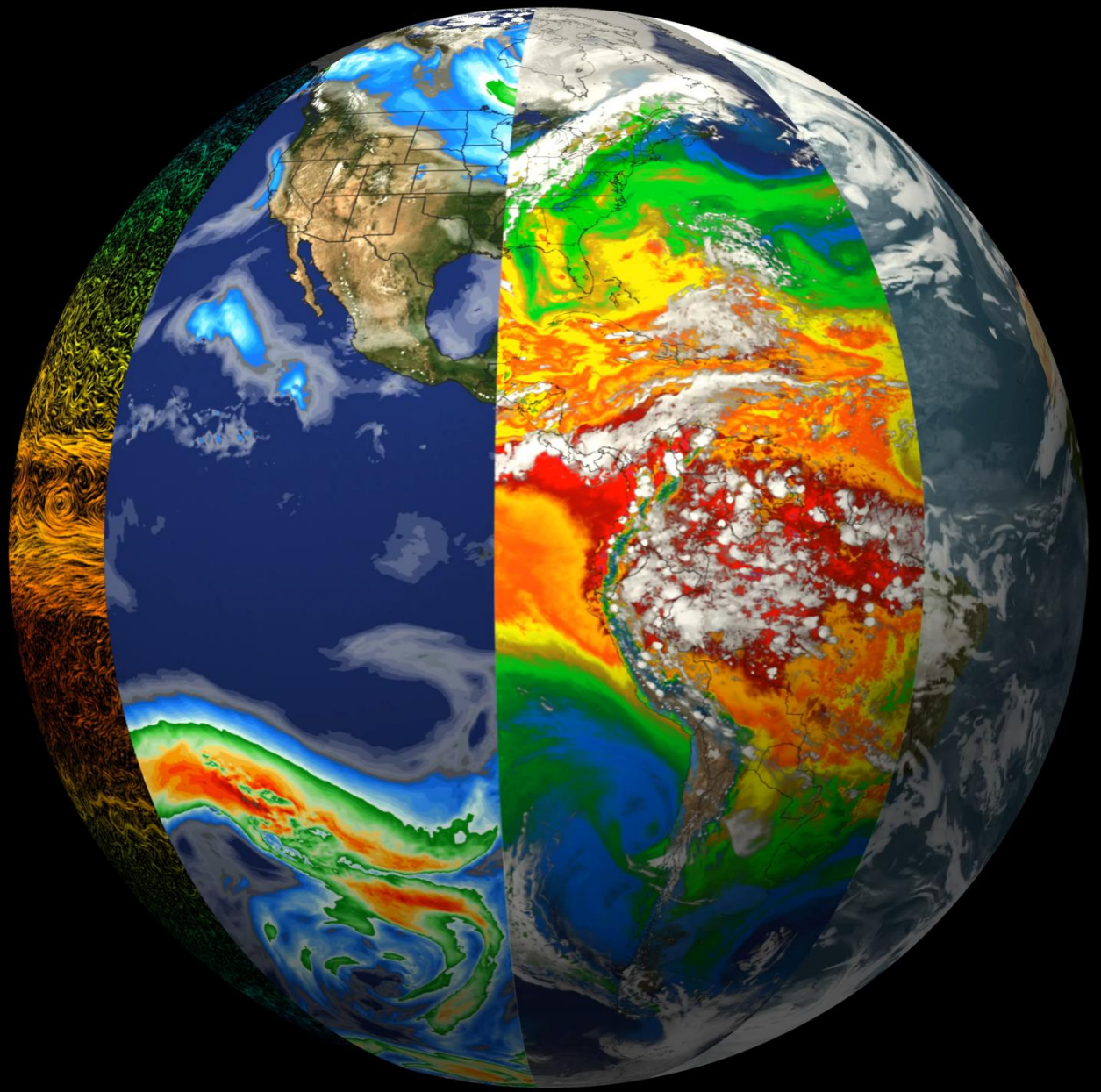
- Identify benefits of using satellite Earth observations to quantify conservation practices and land management.
- Identify how different satellite sensor measurements, resolutions, and orbits impact the type of Earth data they produce.
- Recognize how different Earth observation data products are used to address conservation practices from watershed restoration to land use/land cover change.
- Navigate Worldview to access and view NASA Earth observation data products.



Section 1.
NASA's Earth Action in Agriculture



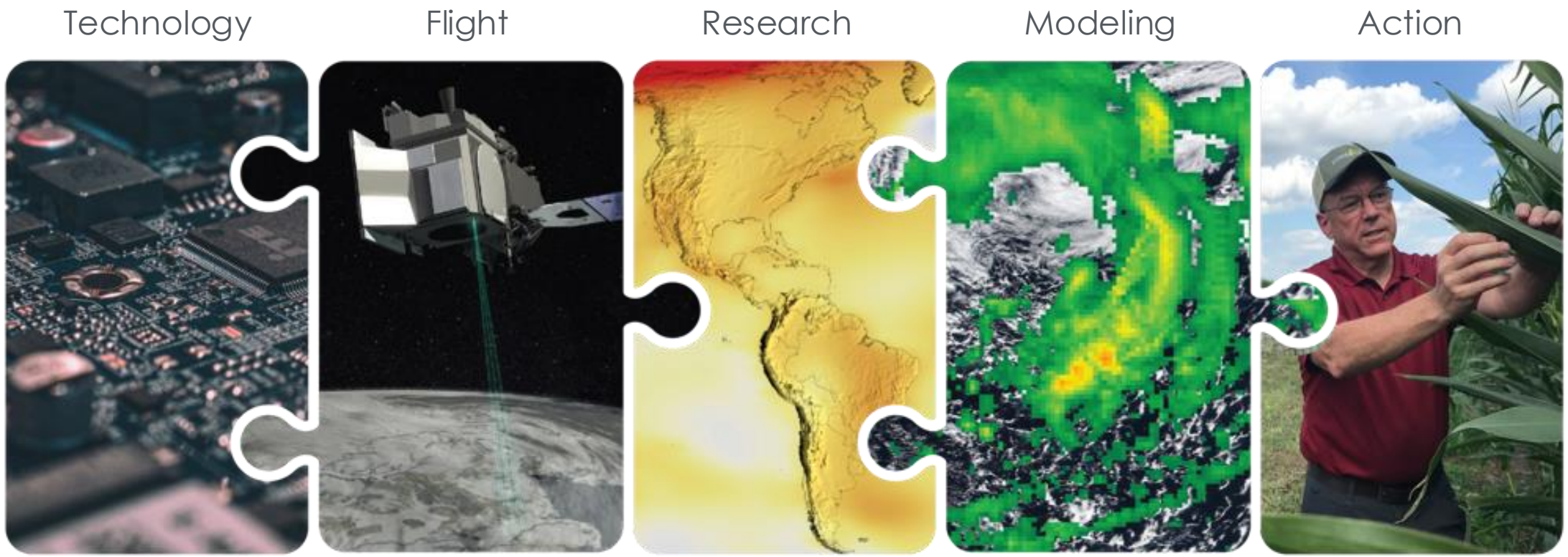




Animation by NASA Science Visualization Studio (SVS)

Earth: A System of Systems

NASA Earth Science Division Programs



Agriculture

Water Resources

Disasters

Ecological Conservation



NASA Earth Action Agriculture: Programs, Consortia, & Scientists

Promotes Earth observations to:

- Strengthen food production
- Support market stability
- Protect human livelihoods

Works through two consortia:

- National – **NASA Acres** applies satellite data solutions to the most pressing challenges facing U.S. agriculture.

- International – **NASA Harvest** leverages satellite data for global food security.



The Agriculture program connects scientists, trainers, and the agricultural workforce and supports web tools such as OpenET.

NASA Agriculture
Engaging Directly with Local Agricultural Communities

2026 Space for Agriculture Tour

This on-the-ground engagement ensures Earth science research, data products, and satellite applications directly align with practical agricultural priorities.

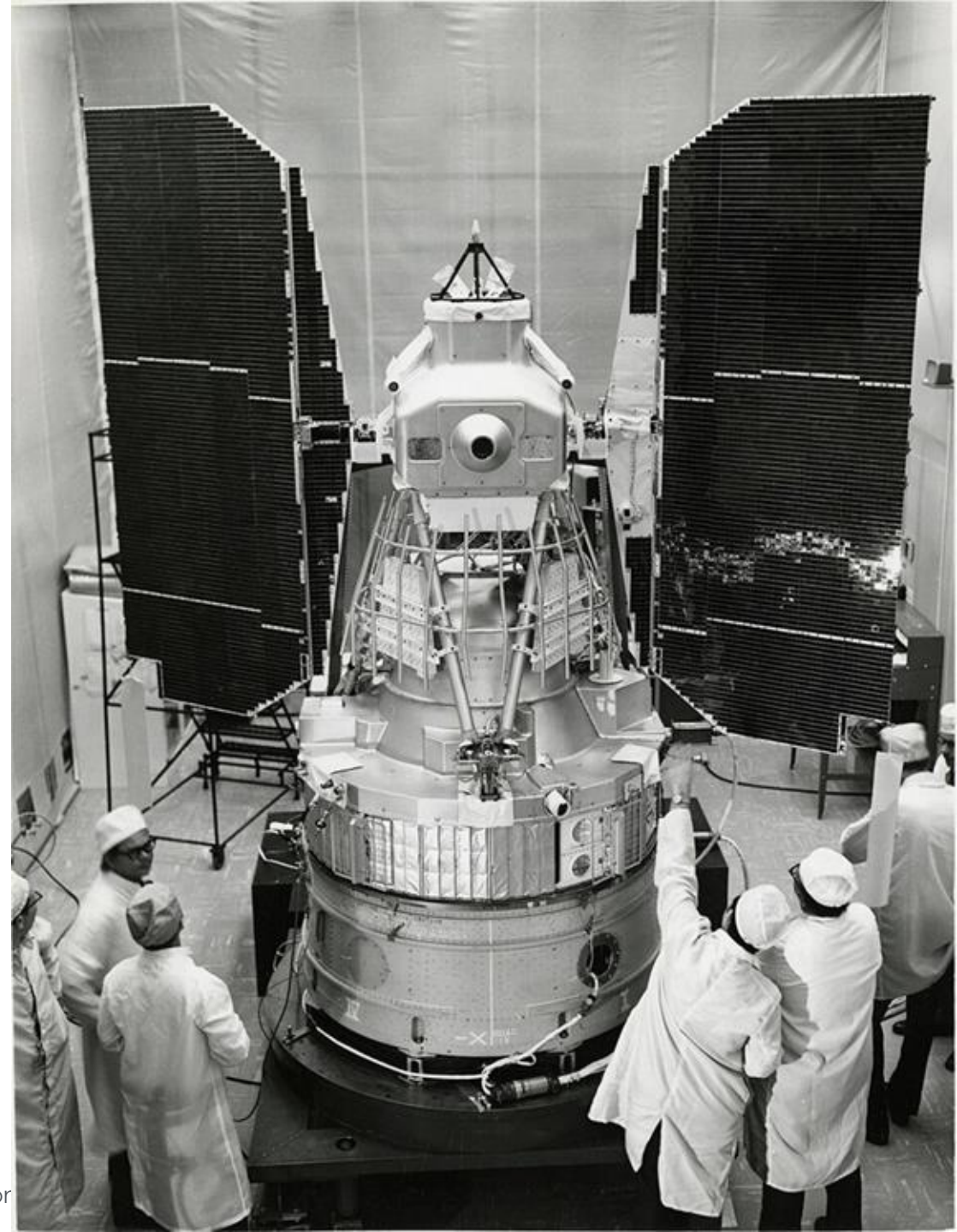
During this time of severe and ongoing drought, NASA leadership and scientists visited working farms, research sites, and processing facilities across West Texas, Oklahoma, and Kansas to connect directly with cotton, peanut, sorghum, grain producers, ranchers, and industry representatives.

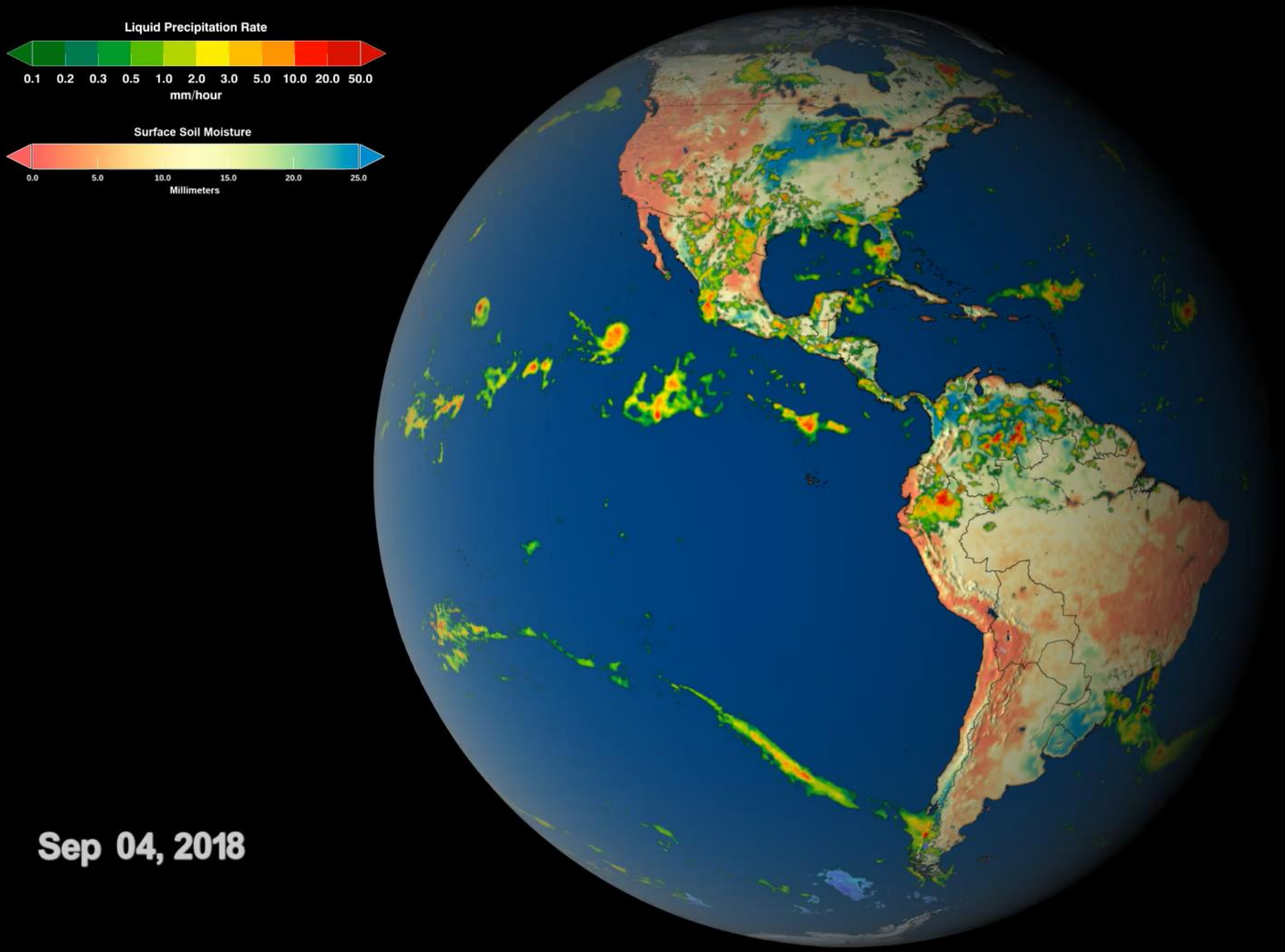




History – USDA & NASA Partnership

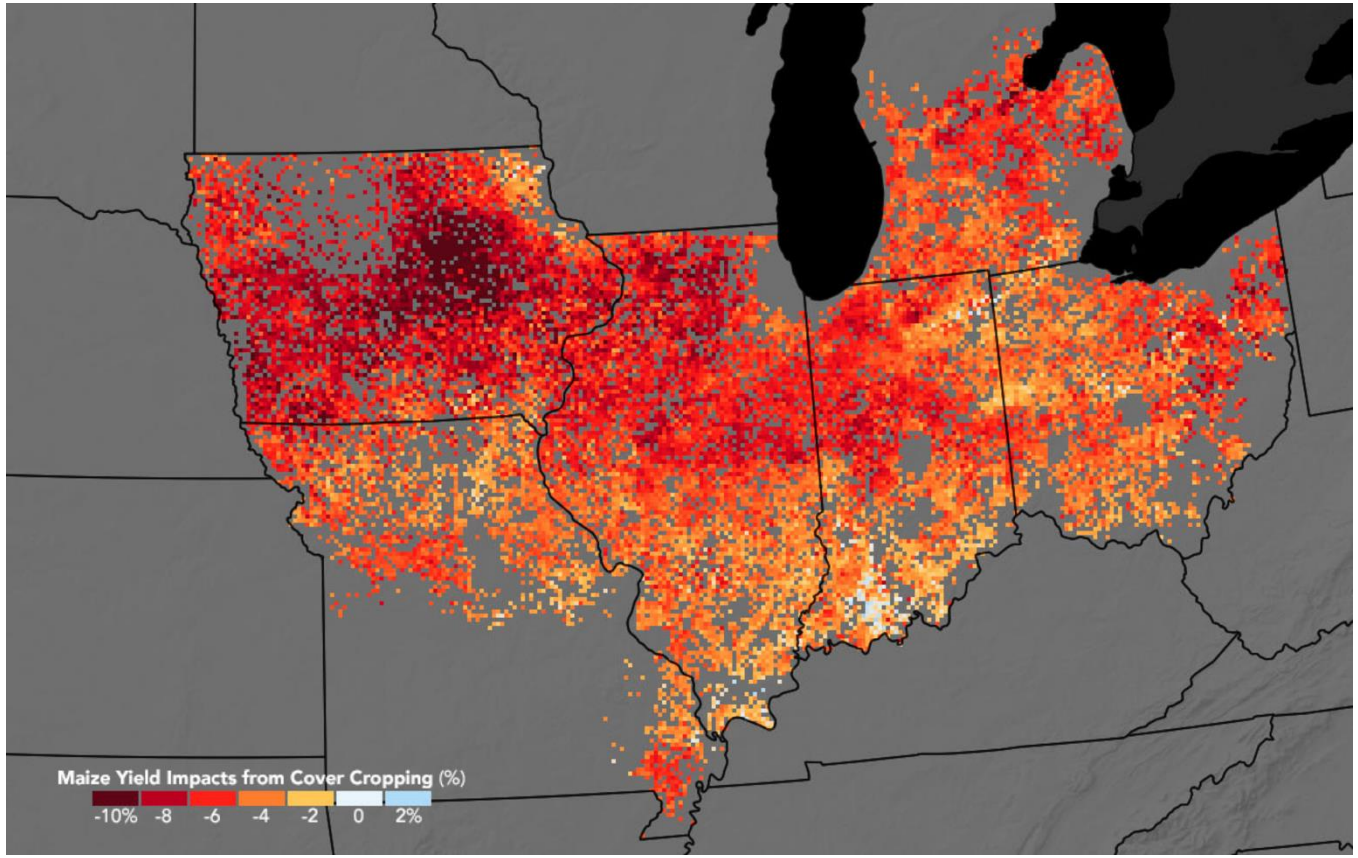
- 1965 State of Agreement between the U.S. Department of Agriculture – Agricultural Research Services (ARS) and NASA
- Aimed to characterize reflectance and emission signatures of different land covers
- Led to the design of the first sensors carried on Landsat 1
- Landsat was the first satellite designed specifically to study and monitor land surfaces




