National Aeronautics and Space Administration

September 10, 2026

Satellite Needs Working Group:

Overview of Process, Solutions, and Needs in Consideration for the Decadal Survey



The Satellite Needs Working Group

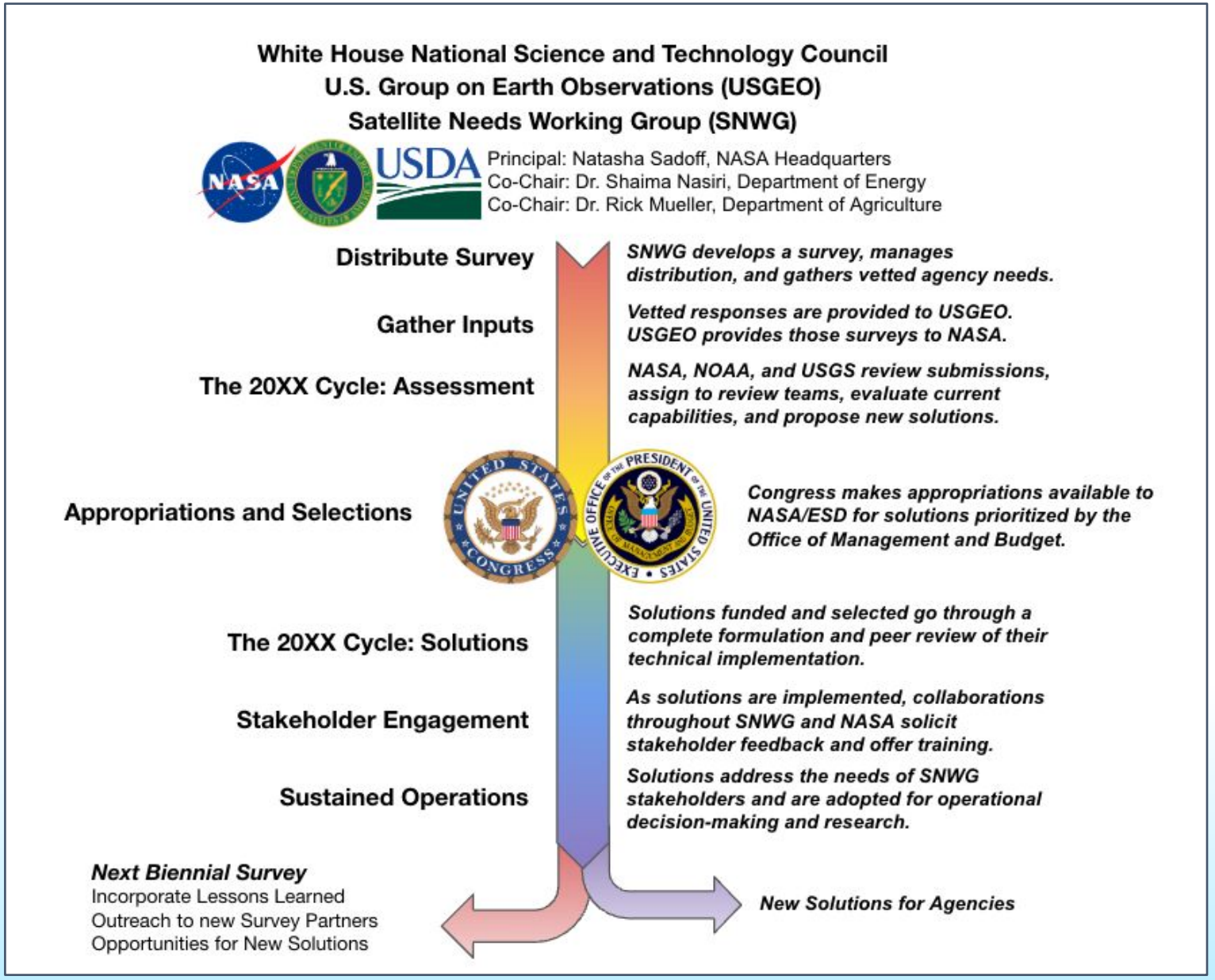
An interagency, coordinated approach to **identify and communicate Federal satellite Earth observation needs**

and **develop solutions** to help federal agencies use Earth-observing satellite data products in their research and decision-making.



SNWG Biennial Process

- SNWG surveys agencies every two years to identify their high-priority Earth observation needs
- After the surveys are received, there is an Assessment Phase in which the survey results are evaluated to bring about viable solutions to Agency needs
    - Previous Assessment Cycles: 2016, 2018, 2020, 2022, and 2024
    - Current Assessment Cycle: 2026



The SNWG Process: Robust and Systematic

- A **consistent and thorough process** has been followed across five survey cycles
  - Interview agency survey submitters to fully understand their needs →
  - Identify what is available or could be done to meet the needs →
  - Communicate outcomes to agencies and OMB →
  - Implement new solutions to meet agency needs
- **Transparency and objectivity** are priorities
  - Documenting internal decision-making processes and communicating them
  - Continuous improvement: tracking and communicating lessons learned, conducting expansive retrospectives
- The process is **expert-driven** and **data-driven**
  - Science, applications, and technology experts across NASA HQ and Centers, NOAA, and USGS evaluate each agency need
  - Each solution is connected to specific agency needs it would help address, and expected impact for agencies is a deciding factor in solution selection
- Information management tools are leveraged to make the process **organized** and **efficient**
  - Tailoring tools for solution brainstorming and management, report writing



The SNWG Assessment

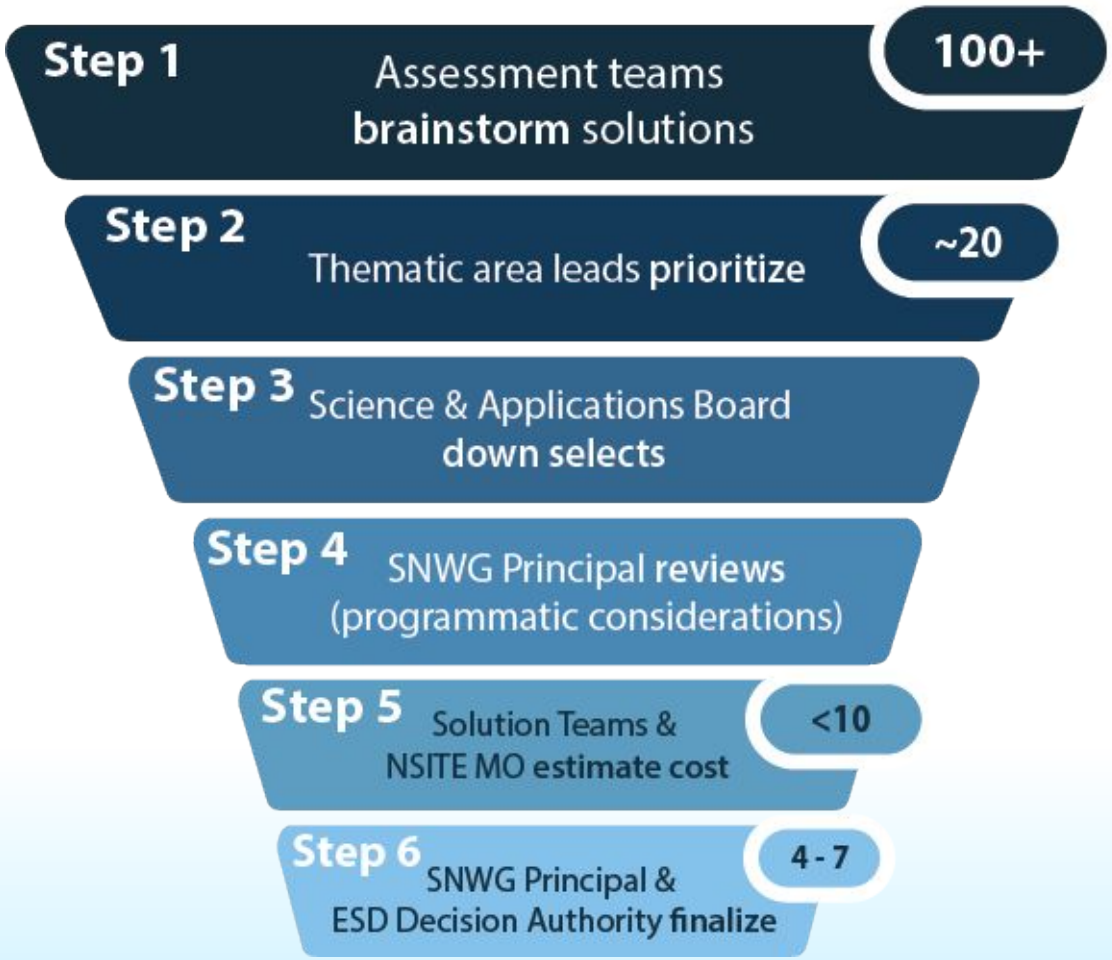
2026 SNWG Survey and Solution Timeline



May - Aug 2026	Sep - Mid Oct 2026	Mid Oct - Dec 2026	2027	2028
Collect surveys	**Review surveys internally**	**Approval by leadership & transmission to NASA**	**Assessment**	**Selected solutions begin development**
Agency subject matter experts draft surveys documenting sustained and unmet satellite data needs	SNWG agency representatives work with submitters and submissions to ensure quality and facilitate internal review	Submissions are sent to USGEO, which sends submissions to agency leadership for approval. Final, approved surveys are then transmitted to NASA	An assessment team of NASA, NOAA, and USGS scientists evaluate the need, conduct agency interviews, propose solutions, and write reports of assessment findings for each survey	Science teams are contracted for 5 years and begin work on the solutions. Agency end users support solution co-design to ensure solutions are fit-for-purpose

How are solutions identified and selected?

- **Over 100 potential solutions** are identified, each connected with one or more specific agency needs
- **100+→~20 solutions:** Thematic Areas prioritized their most impactful solutions and agencies provided feedback. **Criteria:**
  - Thematic area programmatic benefit
  - Leveraging existing activities at NASA, NOAA, USGS
  - Building on existing data processing pipelines
  - Sustaining activities relevant to data continuity
- **~20→~10 solutions:** A Science and Applications Board (SAB) with representatives from NASA, NOAA, and USGS evaluated the prioritized solutions. **Criteria:**
  - Potential for impact, utility, and satisfaction across agencies
  - Scientific merit and technical significance
  - Solution sustainability and transition planning
  - SNWG logistical feasibility/relevance
- **~10→~4-7 solutions:** NASA's SNWG Principal and Decision Authority reviewed all information plus cost estimates. **Criteria:**
  - Programmatic balance for selection
  - Historic equality among Thematic Areas
  - Overall budget considerations

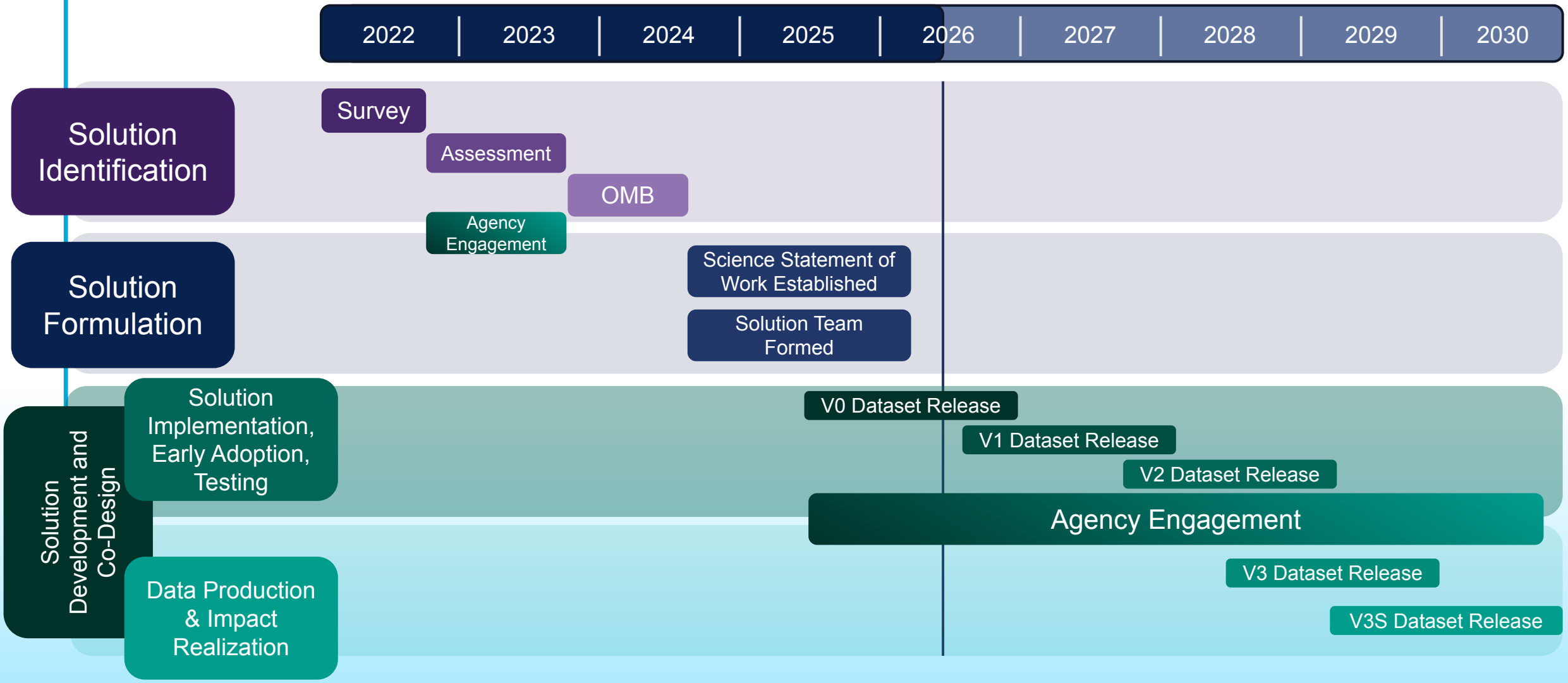


This process is documented in the SNWG Solution Selection Process and Guidelines document

What to Expect: **What is the timeline for solution development?**

Example: Multisensor Worldwide Ocean Winds (MWOW)

Each SNWG solution takes several years to develop from survey to operations – but preliminary data or prototypes are available sooner



What Makes SNWG Solutions Unique?

- **Provide capabilities other missions, programs, or projects can't** because they fall outside the scope or budget.
- **Provide a mechanism to address agency needs** if the agencies do not have the capacity or expertise to submit ROSES proposals, articulate the science or support needed, or otherwise do the work themselves.
- **Can enable greater product continuity** lasting beyond a given mission and can **achieve global, routine production** (i.e., production at scale) of research data products to benefit agencies.
- **Can be mission agnostic and incorporate synergies across missions:** harmonizing and merging data from multiple missions into single products that support quick decision-making and analysis.
- **Provide opportunities to scale and create an ecosystem** of data products and services (e.g., HLS became global and has enabled OPERA, vegetation indices, low-latency).
- **Are explicitly needs-driven:** they are based on agency-identified needs directly from the SNWG survey and interview process.



Solutions and Impact

More than **25 solutions** available across all sectors!

Earth ***Land*** ***Water*** ***Air*** ***Ice***



Multisensor Worldwide Ocean Winds • **Surface Water Extent** • **Planetary Boundary Layer** • **Vertical Land Motion**

Global Algal Bloom Assessments • **TEMPO Near Real-Time Air Quality Products** • **Harmonized Landsat & Sentinel-2**

Surface Disturbance • **NISAR Soil Moisture** • **Air Quality Sensors and Forecasts** • **AND MANY MORE!**

Harmonized Landsat and Sentinel-2 (HLS) Solutions

Building on impactful solutions

SNWG-2016

Harmonized Landsat and Sentinel-2 (HLS)

- Analysis-ready
- 30 m surface reflectance product
- Observations approx every 1.5 days

SNWG-2020

Global HLS-Derived Vegetation Indices Suite (HLS-VI)

- A suite of nine vegetation index: NDVI, EVI, SAVI, MSAVI, NDMI, NBR, NBR2, TVI, and NDWI
- Vegetation health, land use change, and disasters

SNWG-2022

Low-Latency HLS Products

- Reducing the delivery time of HLS data from 3-4 days to within 6 hours of observation
- Will support rapid response capabilities

SNWG-2024

10 m HLS

- U.S. product using nearest-neighbor resampling
- Will enable more precise monitoring of agriculture, infrastructure, and disasters



#1 most-distributed NASA dataset

Nearly 50 PB of data distributed

Learn more about HLS solutions here!

Harmonized Landsat and Sentinel-2 (HLS) Product

Need: More frequent, global observations of the land surface, mapped to a common grid to support disaster response efforts, agricultural monitoring, etc

Solution: Harmonized Landsat and Sentinel-2:

- Analysis-ready 30 m surface reflectance product with observations approx every 1.5 days
- Global observations of the land surface mapped to a common grid
- Cloud-optimized data
- Compatible with the 40-year Landsat record

Impact:

- NASA's number 1 most downloaded dataset
- Available through additional platforms such as Google Earth Engine, Microsoft Planetary Computer, and Esri.
- Enabling improved monitoring of land surface changes, disaster response, and agricultural management.
- The HLS 30 m product serves as an important foundation for other widely used SNWG products including the HLS Vegetation Indices Suite (HLS-VI) and the OPERA Dynamic Surface Water Extent (DSWx) and Surface Disturbance (DIST) products.