Liquid Precipitation Rate
0.1 0.2 0.3 0.5 1.0 2.0 3.0 5.0 10.0 20.0 50.0
mm/hour
Surface Soil Moisture
0.0 5.0 10.0 15.0 20.0 25.0
Millimeters
Sep 04, 2018

Satellite Applications for Agriculture & Districts

- Assess soil moisture and irrigation
- Identify soil and crop health characteristics
- Monitor plant growth and estimate crop and rangeland productivity
- Validate incentive programs
- Quantify and visualized damage from extreme weather events



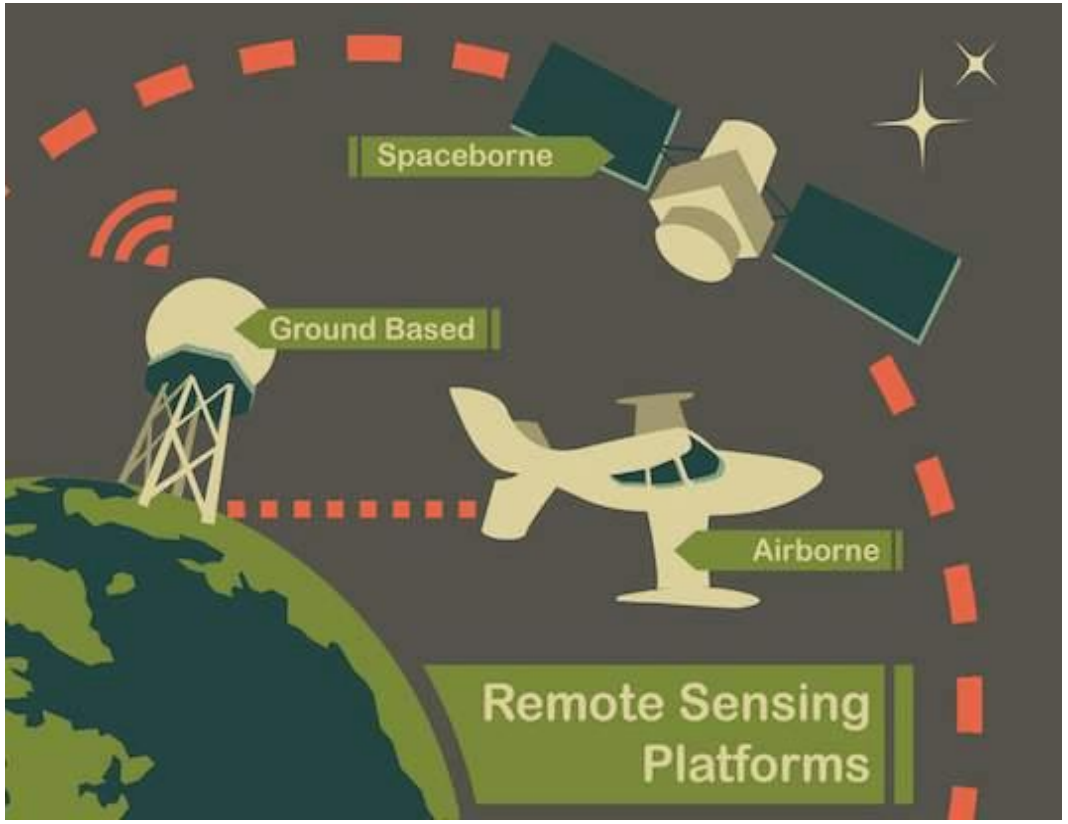
Midwest Farmers Using Cover Crops Take Small Yield Hit
Credit: NASA SVS | Midwest Farmers Using Cover Crops Take Small Yield Hit



Section 2.
Introduction to Remote Sensing

What is remote sensing?

Remote sensing is obtaining information about an object from a distance.



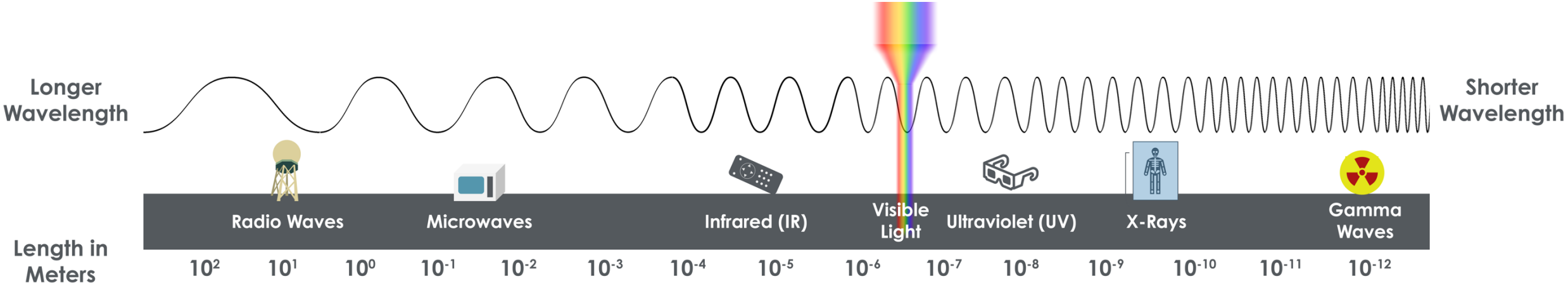
Application needs drive which platforms are used to collect data:

- **Spaceborne:** Satellites orbiting Earth
- **Airborne:** Fly at low altitude such as airplanes and balloons
- **Ground-Based:** Sensors are installed on or near ground level

Satellite Sensor Questions

- What parts of the Earth can the sensor see?
- What features will I be able to see?
- Can the sensor make observations at night? Can it see through clouds?
- How often are observations made over my location of interest?
- Is the information I want available from this sensor?

The Electromagnetic Spectrum



Remote Sensing Resolutions

Spectral Resolution

- Number of independent channels (or bands)

Temporal Resolution

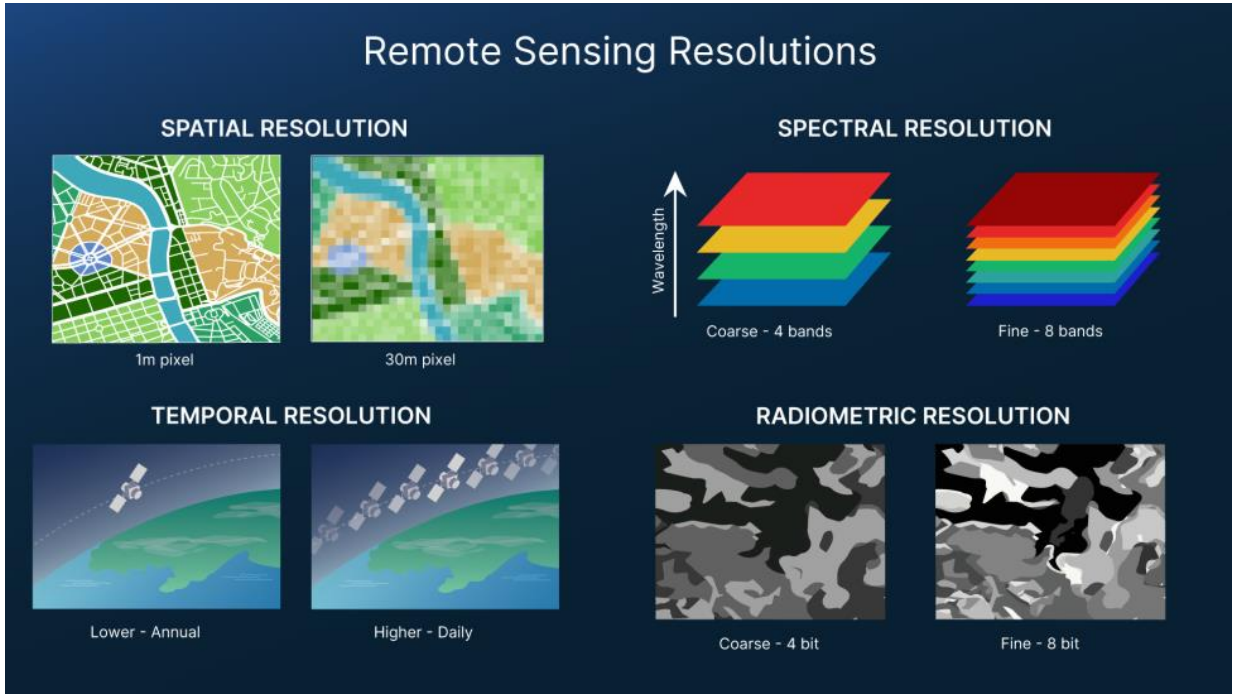
- How often observations are made over an area

Spatial Resolution

- Smallest spatial measurement

Radiometric Resolution

- Sensitivity to differences in electromagnetic energy

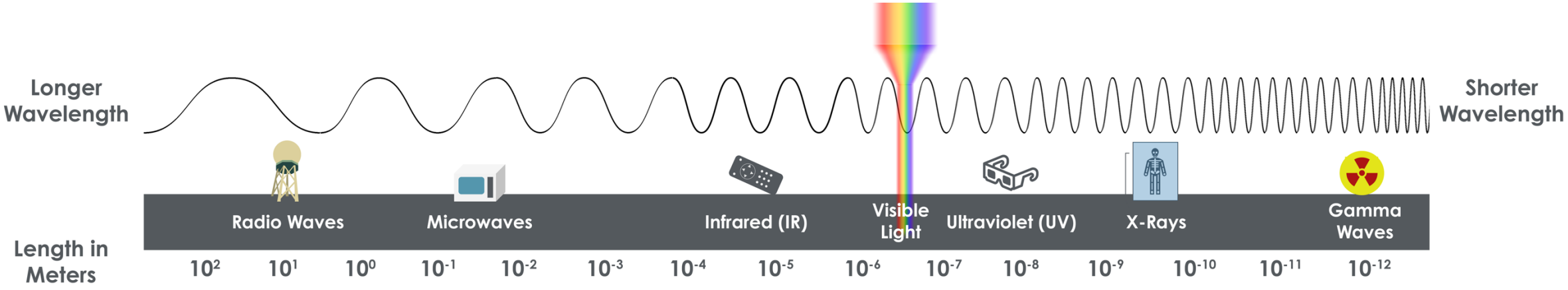


The science need drives the design of each satellite and sensor resolution is dependent on satellite orbit and sensor design.

Image Credit: NASA

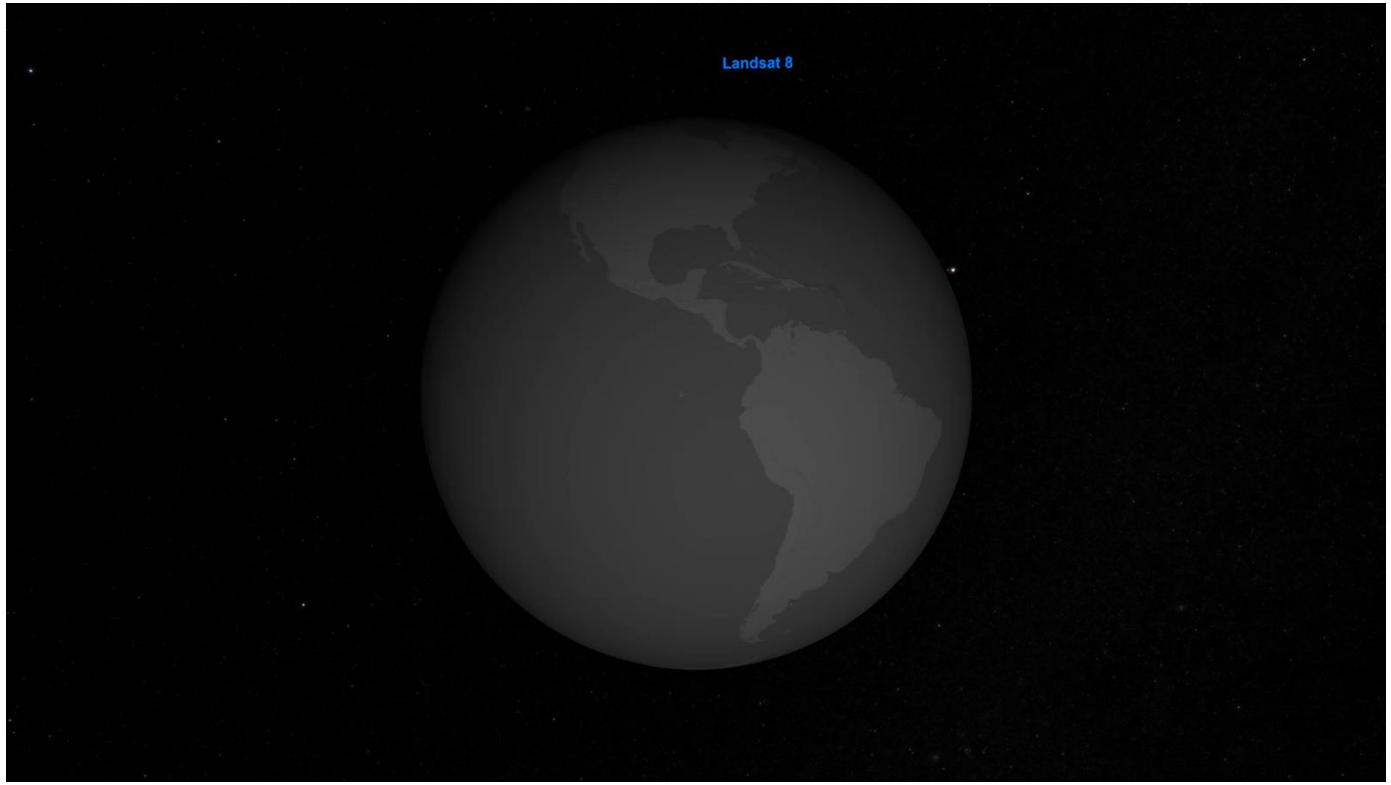
Spectral Resolution

- Signifies the number and width of spectral bands, the range of wavelengths.
- **The higher the spectral resolution, the narrower the wavelength range** for a given channel or band.
- More and finer spectral channels enable remote sensing of different parts of the Earth's surface.
- Typically, **multispectral imagery refers to 3 to 10 bands**, while hyperspectral imagery consists of hundreds or thousands of (narrower) bands (i.e., higher spectral resolution).



Temporal Resolution

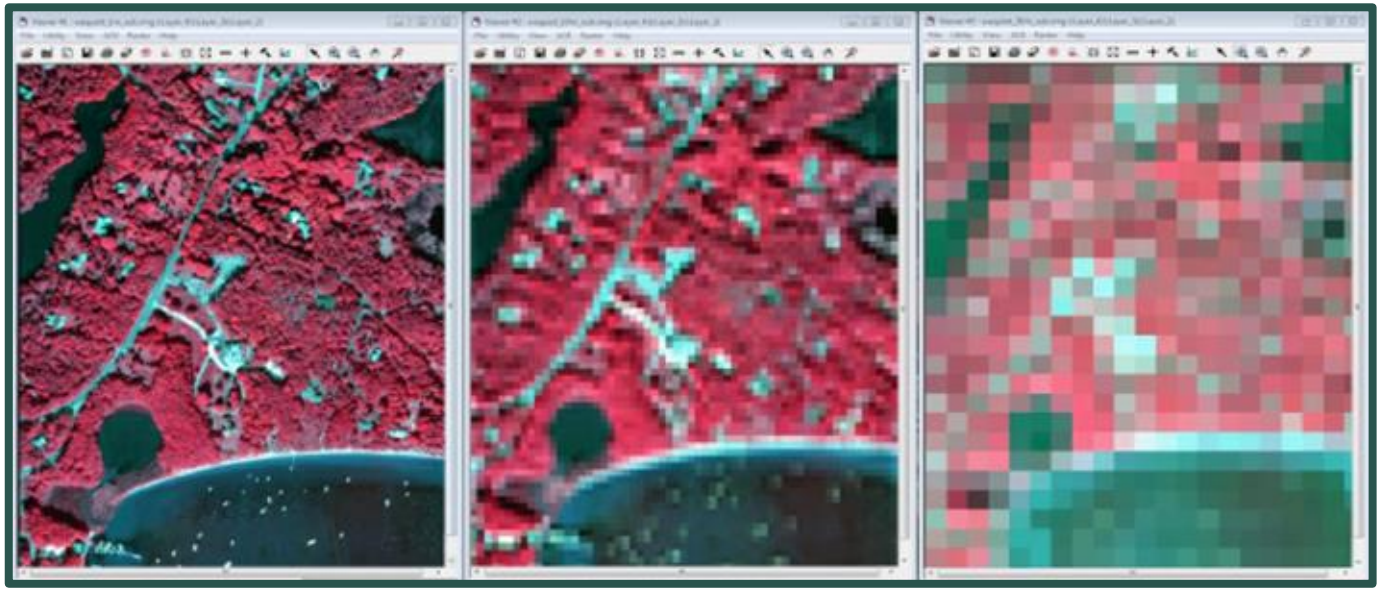
- The time it takes for a satellite to complete one orbit cycle—**also called "revisit time"**
- Depends on satellite/sensor capabilities, swath overlap, and latitude
- Some satellites have greater temporal resolution because they have increasing overlap at higher latitudes



Sensor	Revisit Time
Landsat	16 days
MODIS	2 days
Commercial (OrbView)	1-2 days

Spatial Resolution

- Spatial resolution signifies the ground surface area that forms one pixel in the image.
- It is usually presented as a single value representing the length of one side of one pixel.
- The **higher the spatial resolution, the less area is covered** by a single pixel.
  - Coarser resolutions shows a larger view of an area with less details.
  - Finer resolution can see more details but zoomed in further into a specific location.



Spatial Resolution

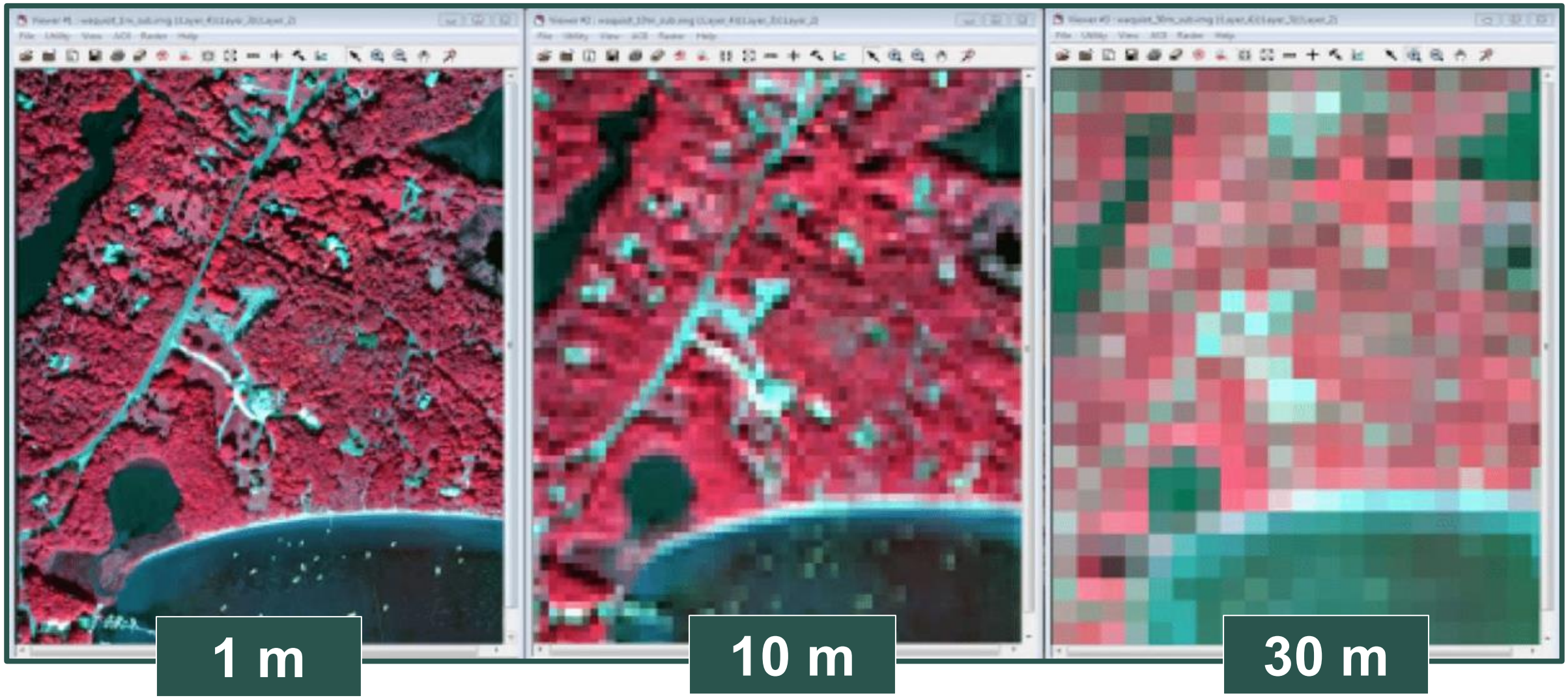
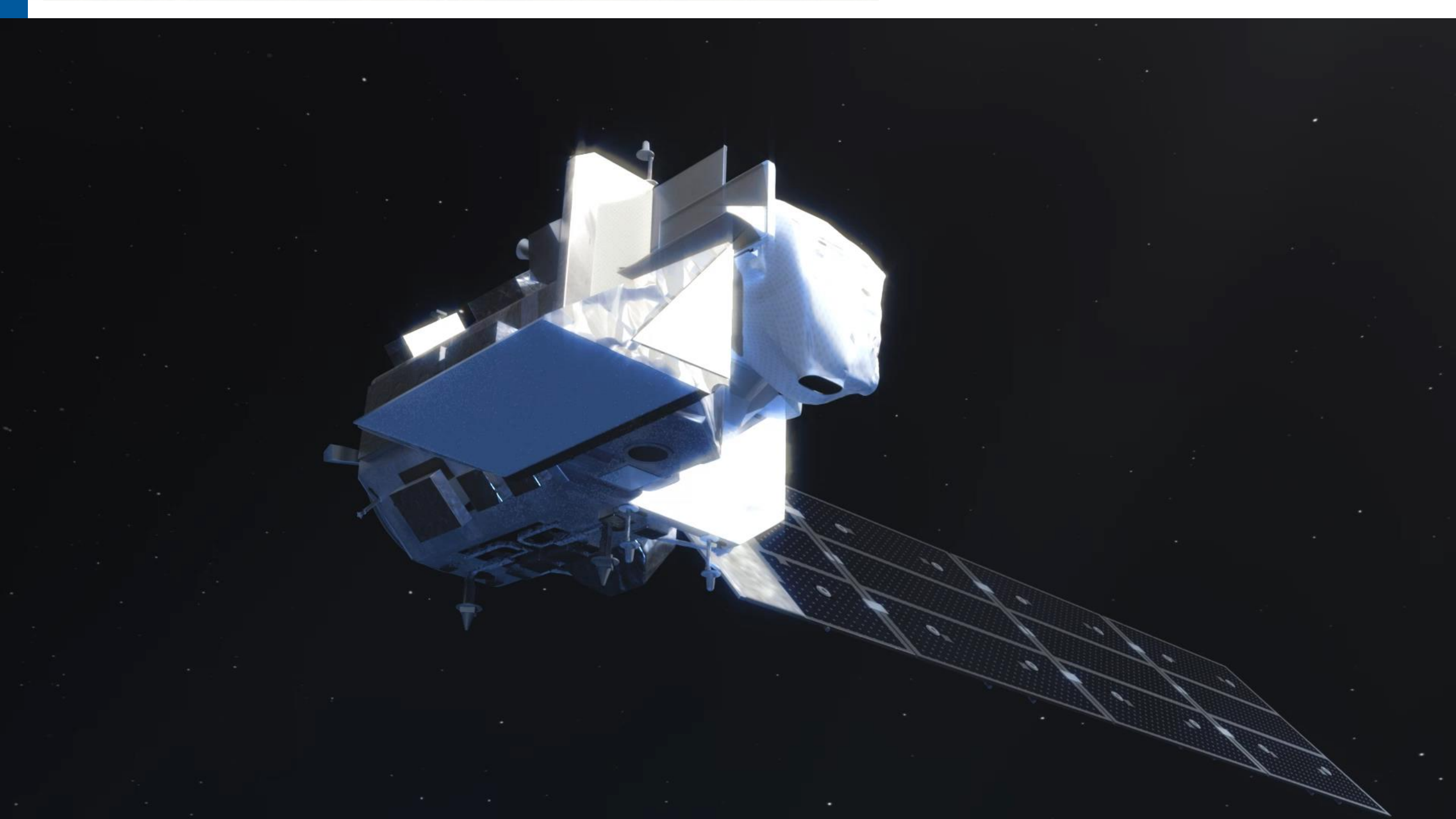
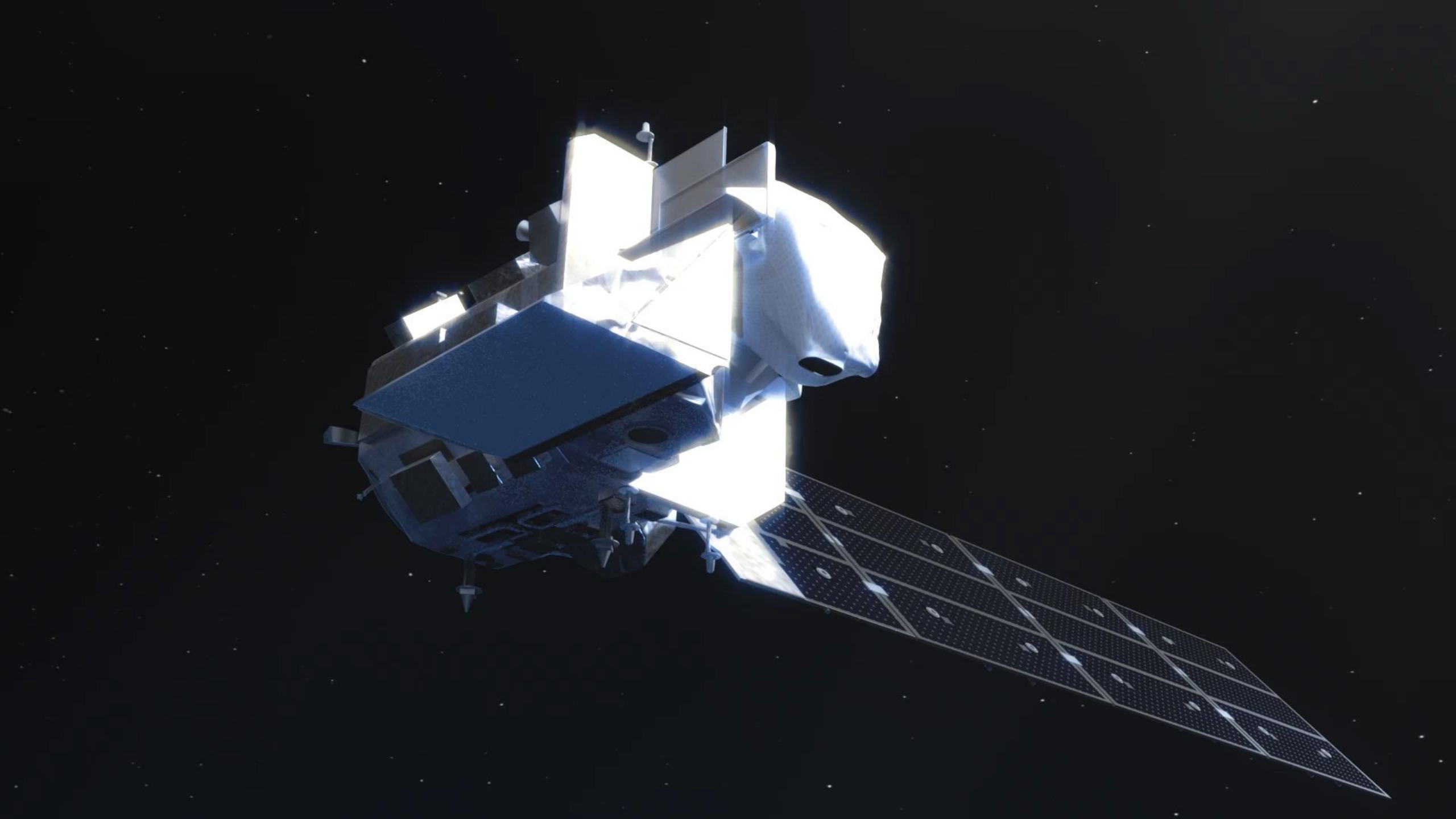


Image Credit: csc.noaa.gov

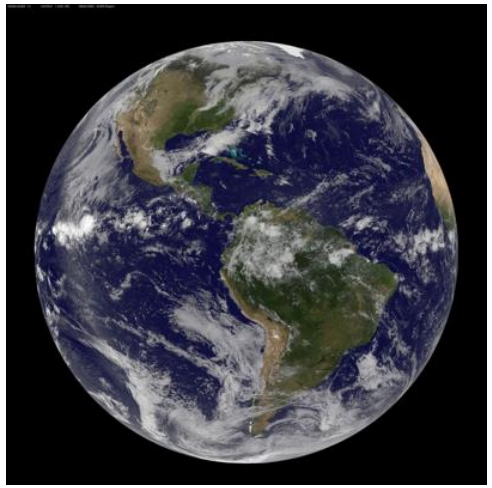


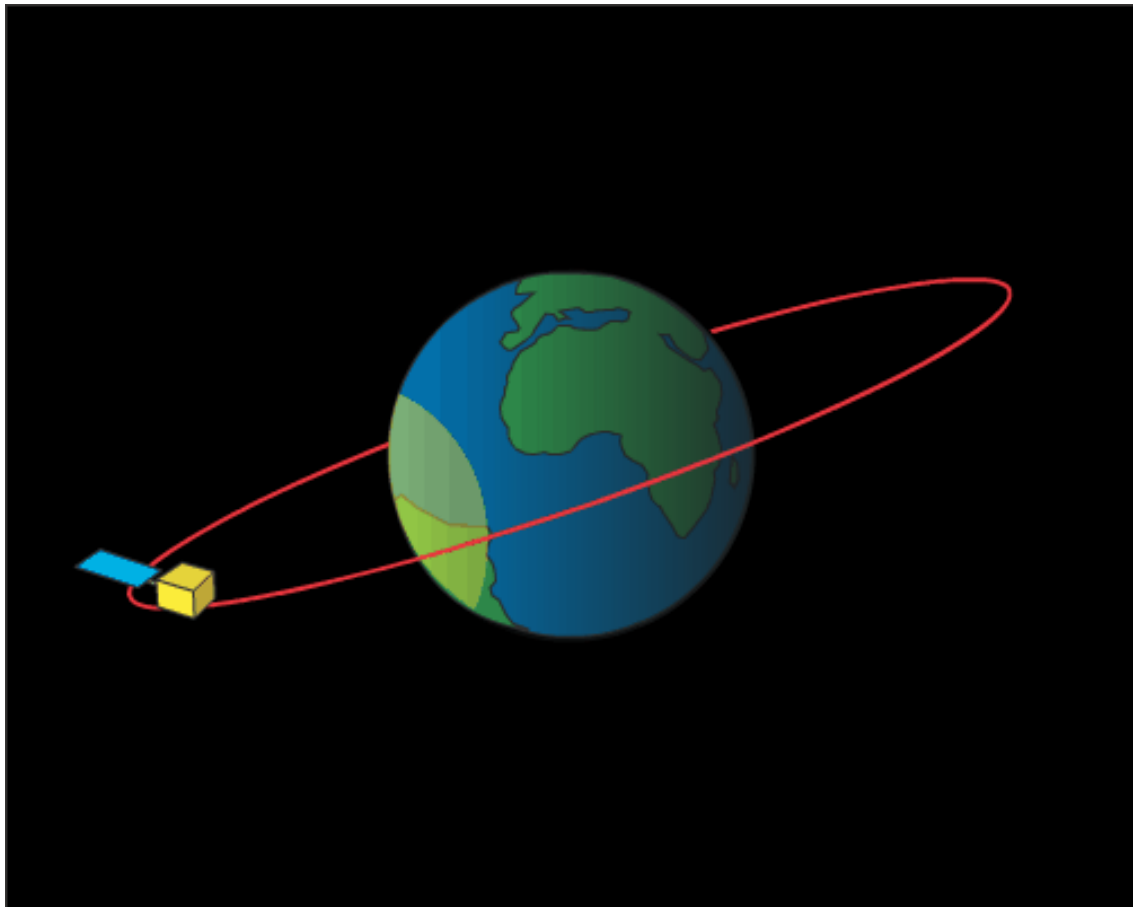


Satellite Orbit Types

Geostationary Orbit (GEO)

- Has the same rotational period as Earth
- Appears ‘fixed’ above Earth
- On the same plane as the equator
- Orbits ~36,000 km above the equator

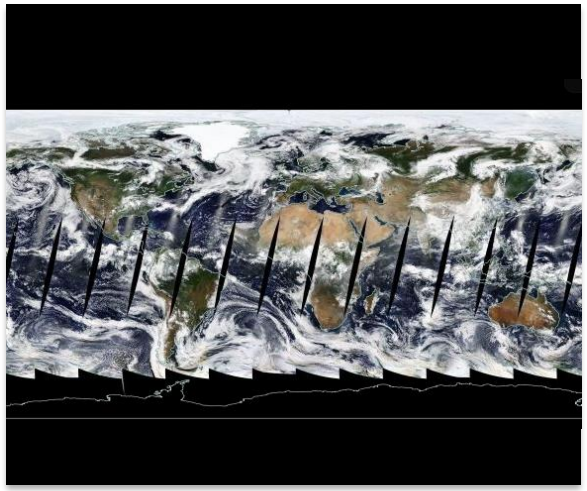


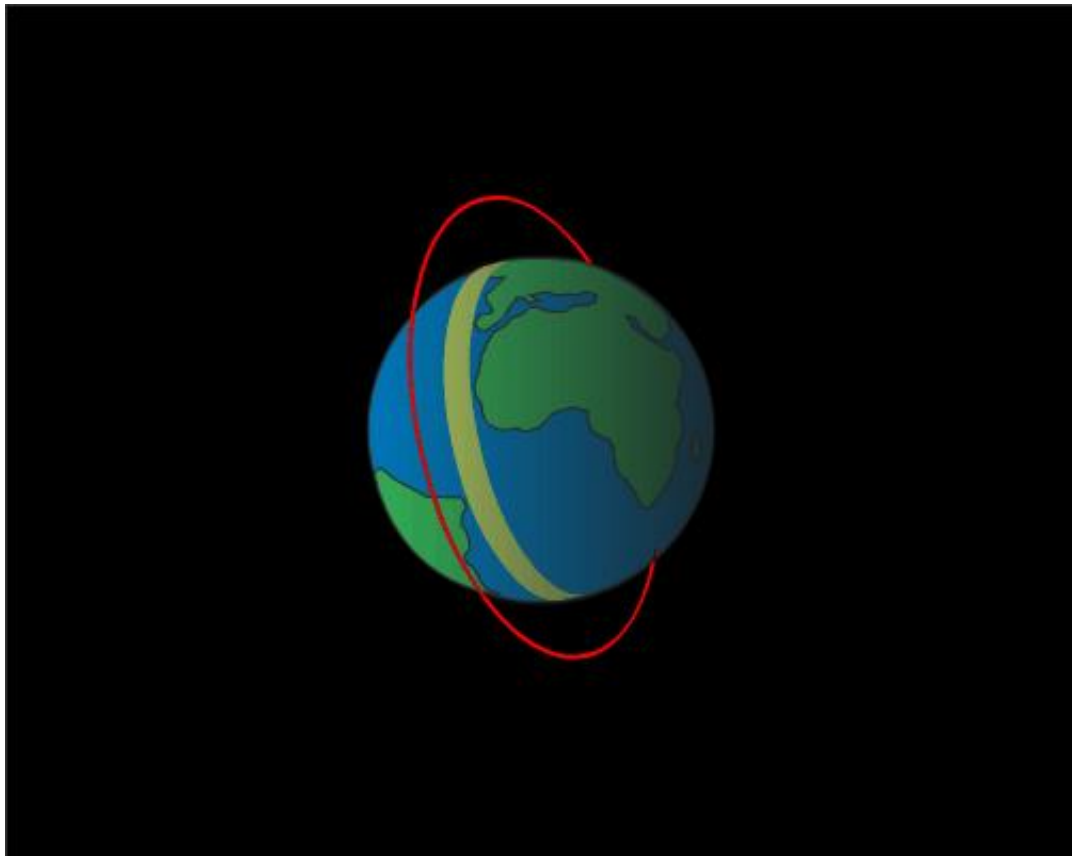


Satellite Orbit Types

Low Earth Orbit (LEO)