HLS/S30 view of San Francisco Bay on January 9, 2021

Links

Training resources
HLS Solutions
LP.DAAC HLSL30 Data
LP.DAAC HLSS30 Data

Global HLS-Derived Vegetation Indices Suite (HLS-VI)

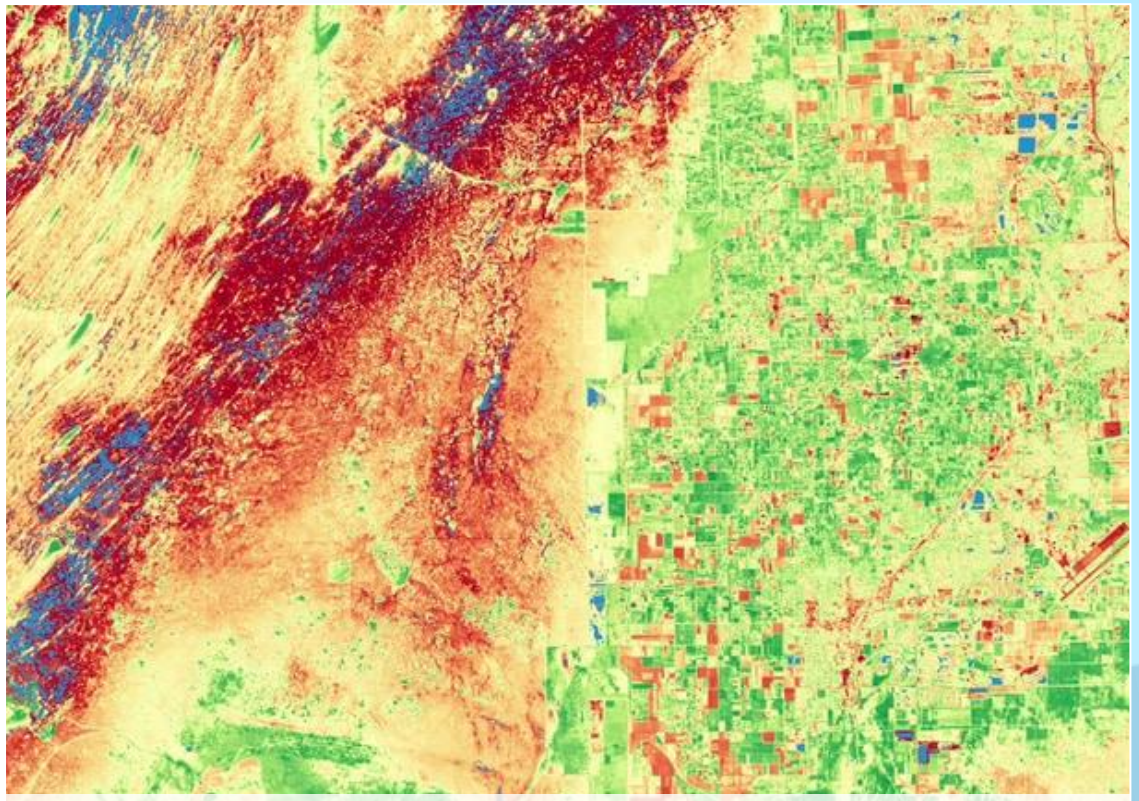
Need: HLS-based vegetation index products

Solution: Global HLS-Derived Vegetation Indices Suite:

- Nine analysis-ready vegetation index products using HLS data: **NDVI, EVI, SAVI, MSAVI, NDMI, NBR, NBR2, TVI, and NDWI.**
- 30 m product with observations approx every 1.5 days.

Impact:

- Enhances vegetation health monitoring, soil properties, and water levels.
- Broadens the user base for HLS data, providing read-to-use vegetation products that can be applied directly to support agricultural activities, forest management and conservation, water resource management, and more.



HLS bands are used to generate vegetation indices such as NDVI and EVI

Links

Training resources
Global HLS-VI Solution
LP.DAAC HLSL30-VI
LP.DAAC HLSS30-VI

Low-Latency HLS Products

Need: Reduce the amount of time for HLS observations to become available after satellite observation.

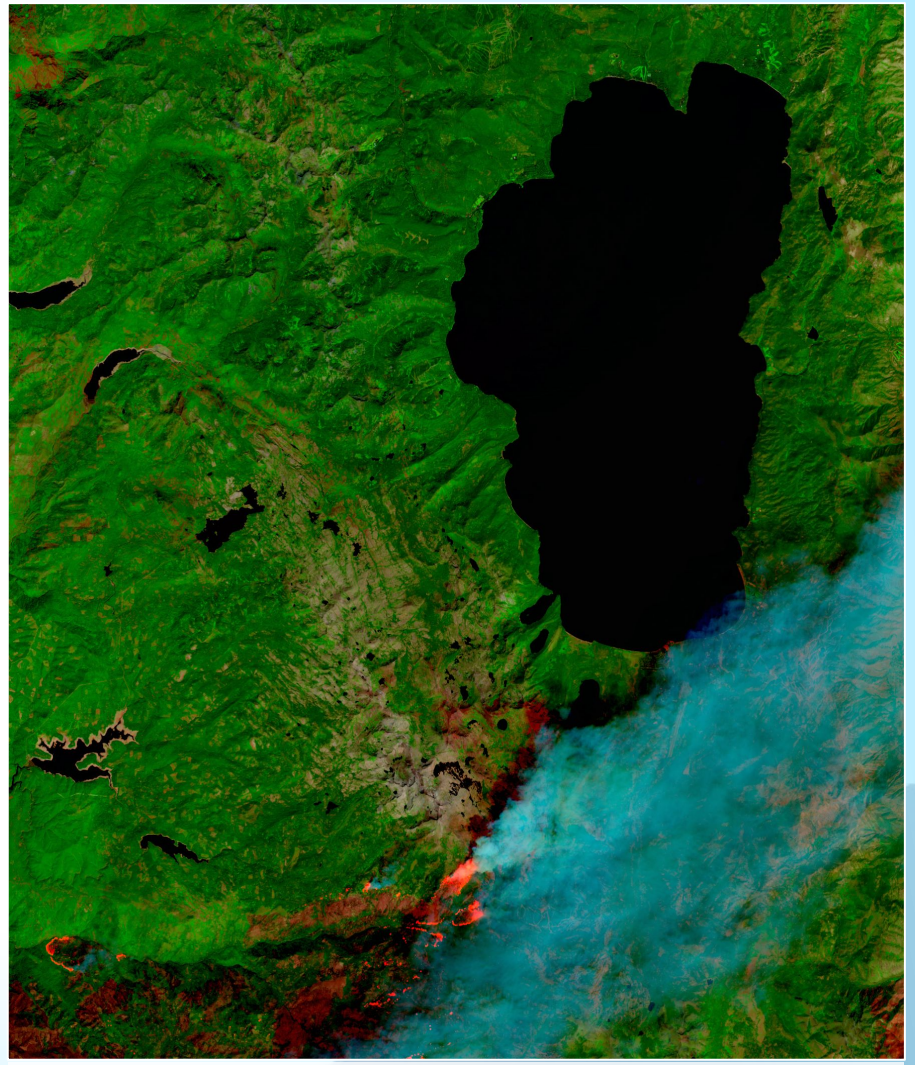
Solution: Low-Latency HLS Products:

- **HLS available within 6-hours of observation.**
- Analysis-ready 30 m surface reflectance product with observations approx every 1.5 days.
- Global observations of the land surface mapped to a common grid
- Cloud-optimized data
- Compatible with the 40-year Landsat record

Impact:

- Enhances agencies' ability to respond to hazards such as wildfires, earthquakes, floods, oil spills, etc.
- Supports agricultural management, enabling short-term monitoring of crop condition to quickly assess and mitigate risks from disease and drought.

Low-latency HLS products are expected in 2027!



HLS/S30 view of the Caldor Fire, Lake Tahoe August 29, 2021

Links

Low-Latency HLS Products

10 m Harmonized Landsat and Sentinel-2 (HLS) Product

Need: A high spatial and temporal resolution dataset

Solution: 10-meter Harmonized Landsat and Sentinel-2:

- A U.S. focused 10 m HLS product
  - Nearest-neighbor resampling of the 30 m Landsat data, and the 20 m and 60 m Sentinel-2 data.
  - Other methods being researched

Impact:

- Enables detection of smaller-scale features such as individual crop fields, and narrow landscape changes
- Advances more precise agriculture, urban analysis, disaster response, and infrastructure monitoring applications.

HLS S30 30-m pixel resolution



HLS S10 10-m pixel resolution



Prototype data (right) are available for testing now; email info@snwg-impact.net for access!