- Fixed, circular orbit above Earth
- Commonly used due to numerous orbital tracks
- Pole to pole can acquire data for the entire globe
- Non-polar cover a partial range of latitudes





NASA Data Processing Levels

Level 0	Level 1	Level 2	Level 3	Level 4
• Raw instrument data	• Geolocated and time referenced data	• Derived geophysical parameters	• Gridded and quality controlled	• Level 2 &/or 3 data combined with other information

Satellites and Sensors: Optical Sensors

Satellites Orbits	Sensors	Spectral Measurements	Temporal Coverage, Observation Time, and Resolution	Spatial Coverage and Resolution
Landsat 8 Landsat 9 polar	TIRS, OLI TIRS-2, OLI-2	Visible, Near IR, Middle IR, Thermal IR	2/2013 – Present 11/2021– Present 10:30 am/pm local time 16 Day	Global Swath: 136 km 30 m
Terra Aqua Polar	MODIS	Visible, Near IR, Middle IR, Thermal IR	12/1999 – Present (10:30 am/pm) 4/2002 – Present (13:30 am/pm) 1-2 Days	Global Swath: 2330 km 250 m to 1 km
SNPP JPSS Polar	VIIRS	Visible, Near IR, Middle IR, Thermal IR	10/28 2011– Present 11/18 2017 – Present 11/10 2022 – Present 1:30 am/pm local time 12 Hours	Global Swath: 3040 km 375 m, 750 m
Sentinel-2A Sentinel-2B & -2C Polar	MSI	Visible, Near IR	6/23/2025 – Present 3/7/2017– Present 10:30 am/pm 5 Day	Global Swath: 290 km 10 m, 20 m, 30 m
PACE Polar	OCI	Visible, Near IR, Shortwave IR	2/8/2024 – Present 1 AM/PM 1 to 2 Days	Global Swath: ~2500 km 1 km

Optical Surface Reflectance for Agriculture

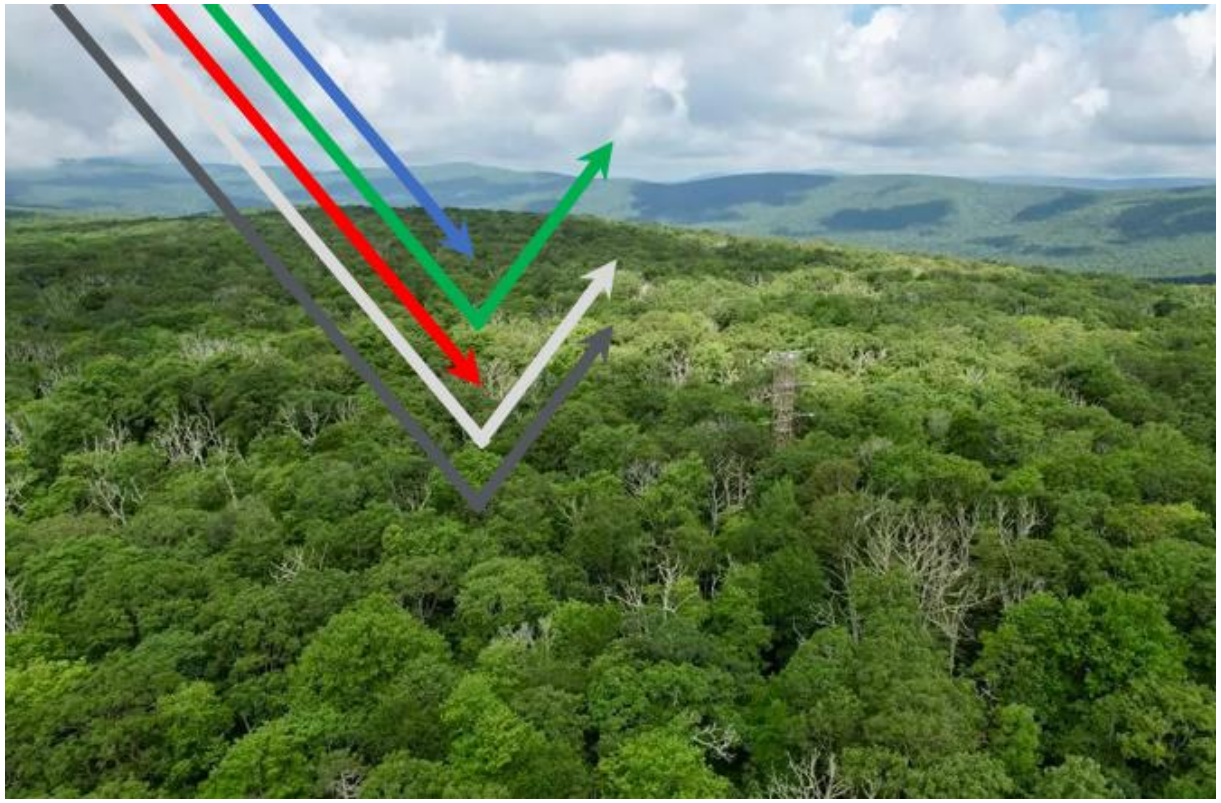


Credit: NASA

Optical Surface reflectance is particularly useful for agriculture because it a **direct, measurable signal** that can be used to quantify vegetation greenness and moisture for monitoring:

1. Crop and soil characterization
2. Vegetation health assessment
3. Phenological monitoring

Spectral Signatures for Vegetation



Credit: NASA

- **VIS:** Reflected radiance peaks at **green** wavelengths. Most incoming radiation in the visible range is absorbed through photosynthesis.
- **NIR:** The highest reflectance occurs in the near infrared region. This range also has low absorption.
- **SWIR:** The short-wave region has high reflectance and low absorption.

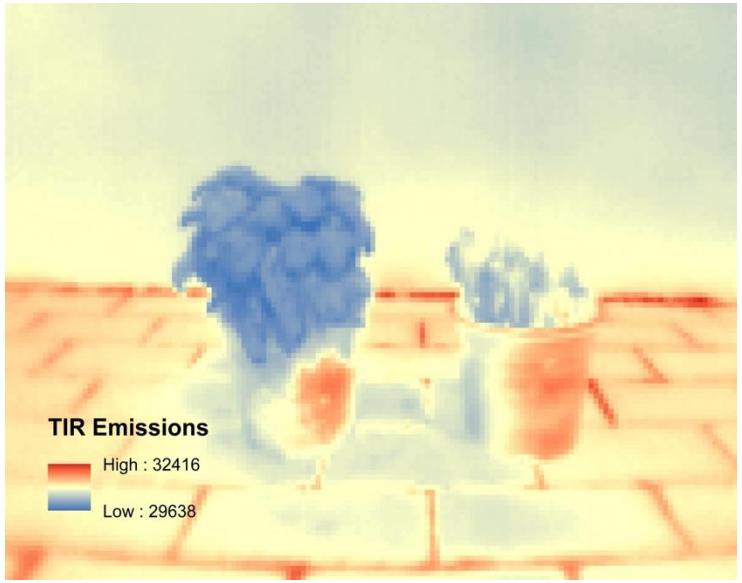
How we can use this information:

- Identify health of plants using NIR and SWIR
- Distinguish plants from other objects like soil and buildings

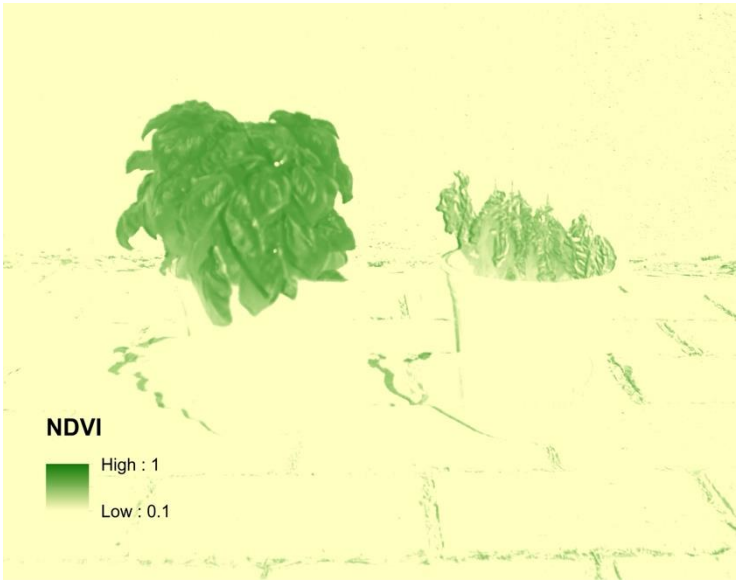
What the Satellite 'Sees'



"True Color"
(Red, Green, Blue)

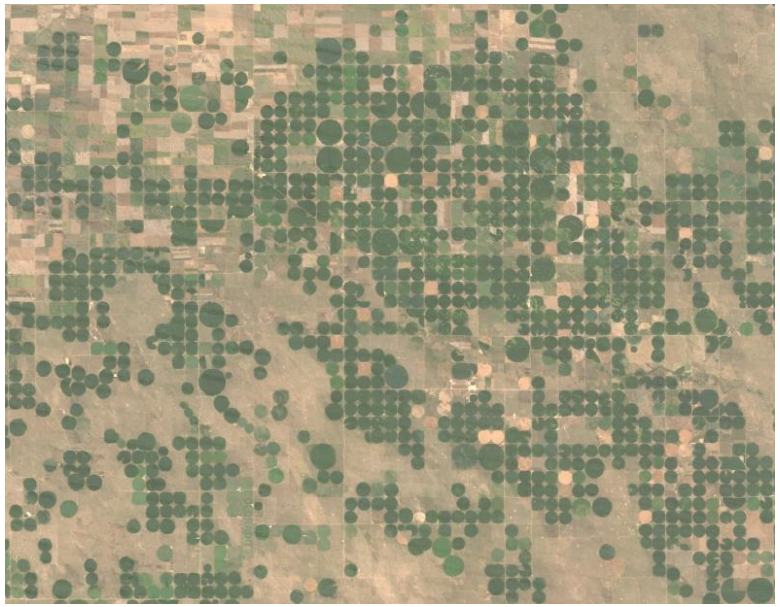


Thermal Infrared Emissions

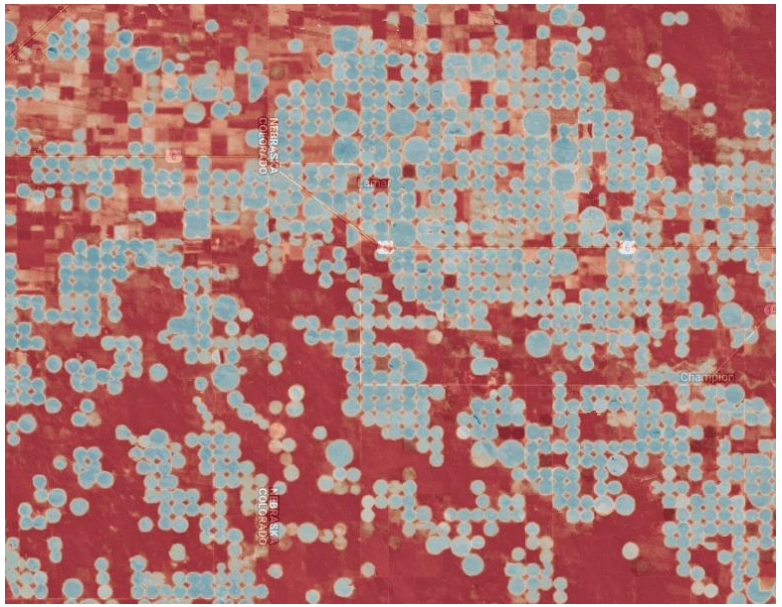


NDVI
(Normalized Difference Vegetation Index)

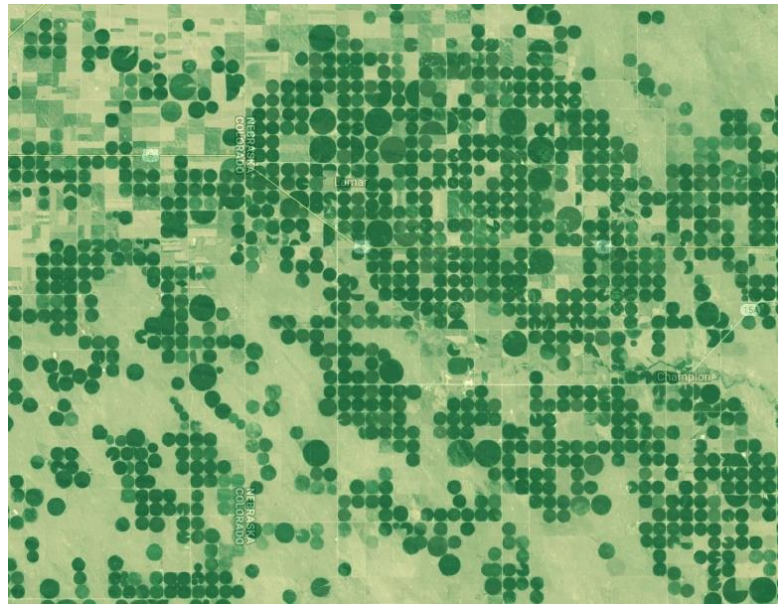
What the Satellite ‘Sees’



“True Color”
(Red, Green, Blue)



Thermal Infrared Emissions



NDVI
(Normalized Difference Vegetation Index)

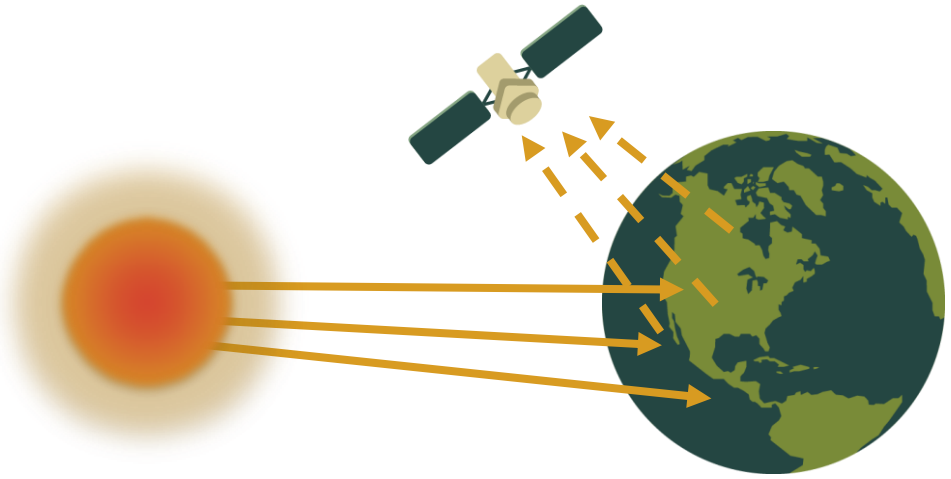
Satellites and Sensors: Microwave Sensors

Satellite/Orbit	Sensors	Spectral Measurements	Temporal Coverage, Observation Time, and Resolution	Spatial Coverage and Resolution
TRMM GPM Low Inclination/ Non-Polar Orbit	Microwave Radiometer and RADAR TMI, PR GMI, DPR	TMI: 10–85 GHz GMI: 10–183 GHz PR (Ku) and DPR (Ku and Ka)	11/27/1997 – 4/15/2015 2/27/2014 – Present Diurnally Varying ~90 minutes	35° S – 35° N 65 °S – 65° N Swaths: 760 – 878 km 885 – 931 km 5 – 72 km 5 – 42 km
SMAP Polar Orbit	Microwave Radiometer	L-Band	1/31/2015 – Present 6:00 am/pm 2–3 days	Near-Global Swath:1000 km 38 km, 9 km
NISAR Polar Orbit	Microwave Synthetic Aperture Radar	L-Band S-Band	7/30/2025 – Present 6:00 am/pm 12 Day	Global Swath: 242 km 2 – 8 m (band dependent)
SWOT Near-Polar Orbit Non-Sun Synchronous	Microwave Radar Interferometer & Radar Altimeter Microwave Radiometer	KaRIN: Ka band (35.75 Ghz) Poseidon-3C Ku Band (13.6 Ghz) & C Band (5.3 Ghz) 18.7, 23.8, 34 GHz	12/2022 – Present 21-day revisit time Varying local time of observations	Global Swaths: 120 km Oceans: 14-15 km Coastal Zones: 10 km Land ~100 m

Remote Sensing Recap

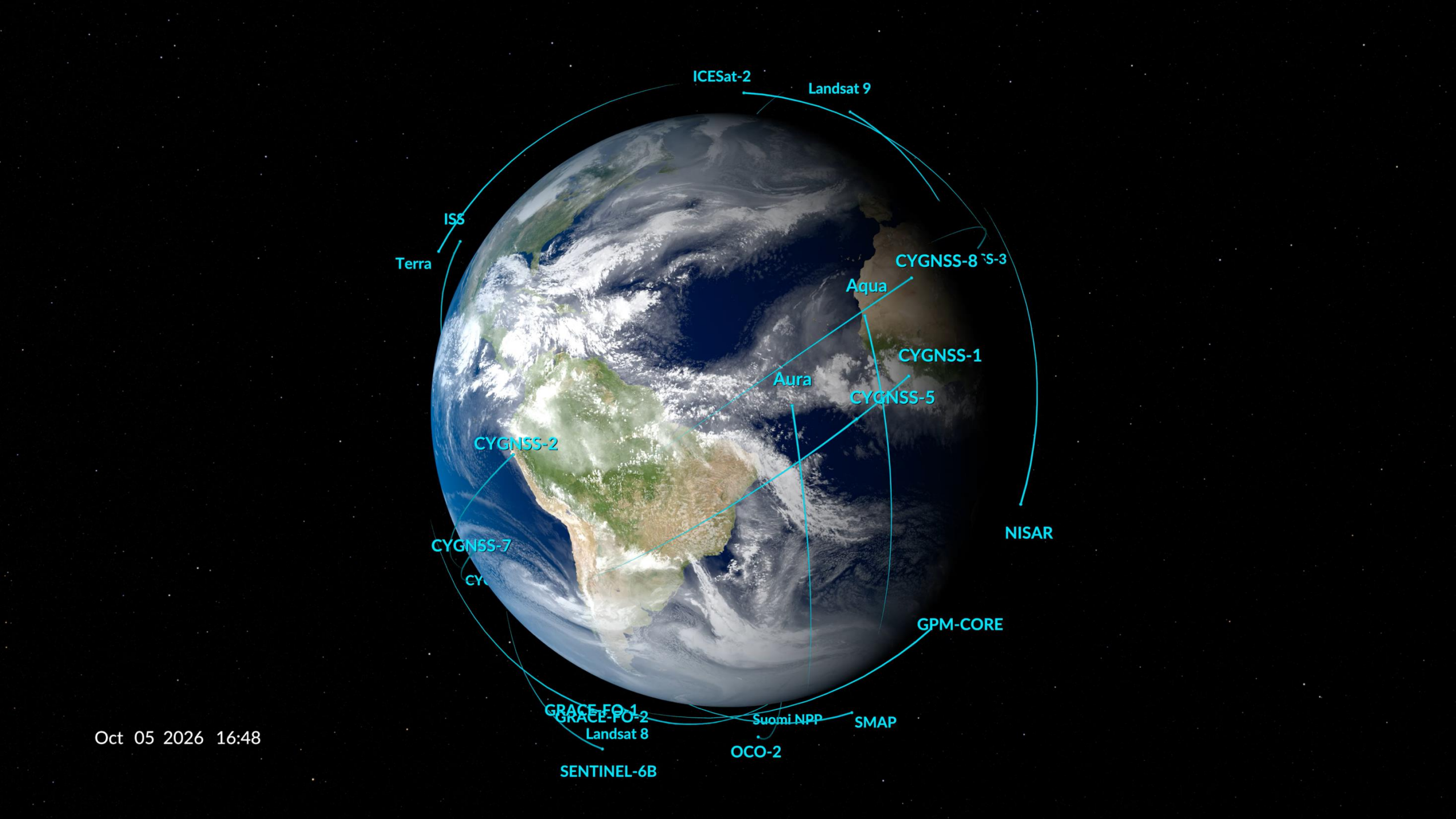
- If you want to measure daily precipitation, would you care more about temporal or spatial resolution?
- What are some of the differences between active vs. passive sensors?
- At 30-meter Landsat resolution, can the government see you in your back yard?