High-Resolution Evapotranspiration (ET) Product within HLS

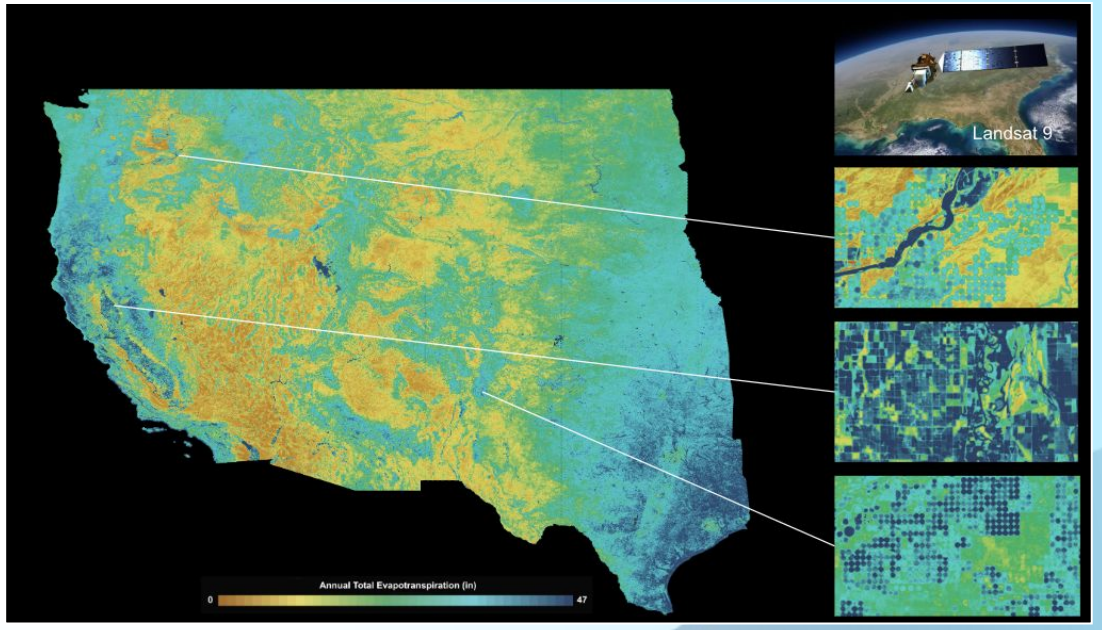
Need: Global, accurate, high-resolution ET data expanding OpenET for a variety of applications

Solution – High-Resolution Evapotranspiration (ET) Product within HLS

- Utilize Harmonized Landsat and Sentinel-2 (HLS) surface reflectance (SR) fields and the Harmonized Land Surface Temperature (LST) Products to continuously map ET at a spatial resolution of 30 m coincident with acquisitions of SR from Landsat and Sentinel-2.
- Expansion of OpenET framework from U.S. to global coverage.

Impact:

- Enhances agencies' ability to capture the impacts of water use, inform water and land management, and identify risks for vegetation water stress and associated wildfire risk.
- Improves farm management, drought monitoring, forest and rangeland health assessment, and global monitoring of threats to food and water security.



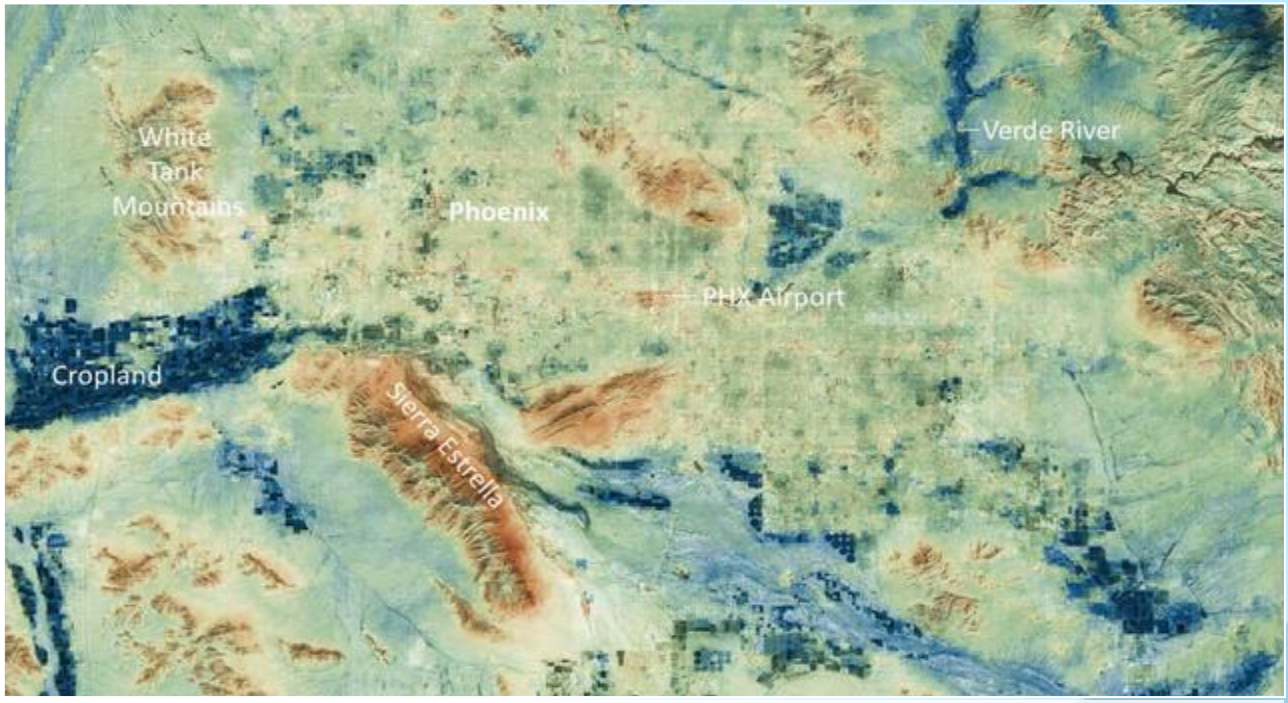
In the western U.S., state officials and farmers already use satellite data from OpenET to track ET and better manage water resources. Satellite data quantifies the water consumed by plants and crops, as well as the impact of drought on crop production and wildfire risk. Applications in the western U.S. have demonstrated high impact for water management and substantial economic value for agricultural producers.

High-Resolution Harmonized Land Surface Temperature (LST) Products within HLS

Need: Agencies need harmonized sub-weekly LST products derived from thermal infrared (TIR) data at a spatial resolution of 30 m, especially for latency of 1 day or less.

Solution: Land Surface Temperature Products within HLS

- Harmonized thermal product at 30 m.
- Uses thermal data from Landsat and VIIRS (at the time of Sentinel-2 overpasses).
- Includes investigating the feasibility of implementing enhanced image fusion to 10 m.



Land-surface temperatures in the Phoenix area in July 2023 during record-breaking hot weather, captured by the Visible Infrared Imaging Radiometer Suite (VIIRS). Creating a harmonized product will enhance the timeliness and use of LST data.

Impact:

- Serves as the primary input for the OpenET project, which is highly valued by the identified users.
- Will enhance agencies' ability to capture the impacts of high-frequency land management activities on water use, detect early signals of rapidly developing crop stress, and characterize daily to weekly water use in regions with frequent cloud cover.

OPERA Near-Global Dynamic Surface Water Extent (DSWx) Product

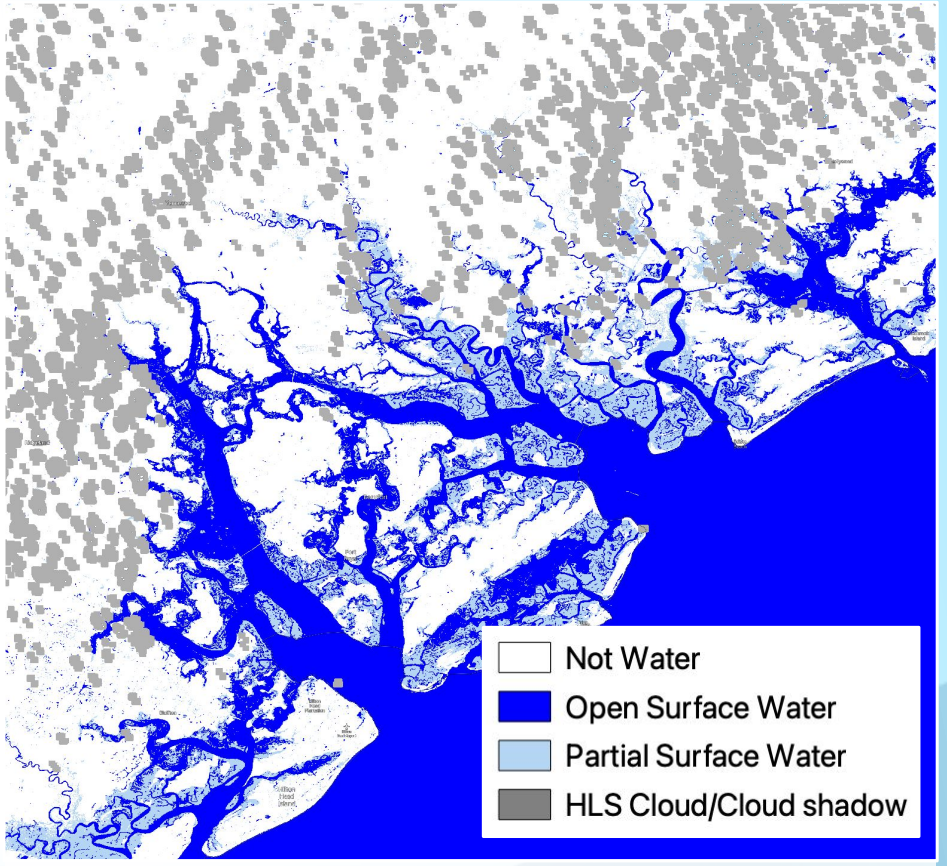
Need: U.S. land and monitoring agencies require frequent information on surface water, even under cloud cover & vegetation.

Solution: Identification of surface water maps every few days

- Near-global DSWx data product suite at 30 m resolution
- Uses imagery from 9 optical and radar satellites (Landsat 8/9, Sentinel-2 A/B/C, Sentinel-1 A/C/D, and NISAR).
- SAR imagery aids in mapping surface water extent in cloudy conditions and beneath some vegetation.

Impact:

- Enhances monitoring of floods, droughts, wetlands, habitats, and water use.
- Supports informed land and water resource management.
- Improves hazard response and recovery capability.



Optical DSWx image of tidal channel networks near Hilton Head, South Carolina.

Links

OPERA DSWx website
OPERA DSWx on Worldview
OPERA DSWx Guide on PO.DAAC
OPERA DSWx applications Github
OPERA Global DSWx Product Suite

OPERA Near-Global Surface Disturbance (DIST) Product

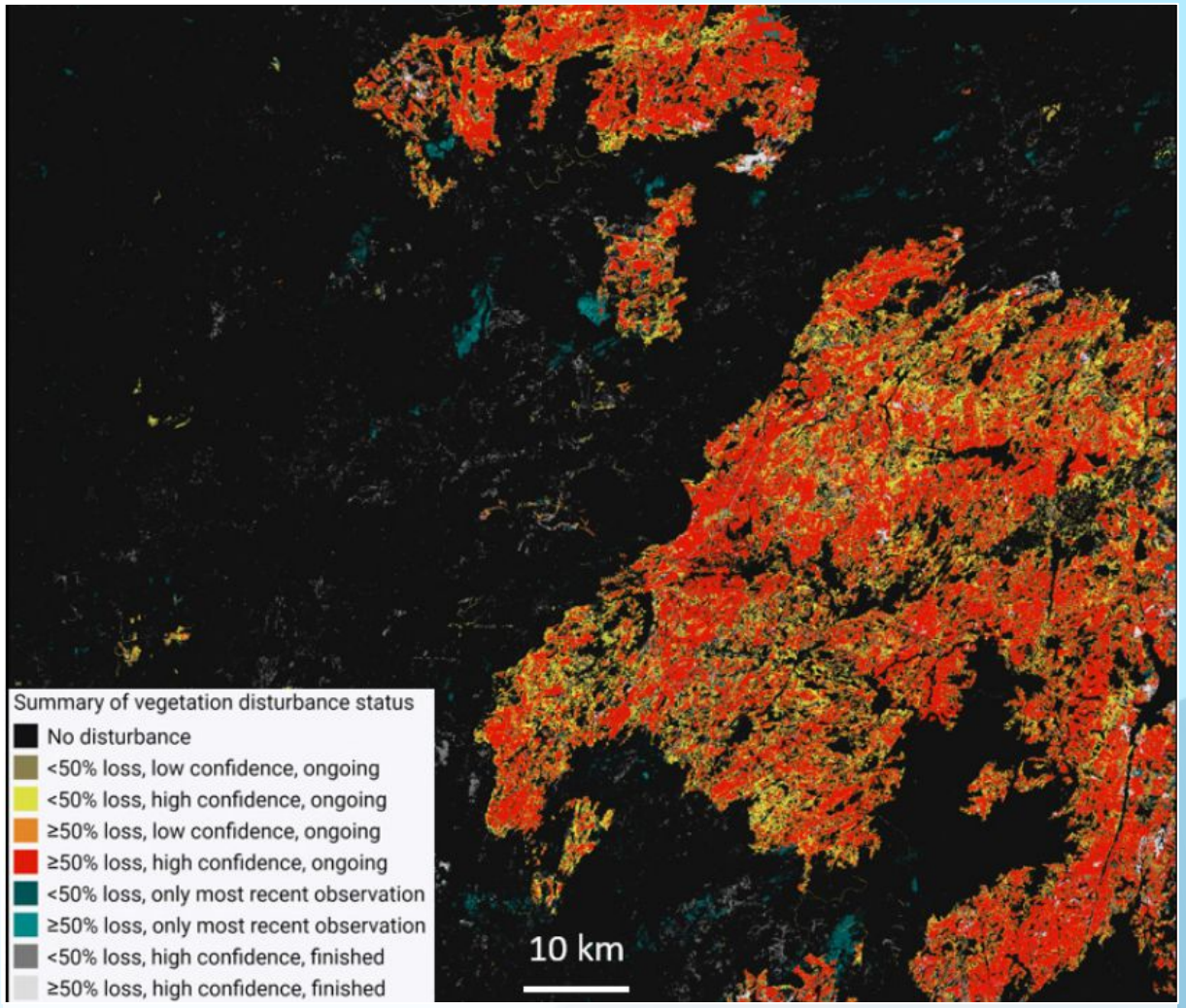
Need: U.S. land monitoring agencies require frequent detection of where vegetation and urban areas are changing

Solution: Identification of land surface disturbance every few days

- Global DIST product suite at 30 m resolution.
- Uses imagery from 8 optical and radar satellites (Harmonized Landsat 8/9 and Sentinel-2 A/B/C, Sentinel-1 A/C/D).
- An annual optical DIST product becomes available after a full year of disturbance granules have been generated.
- Currently developing product to attribute land-cover change agents such as drought, wildfire, mechanical harvest.

Impact:

- Supports tracking wildfires, invasive species, forest health, and deforestation.
- Detects land cover changes for land management and resource monitoring.
- Improves hazard response.



Optical DIST-ALERT image of 2023 wildfires in Quebec, Canada.

Links

OPERA DIST website
OPERA DIST Applications Github
OPERA DIST on Earthdata SNWG Portal
OPERA Near-Global DIST Product

OPERA North America Land Surface Displacement (DISP) Product

Need: U.S. land monitoring agencies require frequent detection land surface deformation, which require consistent, high-resolution observations

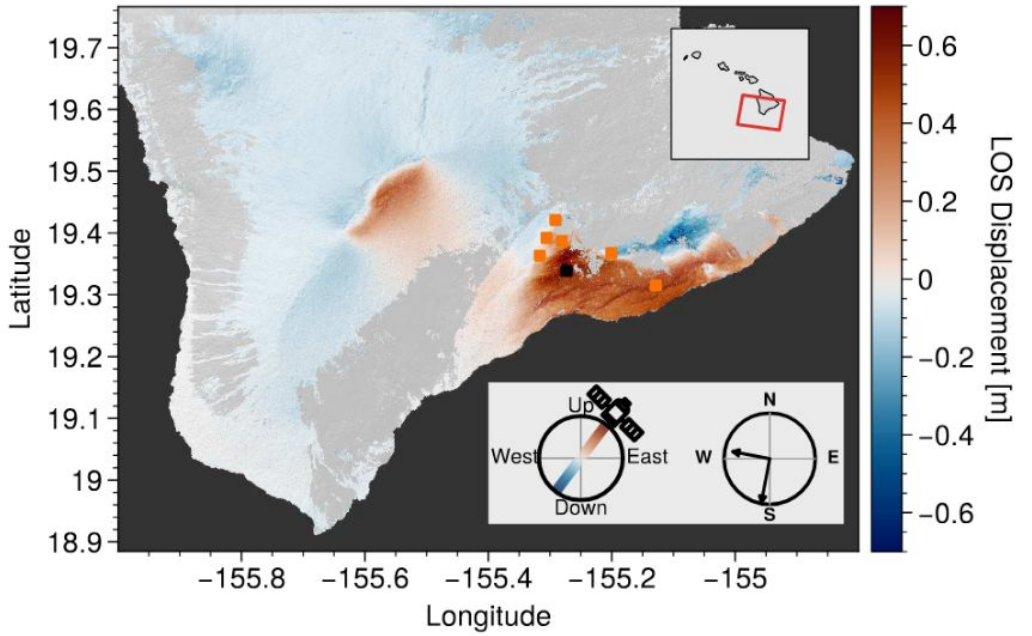
Solution: Identification of land surface displacement every few days

- 30 m resolution every 6, 12, or 24 days.
- Uses radar data from Sentinel-1 A/B/C/D and NISAR.
- Historical DISP-S1 record (2016–2024) available via ASF DAAC.
- OPERA and ASF provide data access through a custom visualization portal.