What Type of Sensor is This?





Section 3.
NASA Earth Observation Missions and their Conservation Applications


ICESat-2
Landsat 9
ISS
Terra
CYGNSS-8
Aqua
CYGNSS-1
Aura
CYGNSS-5
CYGNSS-2
NISAR
CYGNSS-7
GPM-CORE
GRACE-FO-1
GRACE-FO-2
Landsat 8
Suomi NPP
SMAP
OCO-2
SENTINEL-6B
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Global Precipitation Measurement (GPM) – Precipitation

- Integrated Multi-satellitE Retrievals for Global Precipitation Measurement (IMERG) Product
- IMERG: 1998 – Present
- Spatial Resolution: 0.1° x 0.1° grid (~10 km^2)
- Temporal Resolution: Half-Hourly, Daily, Monthly
- NASA & JAXA Joint Mission
- Access: Earthdata Search & Worldview

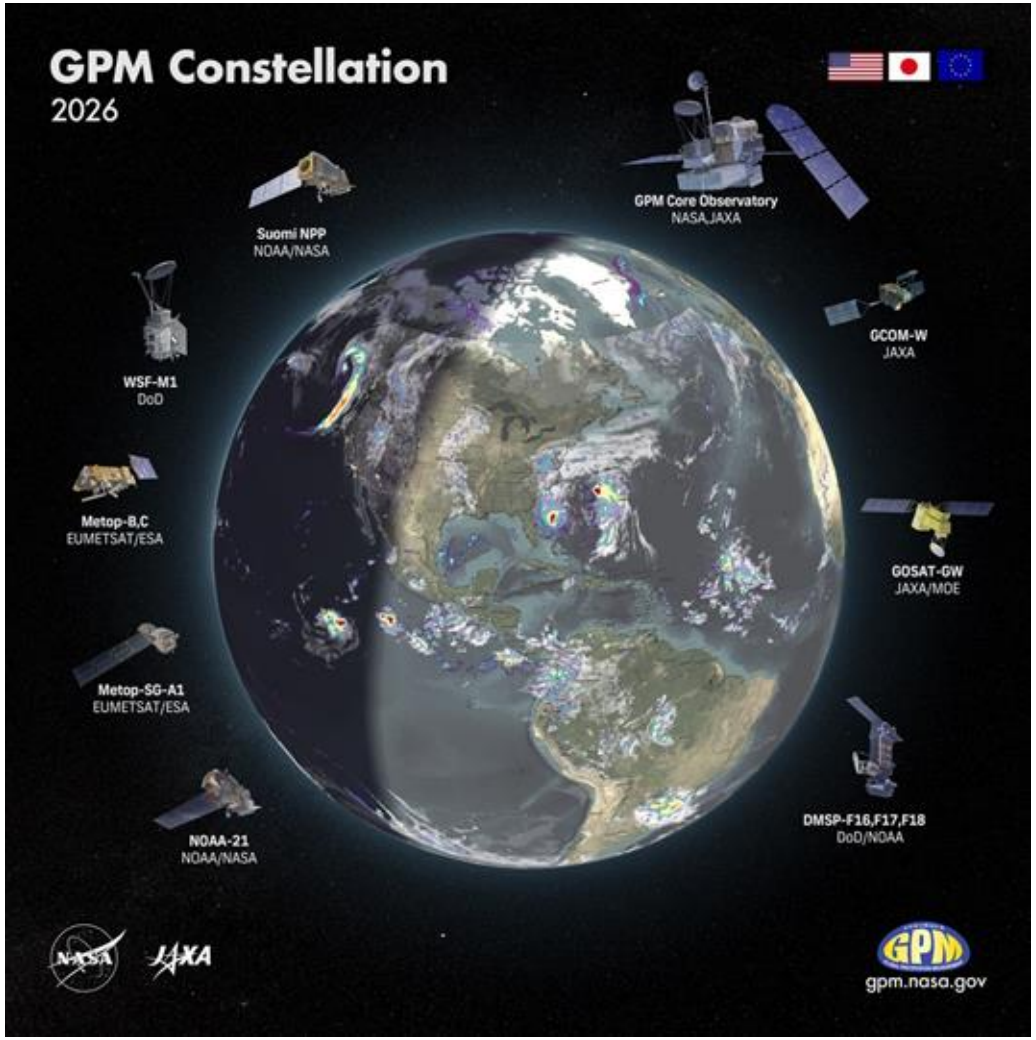


Diagram of the GPM Satellite Constellation (2026)
Image Credit: NASA GSFC

SMAP – Soil Moisture

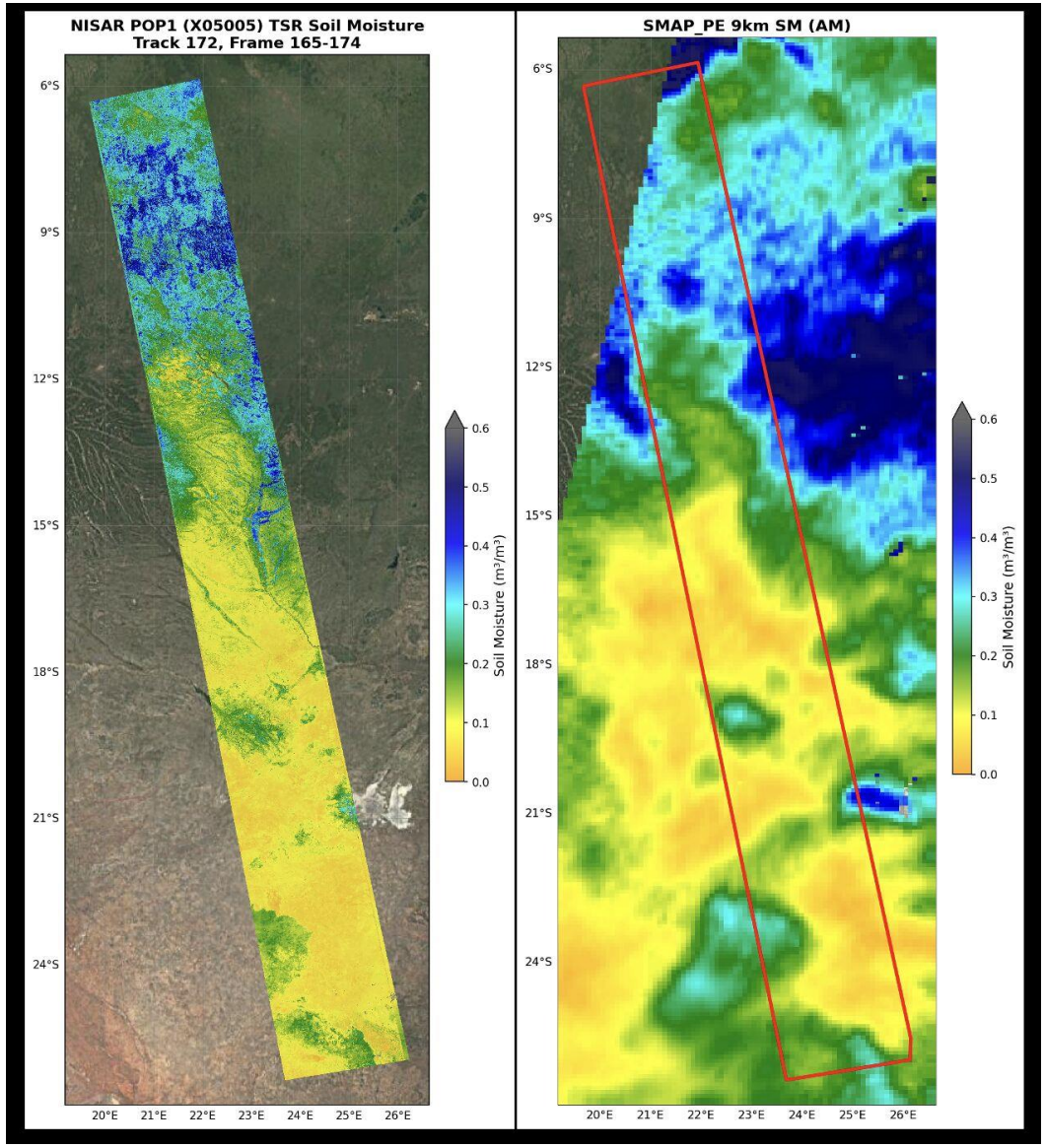
- Soil Moisture Active Passive (SMAP)
- 2015 – Present
- Spatial Resolution: 9 km
- Temporal Resolution: Every 3 Days, Daily, 3-Hourly
- L-Band Passive Radiometer (microwave energy at 1.41 GHz)
- Baseline science mission provides estimates of soil moisture in the top 5 cm of the soil
- Access: Earthdata Search & Worldview



Animation of SMAP launching and collecting data.
Credit: NASA/JPL

NISAR – Soil Moisture

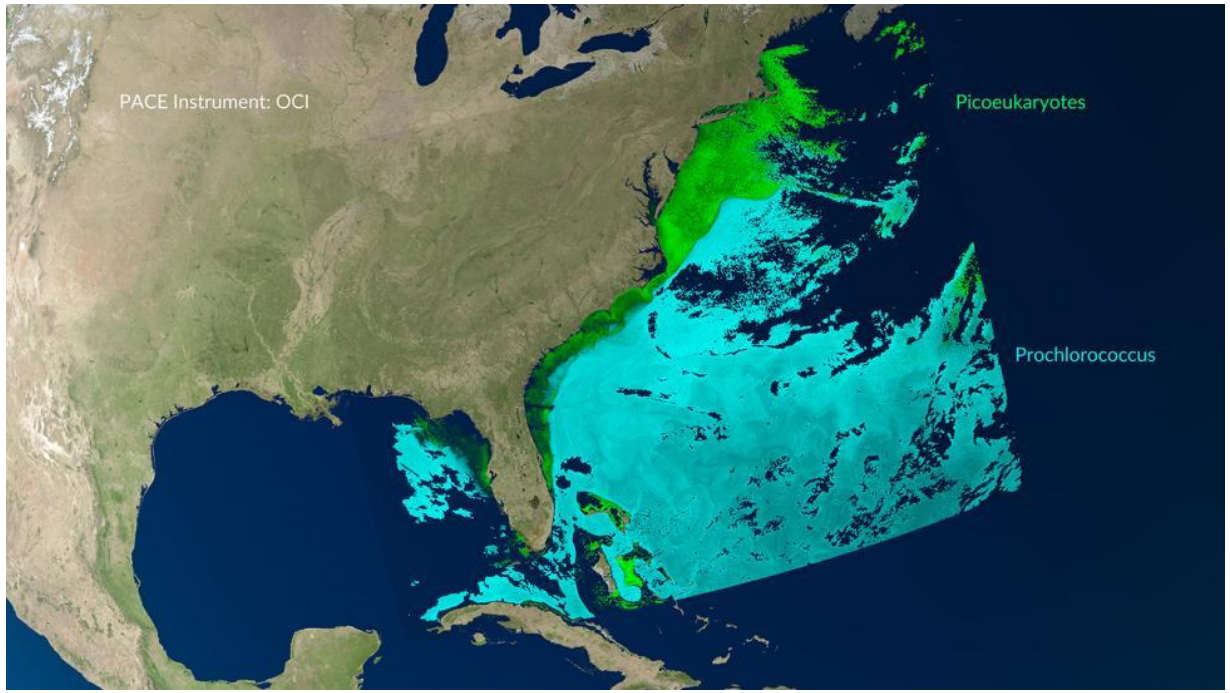
- NASA/Indian Space Research Organization (ISRO) Synthetic Aperture Radar (NISAR)
- Spatial Resolution: 200 m
- Temporal Resolution: 6–12 days
- L-Band SAR (24 cm wavelength) and S-Band SAR (9.4 cm wavelength)
- Level-3 science products will enable farm field-scale soil moisture monitoring when released in 2026.
- Access: Coming soon through the Alaska Satellite Facility



(Left) NISAR soil moisture at 200m on November 11,2025; (Right) SMAP soil moisture at 9km. Soil Moisture overlaid on Google Earth. Credit: NASA GSFC – SVS

PACE – Surface Water Quality

- NASA's Plankton, Aerosol, Cloud, ocean Ecosystem (PACE)
- 2024 – Present
- Spatial Resolution: 1km – 3km
- Temporal Resolution: 1-2 days
- Hyperspectral Global Coverage
- Sensors measure ocean ecology including phytoplankton distribution, analyzes aerosols and clouds, and informs research on ocean–atmospheric exchange.
- Access: Earthdata Search & Worldview



Credit: PACE Data Tutorials

SWOT – Surface Water Quantity

- Surface Water and Ocean Topography (SWOT)
- 2022 – Present
- Spatial Resolution:
  - Swaths: 120 km
  - Oceans: 14-15 km
  - Coastal Zones: 10 km
  - Land: ~100 m
- Temporal Resolution: 21-Day Revisit
- Microwave Radar Interferometer & Radar Altimeter Microwave
- Access: (PO.DAAC)



Credit: SWOT Visualization

Quick Comparison Guide

Satellite Sensor	Temporal Resolution	Spatial Resolution	Best Landscape Spatial Use	Applications
Global Precipitation Measurement	Half-Hourly, Daily, Monthly	~10 km2	State, Country	Near-real-time precipitation (rain and snow) measurements
Soil Moisture Active Passive (SMAP)	Every 2 to 3 days	9 km	County, Watershed, State	Droughts, wildfires, floods, regional soil and agriculture trends
NASA/Indian Space Research Organization (ISRO) Synthetic Aperture Radar (NISAR)	Every 6 to12 days	200 m	Field Scale, County, Watershed	Wetland monitoring, soil moisture, vegetation structure, inundated vegetation, land movement
NASA's Plankton, Aerosol, Cloud, ocean Ecosystem (PACE)	Every 1 to 2 days	1 km – 3 km	Large Lakes, State, County	Water quality, algal blooms, vegetation health, forestry, ecosystem health
Surface Water and Ocean Topography (SWOT)	Every 21 days	~100 m (for land hydrology swath only)	County, Watershed, State	Water levels, flow, slope, and elevation of rivers

MODIS – Surface Reflectance

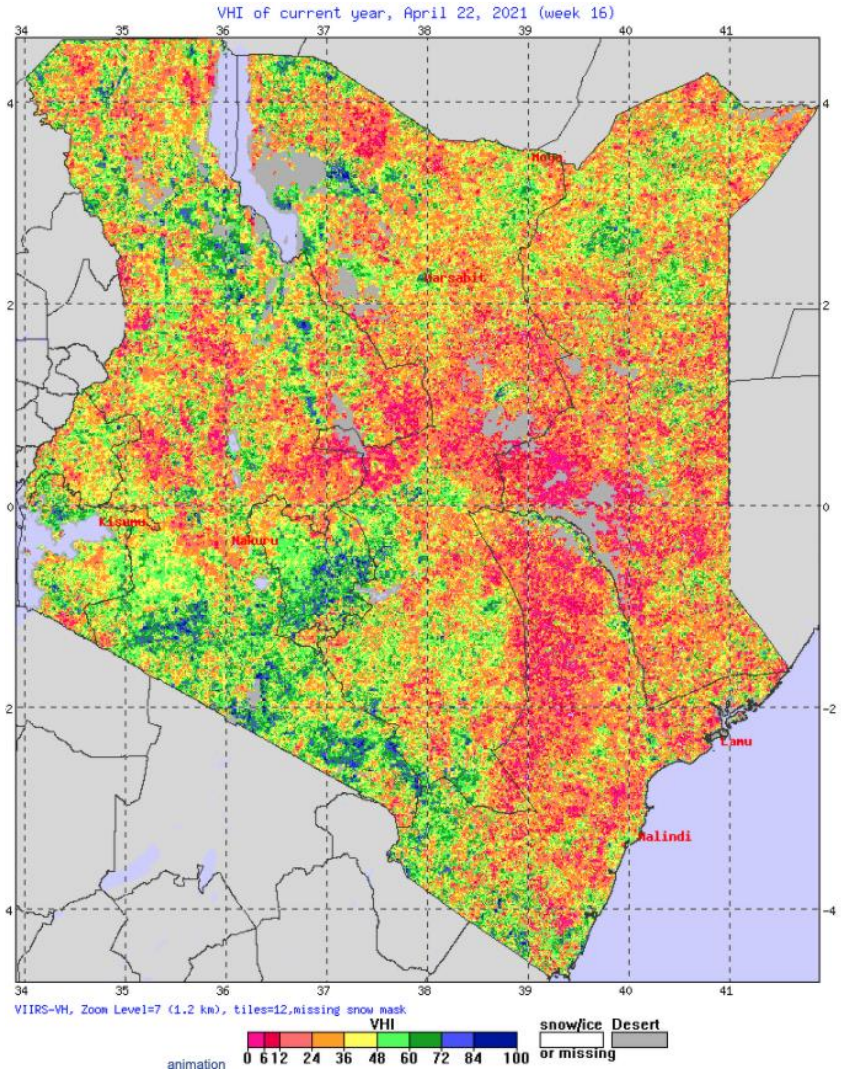
- Moderate Resolution Imaging Spectroradiometer (MODIS)
- Operates on both the Terra and Aqua Spacecraft
- Active: *(Concluding Late 2026/Early 2027)*
  - Terra: 1999 – Dec 1st, 2026
  - Aqua: 2022 – Present
- Temporal Resolution: 1-2 Days
- Spatial Resolution: 2330 km, 250 m to 1 km
- 36 Bands Including Visible, Near IR, Middle IR, and Thermal IR
- Access: Worldview