Impact:

- Enables timely detection of ground motion from earthquakes, volcanoes, landslides, subsidence, uplift, and infrastructure-affecting processes.
- Supports hazard response, risk mitigation, and monitoring of infrastructure stability.
- Provides critical data for long-term land management and safety planning.

*North America: USA and U.S. Territories, Canada within 200 km of the U.S. border and the Cascadia Subduction Zone, and all mainland countries from the southern U.S. border up to and including Panama.



DISP map and time series plots and comparison with GPS for Kīlauea, Hawaii (Source: Staniewicz et al.)

Links

OPERA DISP website
OPERA DISP hazards whitepaper
OPERA DISP vertical land motion whitepaper
OPERA DISP on Earthdata SNWG Portal
OPERA North America DISP Product
ASF Displacement Portal
ASF.DAAC DISP-S1 Data

OPERA North America Vertical Land Motion (VLM) Product

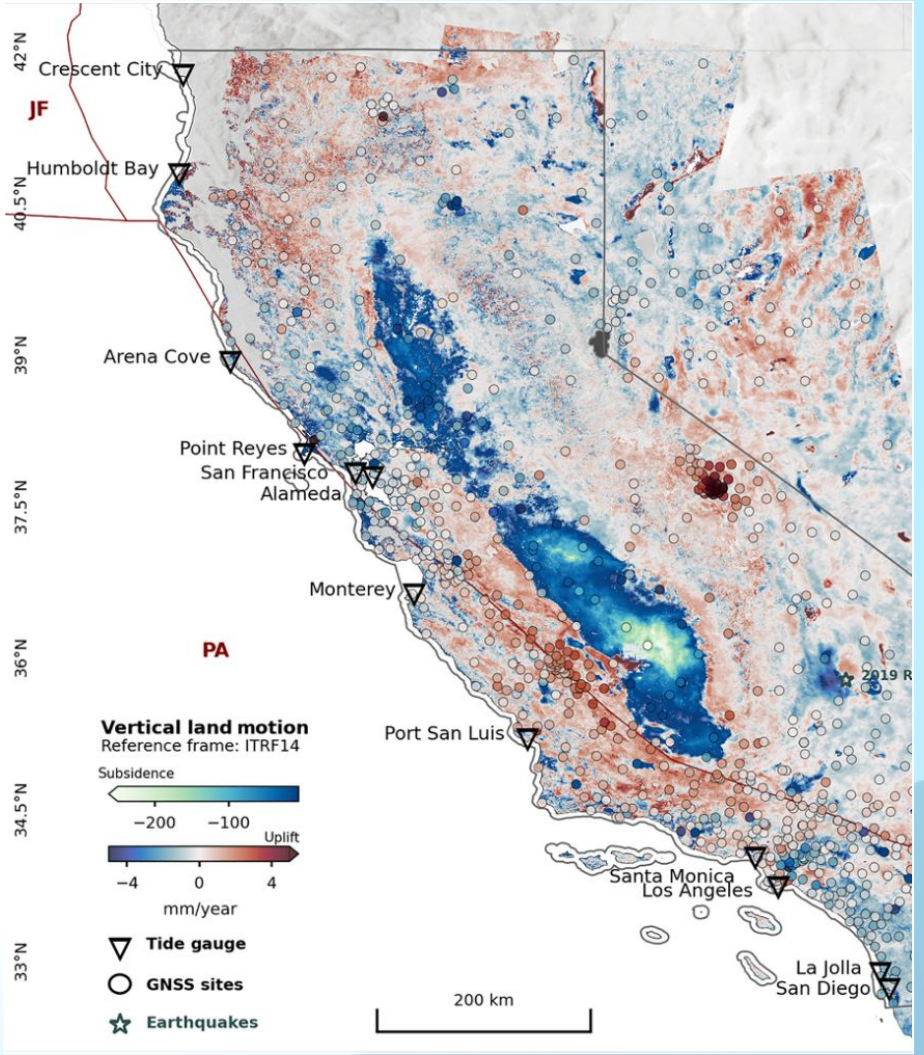
Need: Ability to identify and track the magnitude of vertical land surface motions and vertical rates of motion across North America.

Solution – Suite of vertical land motion products for North America

- Identify and track the magnitude of vertical land surface motions at 120 m resolution.
- Leverages the SNWG-2018 North America Surface Displacement Product in combination with dense global position information from GNSS.
- Uses radar data from Sentinel-1 A/B/C/D and NISAR.
- Monthly (and possibly bi-weekly) products.

Impact:

- Enhances preparedness and reduces the effects of landslides, coastal subsidence, fluid extraction/injection, and other geohazards across the U.S. that cause billions of dollars in damage every year.
- Supports infrastructure stability and modernization efforts.



VLM Prototype in California from 2015-2023: Govorcin, et al. 2025 (Sci. Advances)

Links

OPERA Vertical Land Motion Info Page
OPERA Earthdata webpage
OPERA North America VLM Earthdata Product

High-Resolution North America NISAR Data

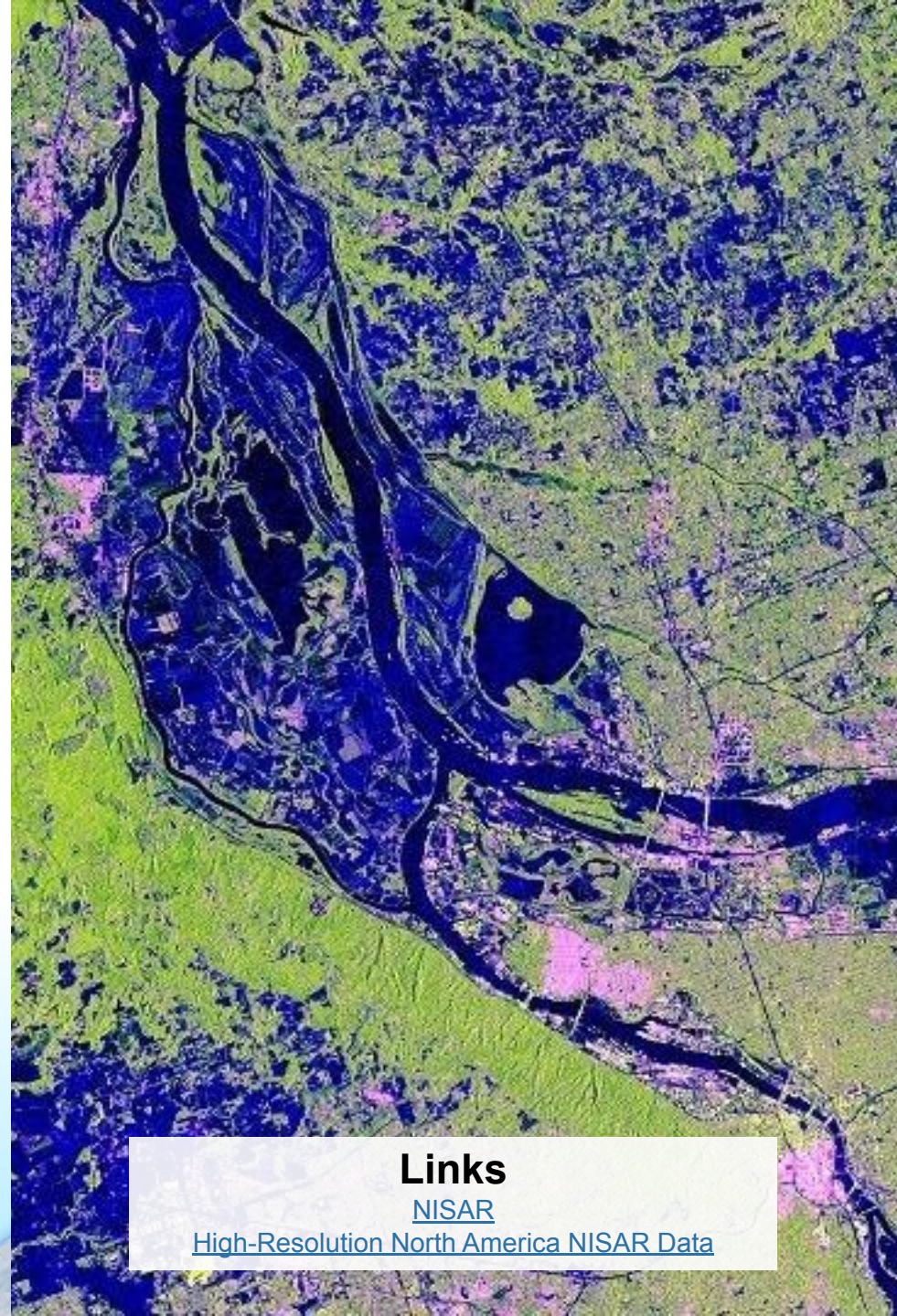
Need: Increasing NISAR data collection from 20 MHz (6.25 × 5 m) to 40 MHz (3.12 × 5 m) and increasing the signal polarization diversity from dual-pol to quad-pol over North America (Canada to Panama, Hawaii and U.S. Territories)

Solution - A New Downlink Station at Wallops:

- Increased downlink capacity of NISAR by 9 Tbits/day.
- Improved image quality globally via increased radar pulse rate.
- Enabled NISAR's highest land resolution collection mode, and improved data collection over North America and U.S. territories.

Impact:

- U.S. federal agencies will greatly benefit from the higher resolution data for disaster response, crop assessment, infrastructure stability, hurricane and atmospheric river forecasts, and more.
- The high resolution acquisitions enable systematic collection of coastal North America ocean data that would not have been possible otherwise.



Links

NISAR

High-Resolution North America NISAR Data

Global NISAR Soil Moisture Product

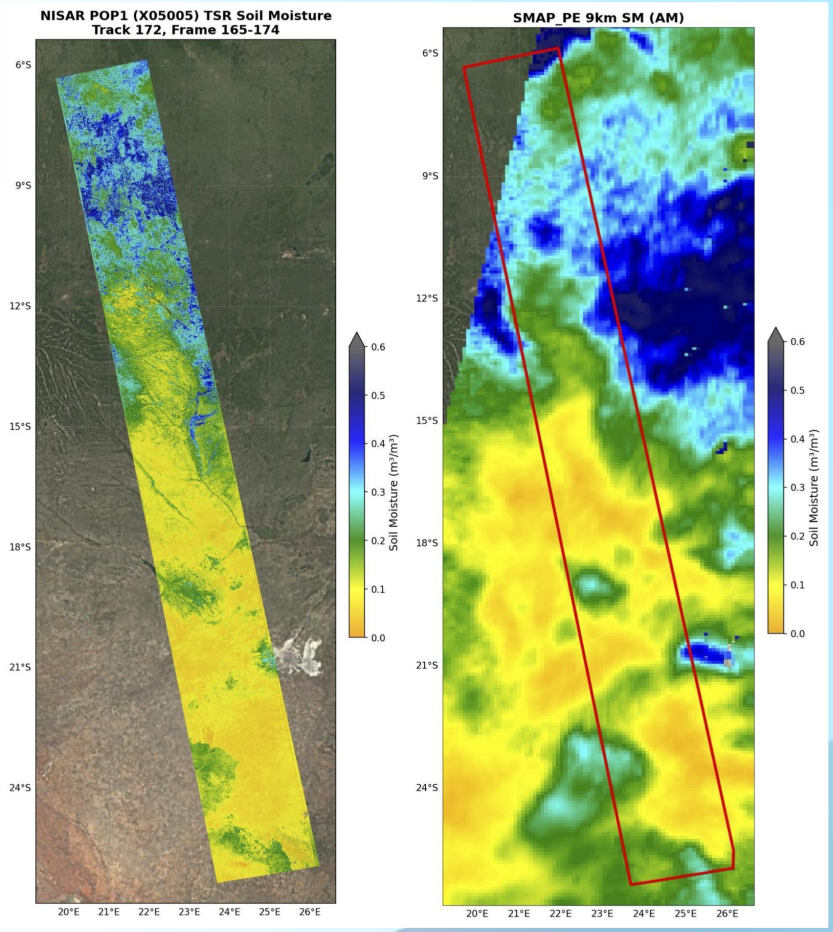
Need: Detailed measurements of soil moisture for use in agricultural applications (e.g., yield estimates and drought monitoring), wetland habitat detection, water budget estimates, and hazard prediction

Solution – Global soil moisture product

- The NASA/Indian Space Research Organization (ISRO) Synthetic Aperture Radar (NISAR) mission collects highly detailed measurements of changes in Earth's surface including land, ice, water, and vegetation
- Global 200 m resolution soil moisture product (~400-meter for the Sahara Desert)
- Minimum of two products every 12 days from both ascending and descending orbits, with more frequent observations at higher latitudes

Impact:

- Supports estimation of crop yields, flood or drought crop hazard alerts, and forecasting of food demands
- Enhances forest fire prediction, water supply management, and other natural resource activities



NISAR soil moisture (left) and concurrent SMAP imagery (right), Nov 11, 2025.

Links

NISAR
Global NISAR Soil Moisture Product
Sample NISAR Soil Moisture Data

Second Generation of the Fire Information for Resource Management System (FIRMS-2G)

Need:

- Fires across the United States impact several millions of acres and cause billions of dollars in damage every year. Timely data for monitoring, managing, and understanding the impacts of wildland fire is critical.
- During major wildfire events, FIRMS is often NASA's most-visited site for data on fire conditions, but additional datasets would make FIRMS even more useful for agency decision makers.

Solution – Next Generation of FIRMS, FIRMS-2G:

- This solution will improve monitoring and forecasting of smoke plumes and provide more frequent data on active fires and burned areas by combining public and private data sources (e.g., Sentinel-2, Sentinel-3, Landsat Next, NOAA-22, FireSat, and WildFireSat).
  - Data latency on burned area estimates will be reduced from 3 months to same-day using data from the VIIRS instrument.
  - More spatially refined burned area information will be available with a 2-day latency using the SNWG-supported HLS Vegetation Indices solution.
  - A review with stakeholders of smoke plume data and models (NOAA HYSPLIT, GEOS-CF, NOAA AerosolWatch, etc.) will inform next steps.



FIRMS U.S./Canada view of the Palisades and Eaton Fires captured on January 9, 2025, by the Suomi-NPP/VIIRS instrument. Active fires shown in red.

Impact:

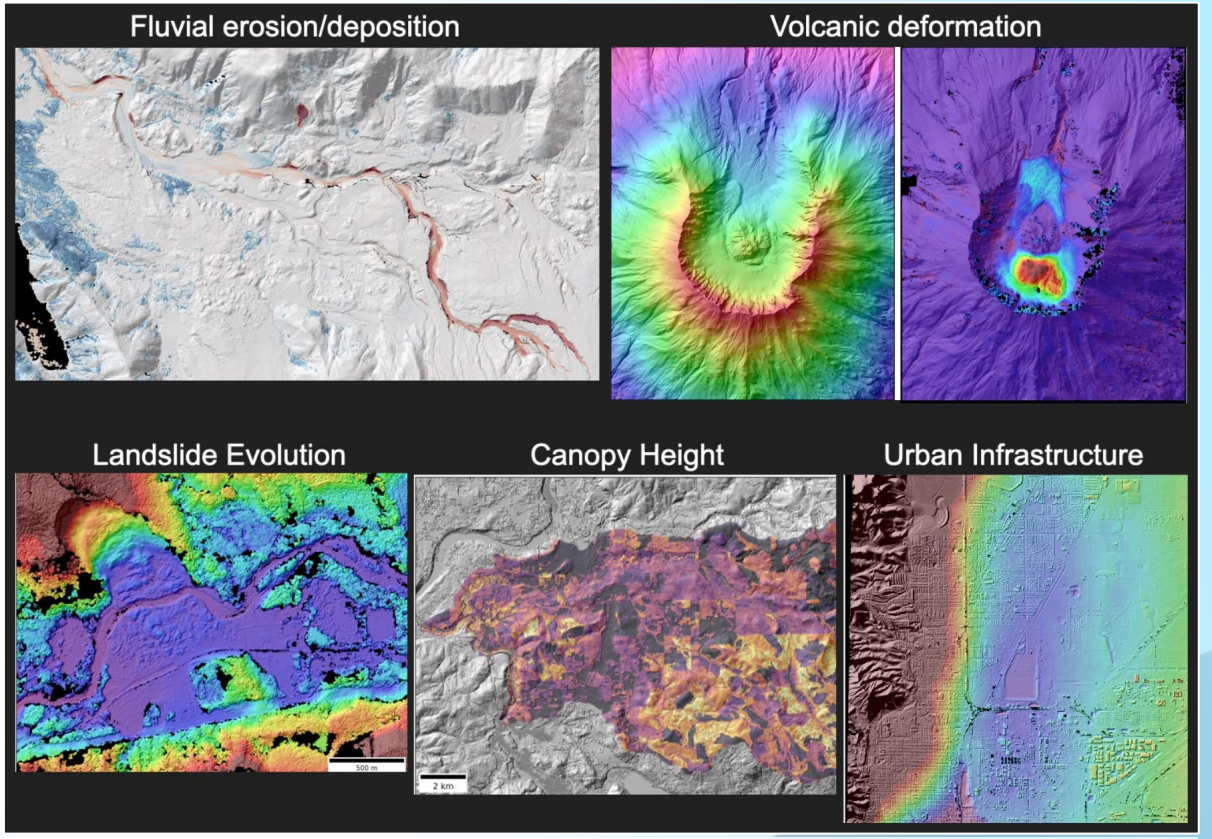
- This solution will build on FIRMS' existing reputation to support fire monitoring, management, and post-fire damage assessments. The new smoke monitoring and forecasting capabilities will help to protect U.S. communities from toxic fumes.