This composite image over the continental United States is a map of the fraction of the photosynthetically available radiation that was absorbed by land vegetation for photosynthesis. Credit: MODIS FPAR

VIIRS – Surface Reflectance

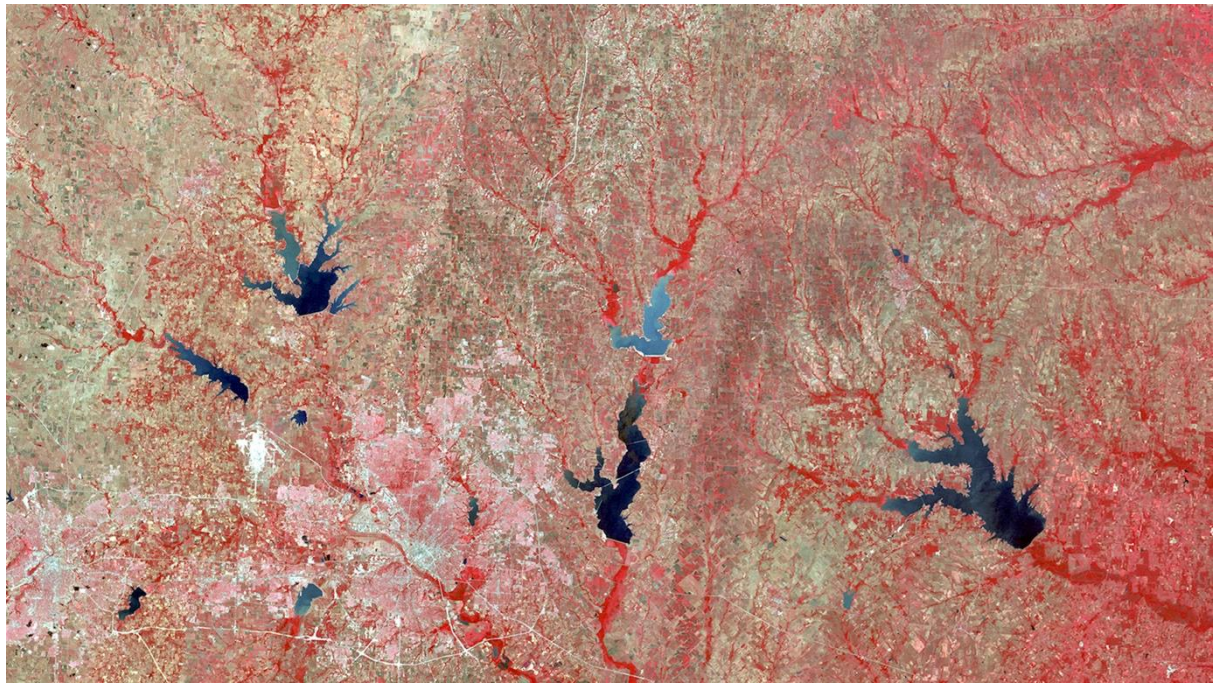
- Suomi National Polar-orbiting Partnership (NPP)
- Sensor: Visible Infrared Imaging Radiometer Suite (VIIRS)
- Active: 2012 – Present
- Temporal Resolution: Daily
- Spatial Resolution:
  - 5 Moderate-Resolution Bands: 375 m
  - 16 Coarse-Resolution Bands: 750 m
- Access: Worldview



VIIRS Vegetation products include Vegetation Condition Index, Temperature Condition Index, and Vegetation Health Index. Credit: NOAA NESDIS

Landsat 8/9 – Surface Reflectance

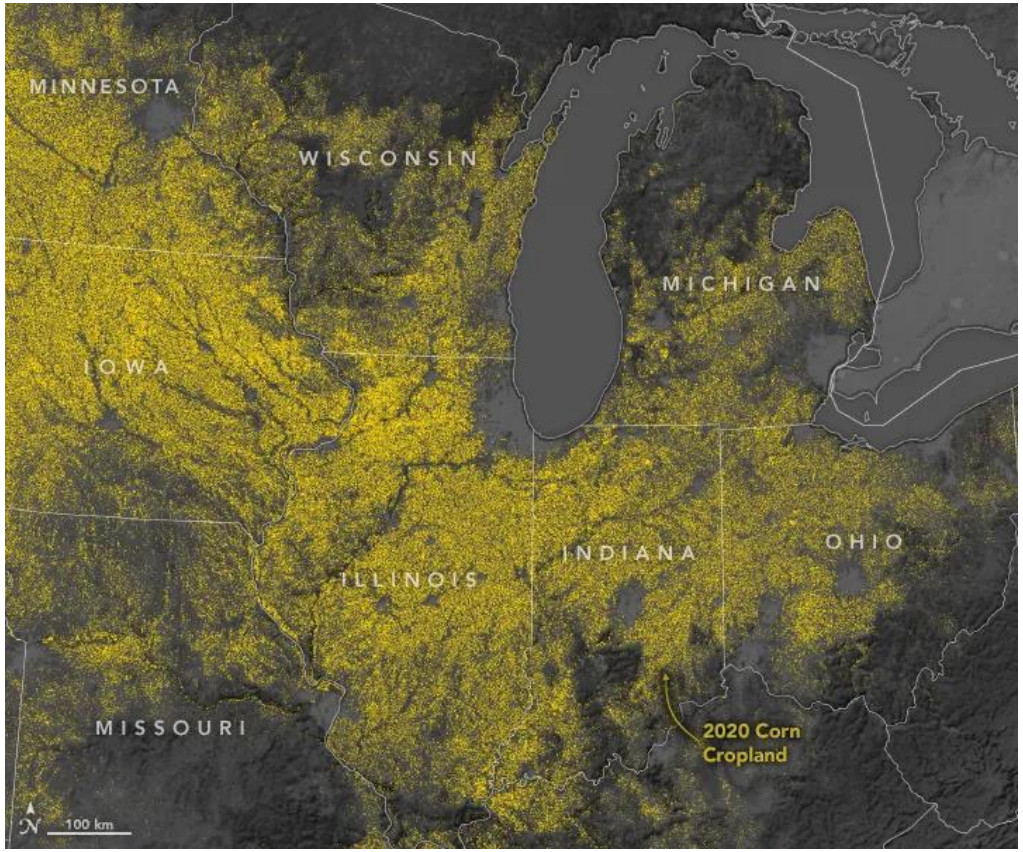
- Landsat 8/9 Operational Land Imager (OLI & OLI-2)
- Active:
  - Landsat 8 OLI: 2013 – Present
  - Landsat 9 OLI-2: 2021 – Present
- Temporal Resolution: 16 Days (8 Days Combined
- Spatial Resolution: 30m
- Visible, Near IR, Middle IR, Thermal IR
- 9 spectral OLI bands. Includes three bands in the 'red edge'.
- Access: Earthdata Search, Worldview, & AppEEARS



This is the First Light image from Landsat 1 over Dallas-Fort Worth, Texas – July 25, 1972. First light refers to the first image collected by a sensor after it's turned on.

Sentinel-2 – Surface Reflectance

- Sentinel-2 (MSI)
- Active: 2015 – Present
- Temporal Resolution: 5 Days
- Sentinel-2 A/B/C Level-2A Surface Reflectance (ESA)
- 13 Spectral Bands with Varying Resolutions: 10 m (4 bands), 20 m (6 bands), 60 m (3 bands)
- Includes three bands in the 'red edge'.
- Access: Copernicus Browser & Worldview



Yellow areas show 2020 corn fields mapped using the Cropland Data Layer (NASS), which combines USGS land cover data with Landsat 8, ResourceSat-2, and Sentinel-2 imagery. Image Credit: NASA Earth Observatory

Quick Comparison Guide

Satellite Sensor	Temporal Resolution	Spatial Resolution	Best Landscape Spatial Use	Applications
Moderate Resolution Imaging Spectroradiometer (MODIS)	Every 1 to 2 days	250 m to 1 km	Farm Scale, County, Regional, Watershed, State	*Historical data needs only* for vegetation health, surface temperature, burn mapping, snow and ice coverage, land use land cover change
Visible Infrared Imaging Radiometer Suite	Daily	*5 Moderate-Resolution Bands:* 375 m	Farm Scale, County, Regional, Watershed, State	Active fire and hotspot detection, flooding extent, river ice monitoring, daily land monitoring, nighttime surface temperature
Landsat 8/9	Every 8 days	30 m	Field Scale, Farm Scale, County, Watershed	Crop health, phenology, vegetation moisture, forestry and land cover, surface water, daytime land surface temperature
Sentinel-2	Every 5 days	10 m to 20 m	Field Scale, Farm Scale, County	High-resolution applications of agriculture, crop monitoring, land cover change, tree cover change

Moderate Spatial Resolutions

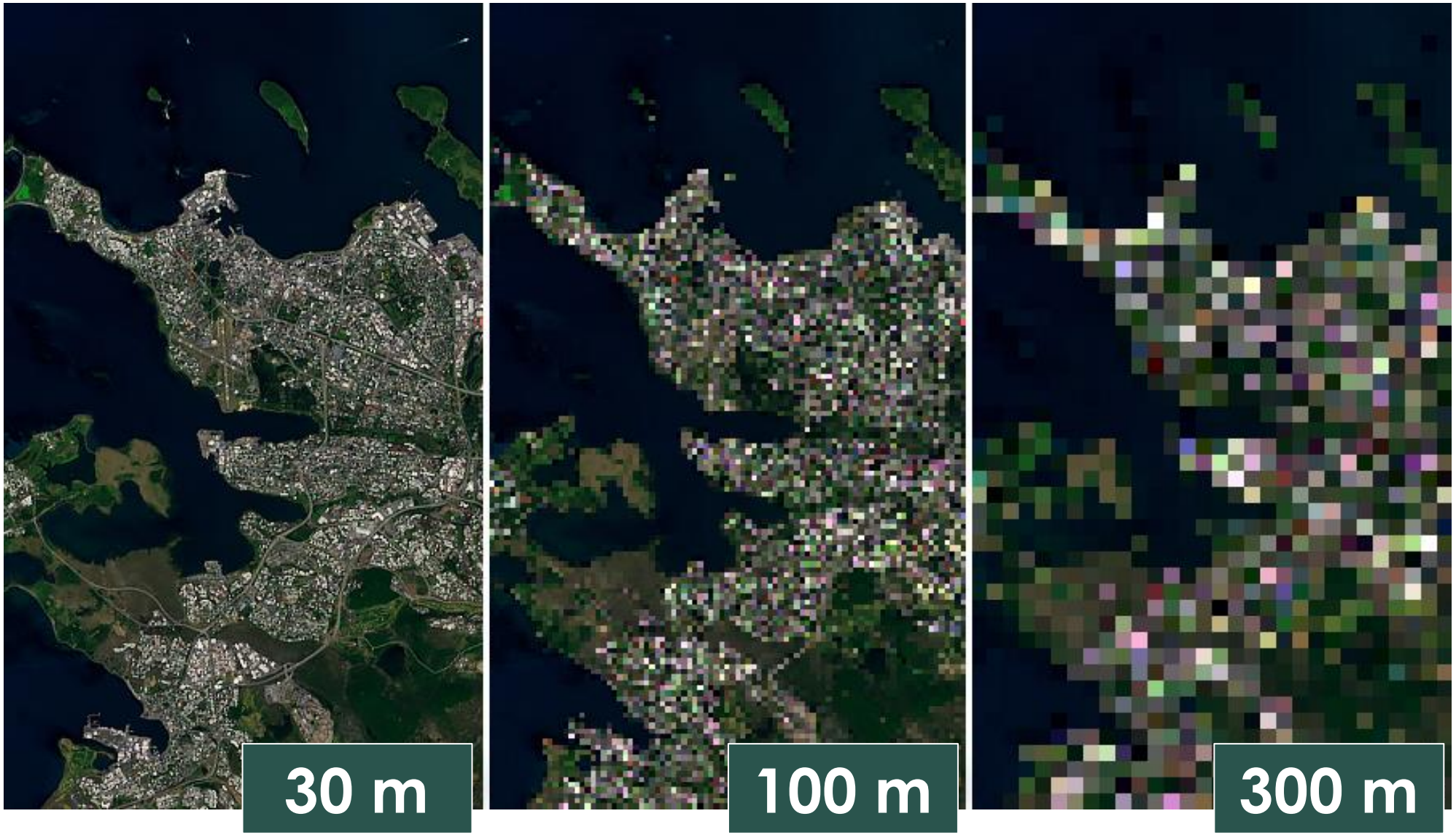
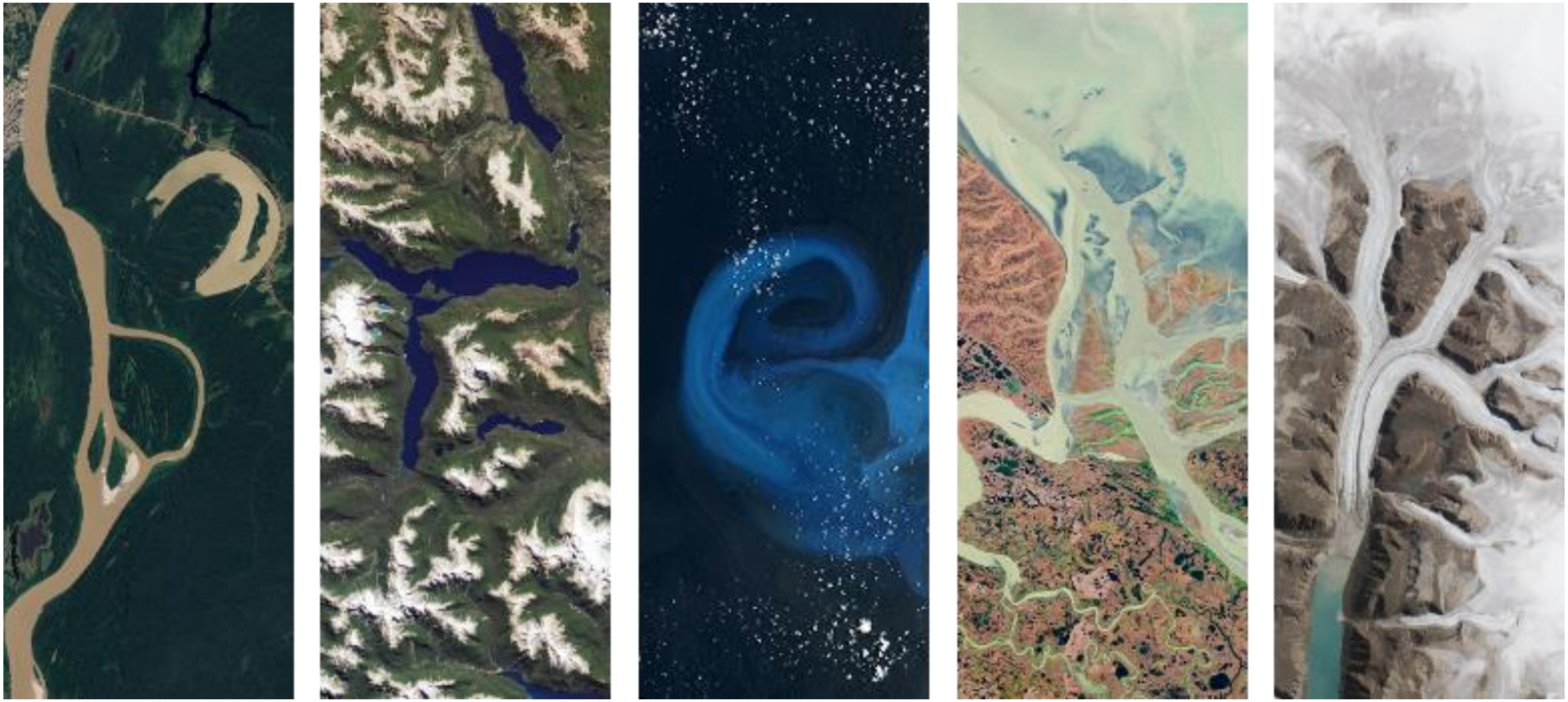


Image Credit: NASA

15-Minute Break

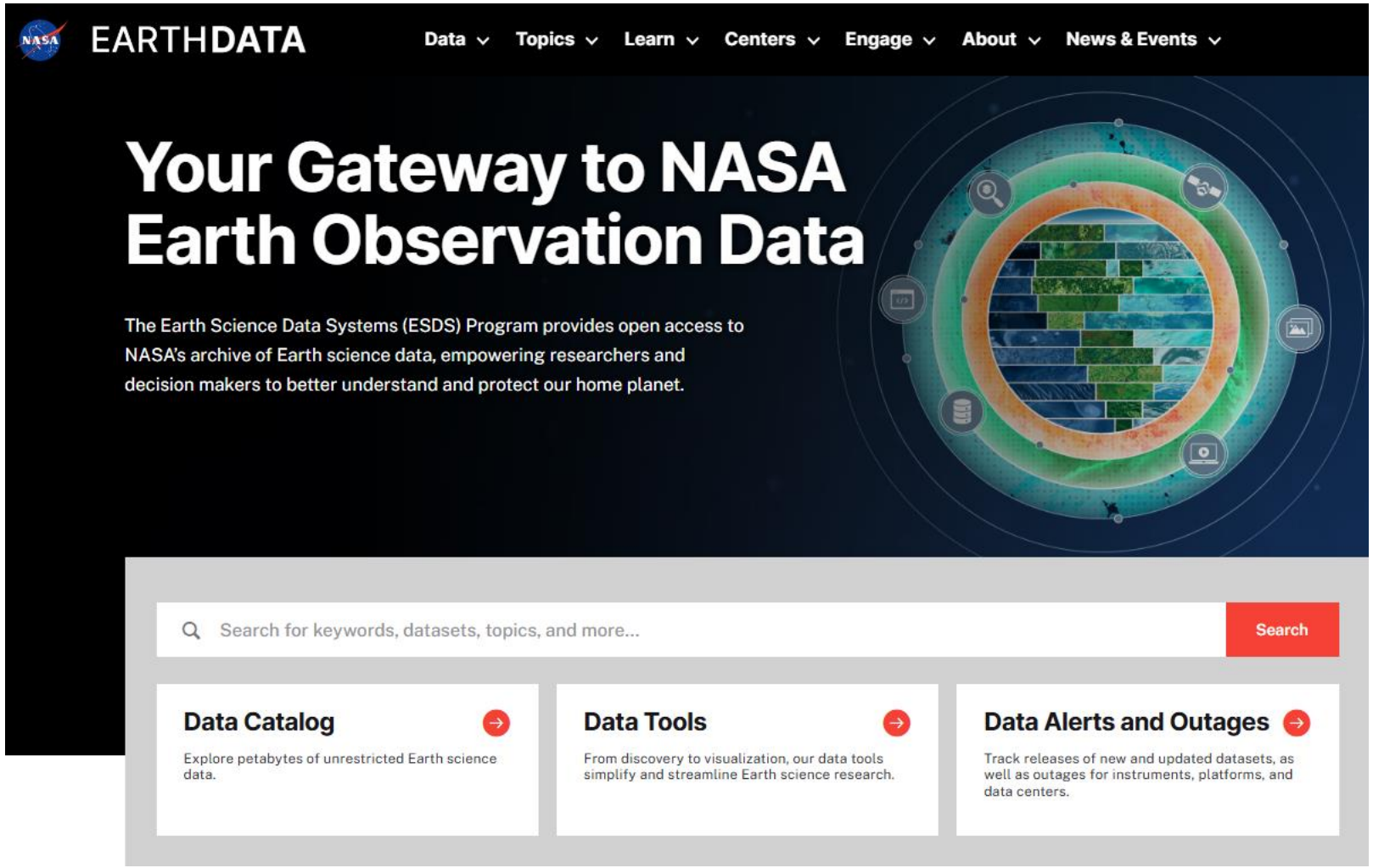




Section 4.
NASA Earth Observations Visualization and Data Access Tools

Data Access Tools

- Worldview
- AppEEARS
- Giovanni
- Earthdata Search
- DAACs (Transitioning to the title "Centers")
- Free registration and access through Earthdata login
- Allows for variation in data needs
  - Visualization vs. Download

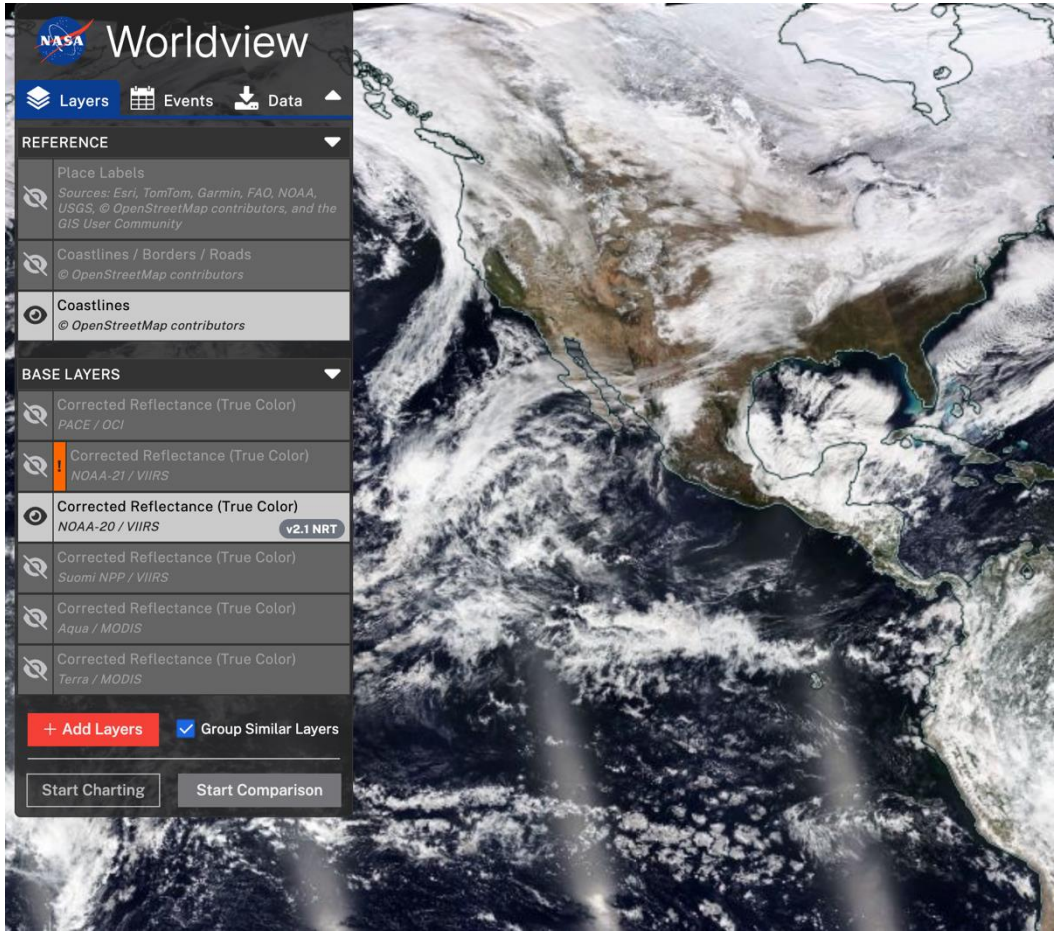


Worldview

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

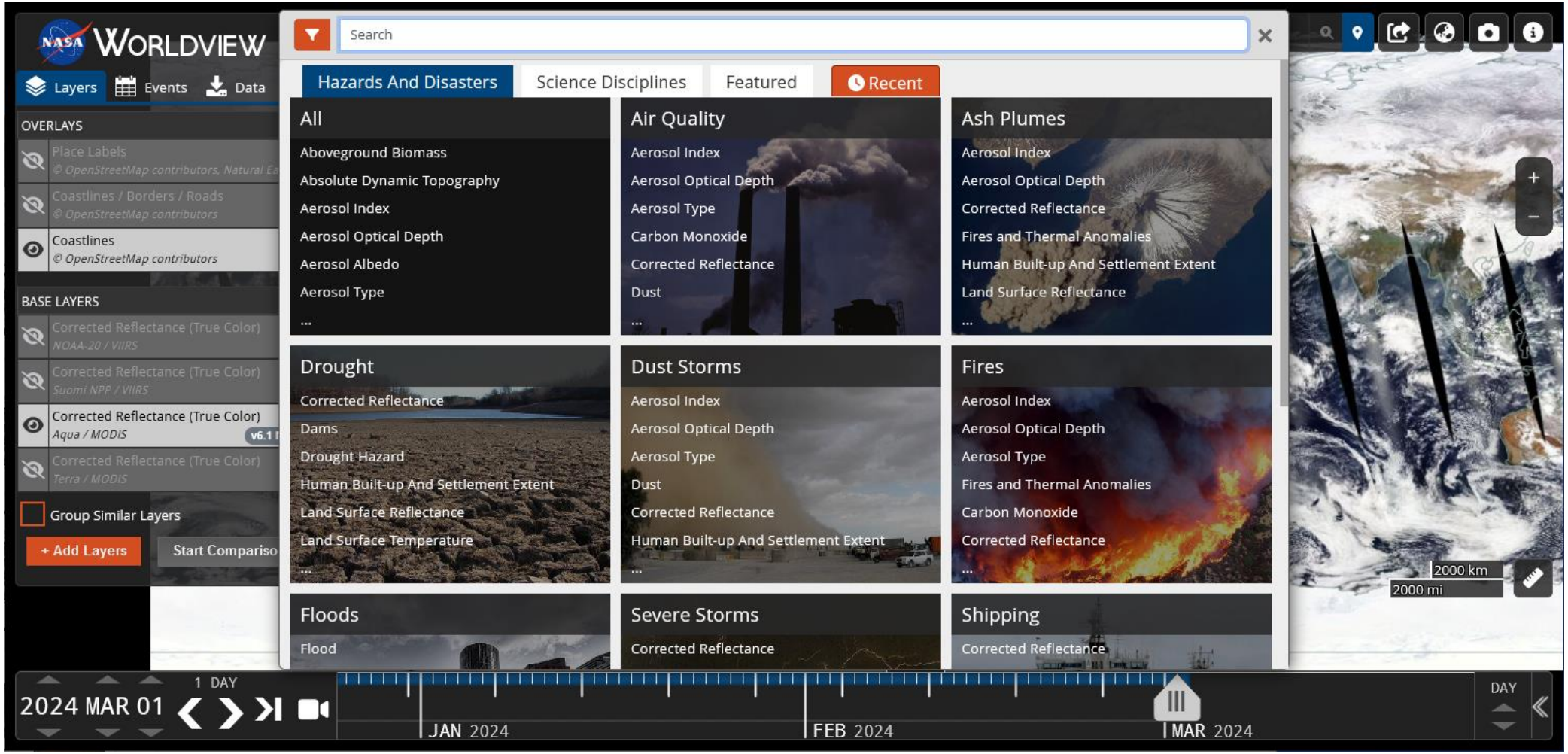
Access satellite data easily:

- 1000+ global, full-resolution satellite imagery layers
- Some imagery available in near real time
- Choose date or date range
- Browse, search, save, share, & download imagery layers



Worldview – Adding Data Layers

Organized by application area and science discipline.

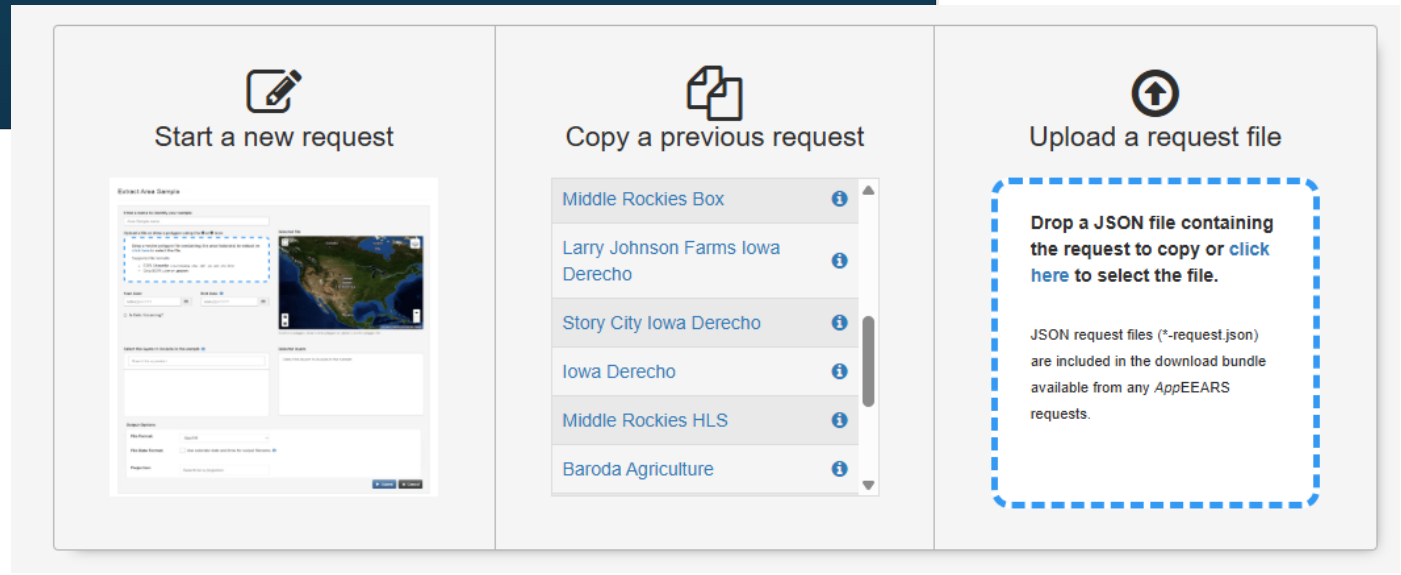


*App*EEARS!

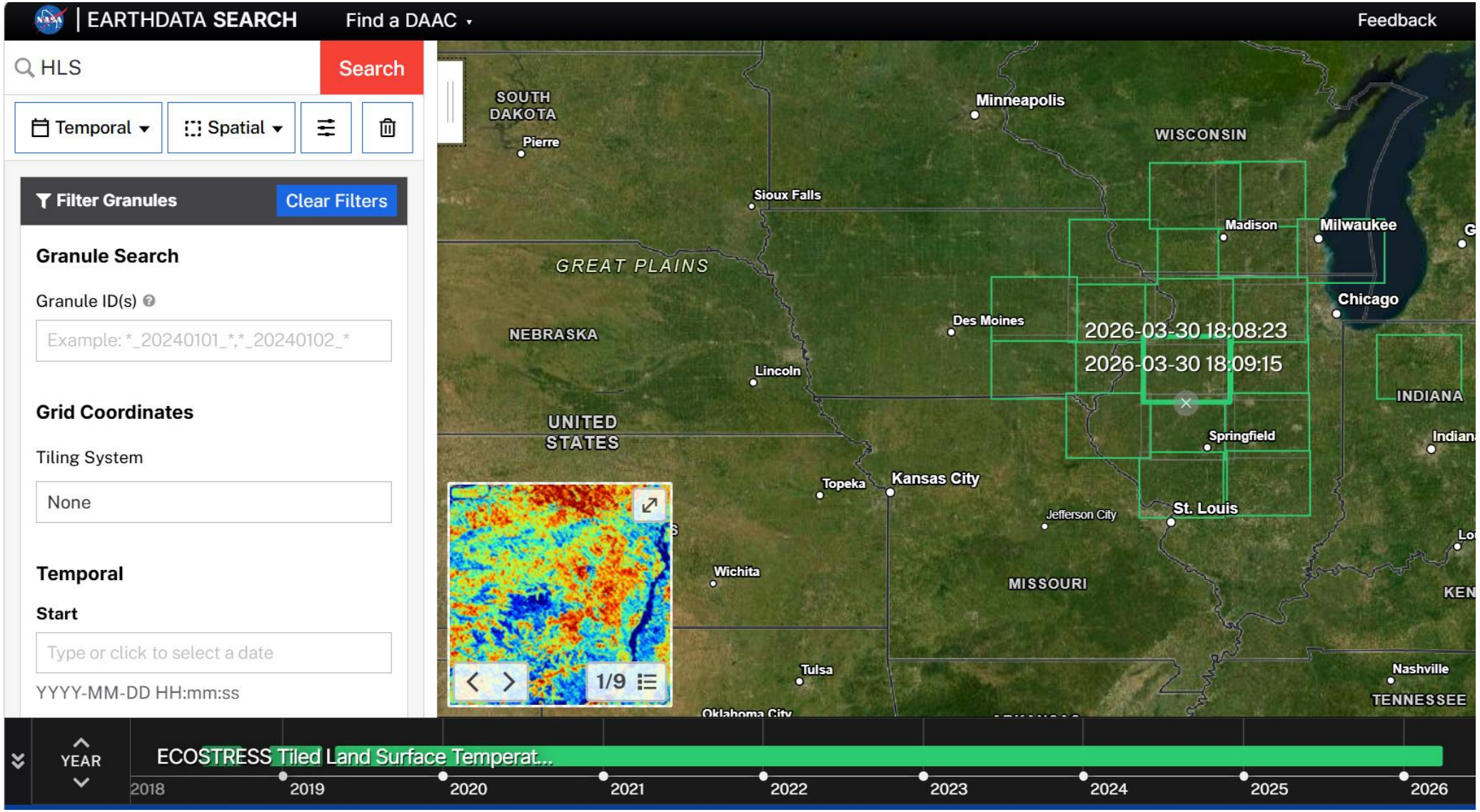
Welcome to *App*EEARS!

Application for **E**xtracting and **E**xploring **A**nalysis **R**eady **S**amples (***App*EEARS**)

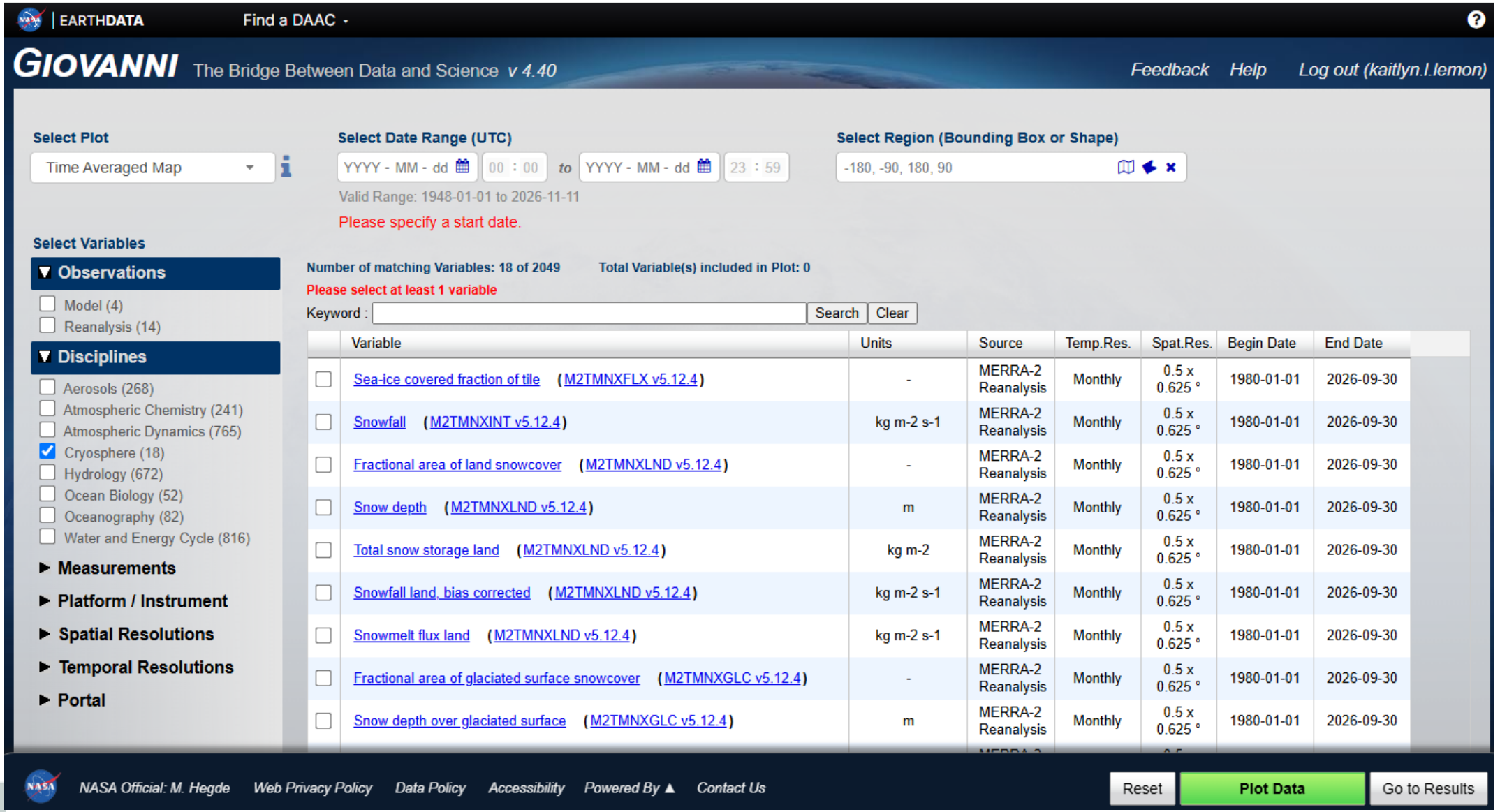
The Application for Extracting and Exploring Analysis Ready Samples (***App*EEARS**) offers a simple and efficient way to access and transform geospatial data from a variety of federal data archives. *App*EEARS enables users to subset geospatial datasets using spatial, temporal, and band/layer parameters. Two types of sample requests are available: point samples for geographic coordinates and area samples for spatial areas via vector polygons. Sample requests submitted to *App*EEARS provide users not only with data values, but also associated quality data values. Interactive visualizations with summary statistics are provided for each sample within the application, which allow users to preview and interact with their samples before downloading their data. Get started with a sample request using the Extract option above, or visit the Help page to learn more.



Earthdata Search



Giovanni

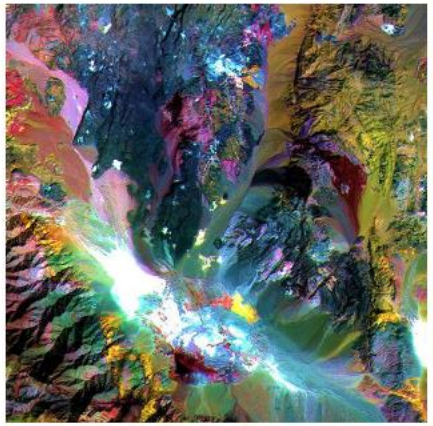

EARTHDATA
Find a DAAC
GIOVANNI The Bridge Between Data and Science v 4.40
Feedback Help Log out (kaitlyn.l.lemon)
Select Plot
Time Averaged Map
Select Date Range (UTC)
YYYY - MM - dd 00 : 00 to YYYY - MM - dd 23 : 59
Valid Range: 1948-01-01 to 2026-11-11
Please specify a start date.
Select Region (Bounding Box or Shape)
-180, -90, 180, 90
Select Variables
Observations
Model (4)
Reanalysis (14)
Disciplines
Aerosols (268)
Atmospheric Chemistry (241)
Atmospheric Dynamics (765)
Cryosphere (18)
Hydrology (672)
Ocean Biology (52)
Oceanography (82)
Water and Energy Cycle (816)
Measurements
Platform / Instrument
Spatial Resolutions
Temporal Resolutions
Portal
Number of matching Variables: 18 of 2049
Total Variable(s) included in Plot: 0
Please select at least 1 variable
Keyword :
Search
Clear
Variable
Units
Source
Temp.Res.
Spat.Res.
Begin Date
End Date
Sea-ice covered fraction of tile (M2TMNXFLX v5.12.4) - MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
Snowfall (M2TMNXINT v5.12.4) kg m-2 s-1 MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
Fractional area of land snowcover (M2TMNXLND v5.12.4) - MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
Snow depth (M2TMNXLND v5.12.4) m MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
Total snow storage land (M2TMNXLND v5.12.4) kg m-2 MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
Snowfall land, bias corrected (M2TMNXLND v5.12.4) kg m-2 s-1 MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
Snowmelt flux land (M2TMNXLND v5.12.4) kg m-2 s-1 MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
Fractional area of glaciated surface snowcover (M2TMNXGLC v5.12.4) - MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
Snow depth over glaciated surface (M2TMNXGLC v5.12.4) m MERRA-2 Reanalysis Monthly 0.5 x 0.625 ° 1980-01-01 2026-09-30
NASA Official: M. Hegde
Web Privacy Policy
Data Policy
Accessibility
Powered By
Contact Us
Reset
Plot Data
Go to Results

DAAC Centers

Home / Centers

Centers

NASA's Distributed Active Archive Centers (DAACs), Science Investigator-led Processing Systems (SIPS), and other centers work to archive, process, and deliver world-class Earth science data.

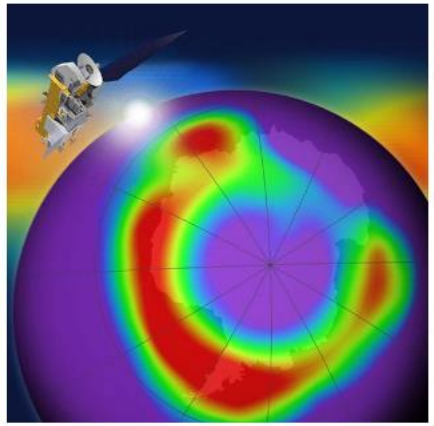


LP DAAC

Sioux Falls, SD

NASA's Land Processes Distributed Active Archive Center provides data crucial to the investigation, characterization, and monitoring of biological, geological, hydrological, ecological, and related conditions and processes.

Learn More About LP DAAC

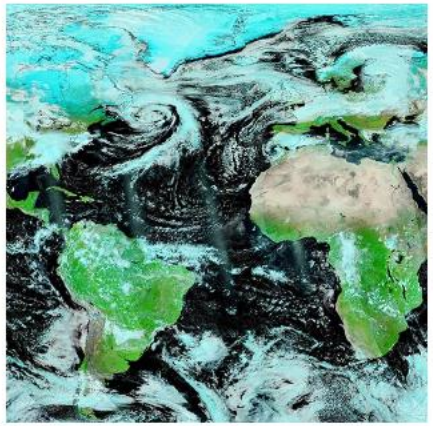


MLS SIPS

Pasadena, California

The Microwave Limb Sounder (MLS) Science Investigator-led Processing System processes data from the MLS instrument on the Aura platform.

Learn More About MLS SIPS

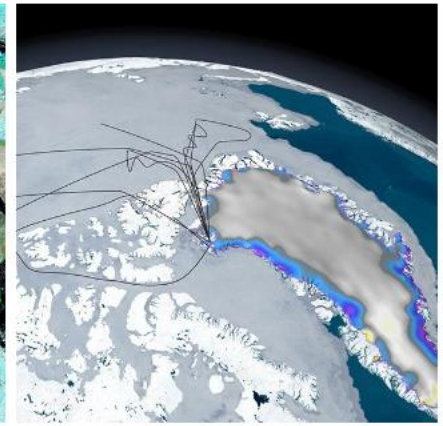


MODAPS SIPS

Greenbelt, MD

Data from the Moderate Resolution Imaging Spectroradiometer (MODIS) Adaptive Processing System (MODAPS) Science Investigator-led Processing System improves our understanding of global dynamics and processes occurring on the land, in the oceans, and in the lower atmosphere.

Learn More About MODAPS SIPS



NSIDC DAAC

Boulder, CO

NASA's National Snow and Ice Data Center Distributed Active Archive Center provides data on snow and ice processes, particularly interactions among snow, ice, atmosphere, and ocean.

Learn More About NSIDC DAAC

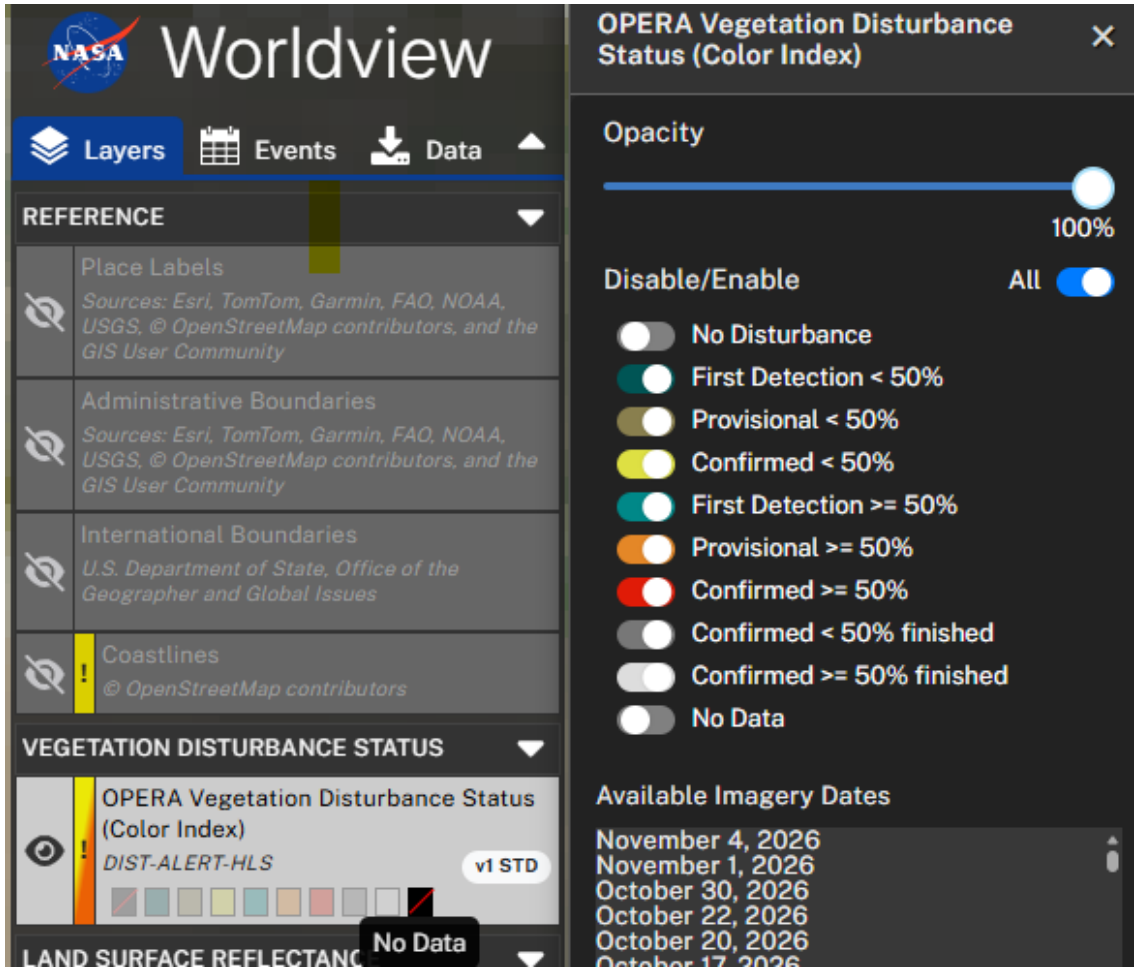


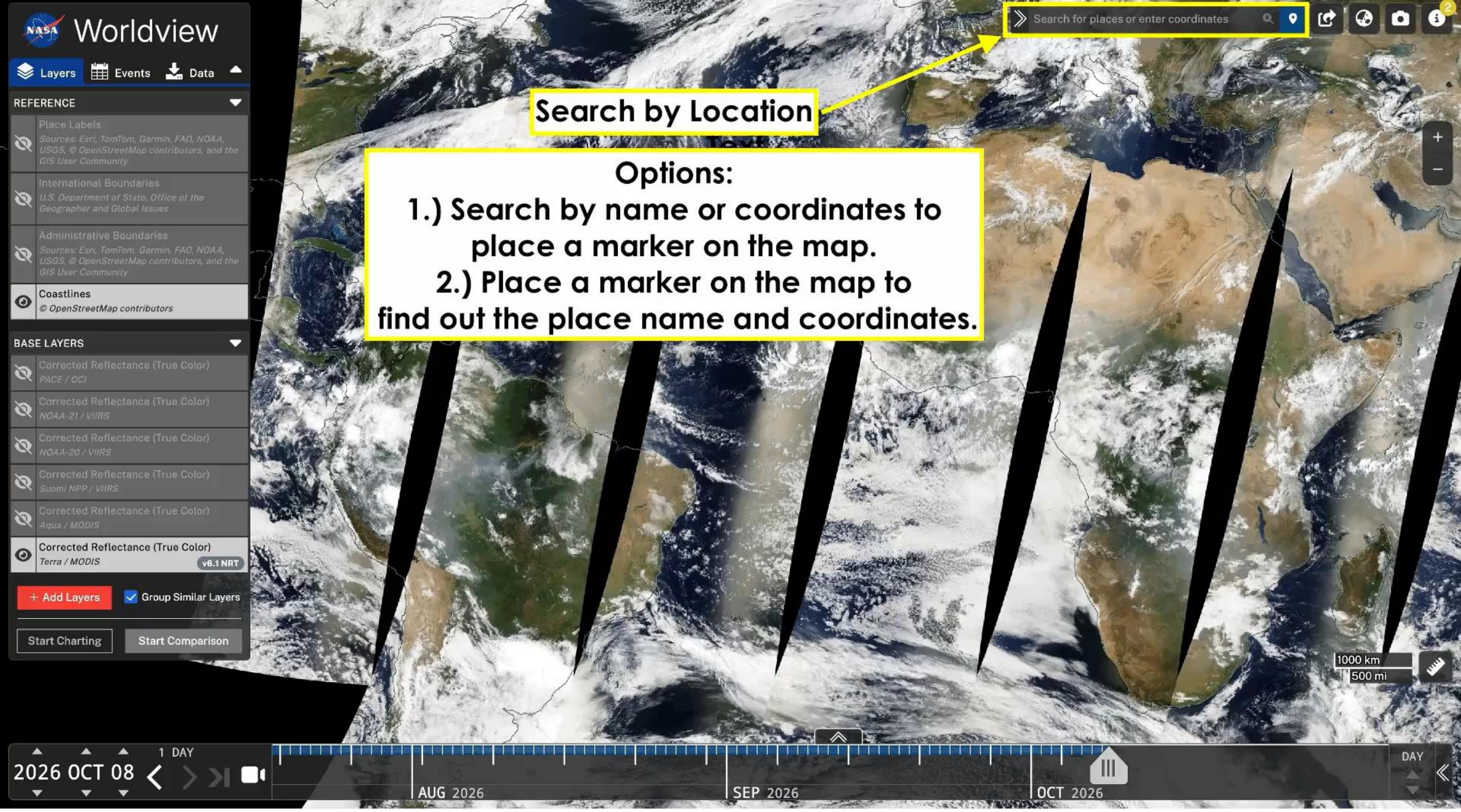
Section 5.
Land Surface Disturbance Demo in Worldview, Worldview Exercise, and Discussion

OPERA Vegetation Disturbance Status DIST-ALERT

- Maps vegetation disturbance detected outside a historical norm using optical imagers.
- Observational Products for End-Users from Remote Sensing Analysis (OPERA)
- Every 2-3 Days
- Jan 2023 – Present
- Spatial Resolution: 30 m
- The input dataset for generating each product is the Harmonized Landsat/Sentinel-2 (HLS) dataset.

10 Different Classifications:




Worldview
Layers
Events
Data
REFERENCE
Place Labels
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
International Boundaries
U.S. Department of State, Office of the Geographer and Global Issues
Administrative Boundaries
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
Coastlines
© OpenStreetMap contributors
BASE LAYERS
Corrected Reflectance (True Color)
PACE / OCI
Corrected Reflectance (True Color)
NOAA-21 / VIIRS
Corrected Reflectance (True Color)
NOAA-20 / VIIRS
Corrected Reflectance (True Color)
Suomi NPP / VIIRS
Corrected Reflectance (True Color)
Aqua / MODIS
Corrected Reflectance (True Color)
Terra / MODIS
v6.1 NRT
+ Add Layers
Group Similar Layers
Start Charting
Start Comparison
Search for places or enter coordinates
Search by Location
Options:
1.) Search by name or coordinates to place a marker on the map.
2.) Place a marker on the map to find out the place name and coordinates.
1000 km
500 mi
1 DAY
2026 OCT 08
AUG 2026
SEP 2026
OCT 2026
DAY

Hands on Exploration

Step 1. Navigate to Worldview: https://worldview.earthdata.nasa.gov/

Step 2. In the "Welcome to NASA Worldview" window, select the Land Surface Disturbance demo.



Step 3. With your group, read through each of the ten steps.

Step 4. When the demo is through, exit the 'comparison mode', but leave all other settings.

Step 5. Discuss potential applications of this tool with your table until everyone is finished.

Hands on Exercise – Rosemount Data Center Case Study

1. **Search Location:** In the search bar, copy or type the coordinates for Rosemount, Minnesota (44.7351, -93.0631).
2. **Select Timeframe:** Using the 'Date Selector', navigate to 2024 Apr 22.
3. **Explore the Data:** Without changing the location, navigate through the next series of dates:

   2024 May 18 • 2024 June 19 • 2024 July 19 • 2024 Aug 13

QUESTION: What do you observe?

4. **Measure Impacted Area:** Using the Ruler Tool, measure the approximate area disturbed on 2024 Aug 13.
5. **Compare to Pre-Disturbance Date:** Using the Comparison Tool, compare 2024 Aug 13 with 2023 Dec 20. How much land (approximately) was disturbed during the construction?

Exercise 1 Discussion

Q&A and Discussion

- What applications did you/your table think of during the demo for this product?
- How could this product apply to your work?
- What were your expectations of Worldview's capabilities before this demo? What has changed after and how do you want to explore it?

Hands on Exercise – Beltrami County, MN | Derecho Event

During the June 20–21, 2025 derecho event, 120 mph/h wind gusts downed roughly 9 million trees.

1. **Exit** Comparison Mode and exit out of the measuring tool.
2. **Add an additional layer** using the 'Add Layer' button and search:

   Reflectance (Nadir BRDF-Adjusted)

NOTE: You will see there are 2 layers with this name. One was already added during the demo (Sentinel-2). Leave that one selected and add the additional layer (Landsat 8 & 9/OLI).

3. **Navigate** to **Bemidji, MN** by copying or typing in the following coordinates [47.4752, -94.8363].
4. **Select date** Using the 'Date Selector', navigate to **2025 June 12** (before the event).
5. **Center and zoom to** 1000m/5000ft.
6. **Disable Layers** Using the view options panel, disable all layers except for the first three (No Disturbance, First Detection <50%, & Provisional).
7. **Compare dates** using the 'Comparison Tool' select a post derecho event date for **2025 June 28**.
8. **Disable** all but the three layers in step 6.
9. **Identify new disturbances** on June 28 – right click and copy the coordinates.
10. **Identify land classification** copy and paste coordinates into search bar at https://croplandcros.scinet.usda.gov.
11. **Save Coordinates** and land classification for tomorrow's session.

Exercise 2 Discussion

Q&A and Discussion

- How did the second exercise change your perception of the data products and their applications?
- What land cover types did you find classified as first detection/provisional/disturbance?

Session 1 Summary

- Remote sensing is the acquiring of information from a distance. NASA observes Earth and other planetary bodies via remote instruments on space-based platforms (e.g., satellites or spacecraft) and on aircraft that detect and record reflected or emitted energy.
- Remote instruments, which provide a global perspective and a wealth of data about Earth systems, are used for different applications based upon their design and resolutions.
- Understanding the differences in sensor design, revisit-time, and range of the electromagnetic spectrum allows us to best select which data product will be the most useful for an individual need.
- NASA Earthdata offers a variety of means of viewing, accessing, and downloading NASA Earth observation data products.
- Worldview allows you to visualize and interpret data without having to download it.



Thank You & See You Tomorrow!