Accessible 3D Topographic Mapping Software

Need: A user-friendly graphical interface for NASA's Ames Stereo Pipeline (ASP) suite of open-source topographic mapping tools that operates in the cloud, with clearer documentation.

Solution – User-friendly interface for NASA ASP in the cloud

- A "point and click" web-based interface that guides users through ASP functions.
- Runs ASP processing in a scalable cloud environment.
- Near real-time preview and download for small areas.
- Job management system for larger areas.



Sample applications involving ASP elevation and elevation change products prepared from Maxar WorldView stereo images

Impact:

- Expand the user base for elevation data products across federal agencies.
- Accurate, up-to-date surface topography is an essential input dataset for many applications including flood inundation, forest and mineral resource assessment, and land hazard assessment.

Airborne Data Management Group (ADMG)

Need: More efficient and intuitive discovery of and access to NASA's airborne and field Earth Science observations

Solution: Centralize and standardize suborbital data:

- Develop and maintain NASA's Catalog of Archived Suborbital Earth Science Investigations (CASEI) as a centralized catalog of airborne and field investigations
- Curate and standardize metadata across campaigns, platforms, and instruments
- Improve coordination and processes for transferring data into NASA archives
- Preserve the context needed to understand and reuse historical observations

Impact:

- Makes NASA airborne and field data easier to discover and reuse
- Reduces time required to archive and publish new observations
- Preserves valuable data that may otherwise be lost or difficult to access
- Increases the scientific return on NASA's investments



ADMG improves discovery of airborne and field Earth Science data by advancing suborbital metadata standardization

Links

CASEI Homepage
ADMG Solution Overview

Water Quality Products

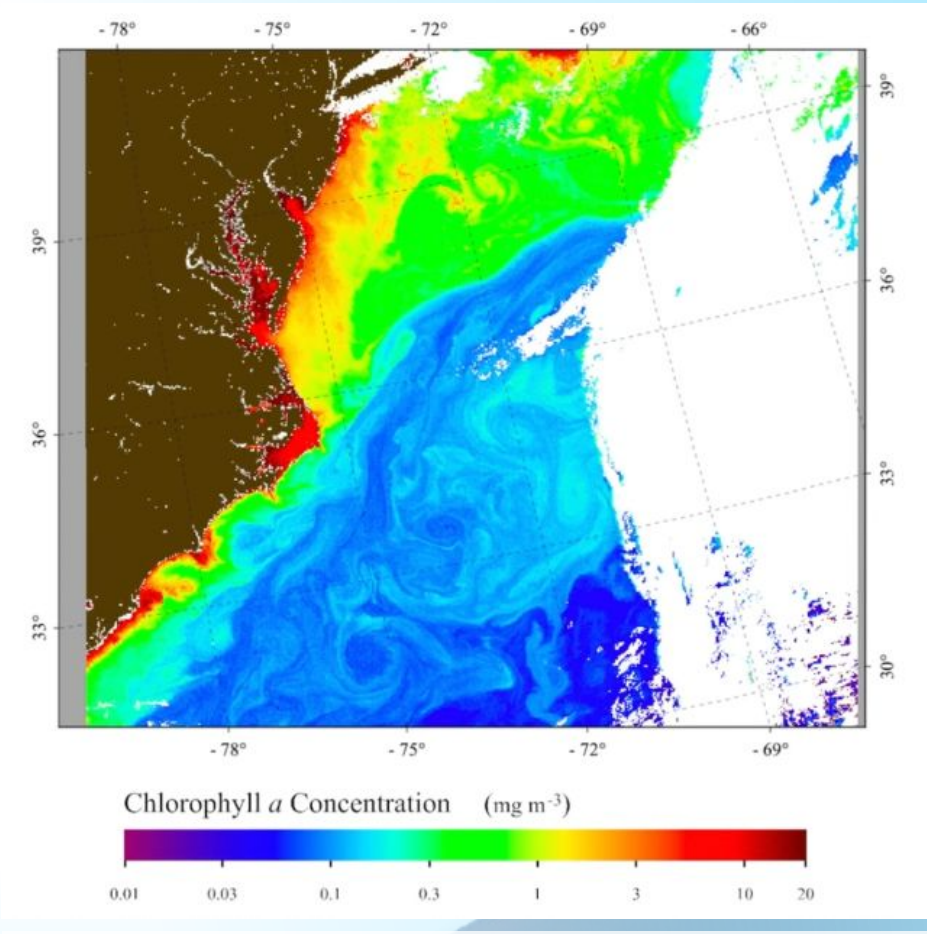
Need: Analysis-ready ocean color data for coastal and inland water quality monitoring.

Solution: Open Source Level-2 and Level-3 products from the Sentinel-3 Ocean and Land Colour Instrument (OLCI)

- 44 water quality products encompassing:
  - Ocean Color
  - Inherent Optical Properties
  - Chlorophyll α concentration
  - Diffuse Attenuation Coefficient for Downwelling Irradiance
  - Remote Sensing Reflectance
- Compatible with NASA's standard ocean color time-series.
- Processing capabilities for OLCI data distributed through the SeaDAS software package.

Impact:

- Supports monitoring and management of coastal water quality, fisheries and aquaculture, and marine protected areas.
- Provides crucial insights into the function and health of marine ecosystems and the effects of climate variations and ocean acidification.



Chlorophyll α concentrations in April 2023 for the Chesapeake Bay, Purple represents low concentrations of Chlorophyll α, while red represents high concentrations.

Links

NASA Ocean Biology
Water Quality Products

Global Cloud Composites from SatCORPS

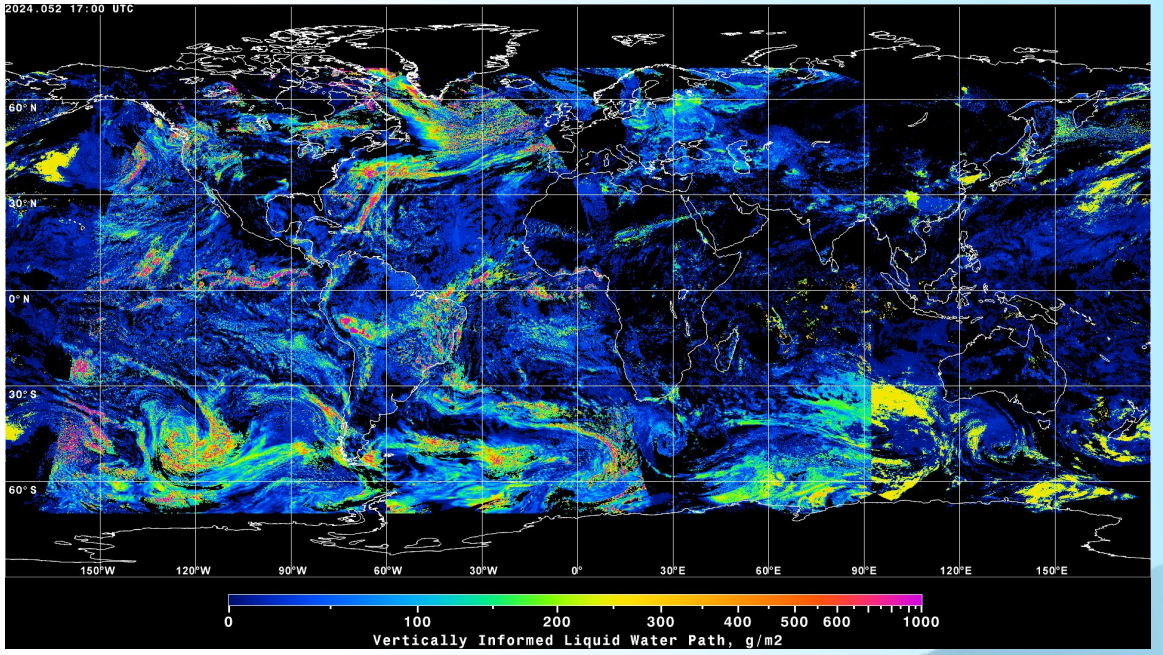
Need: Higher resolution satellite observations of cloud dynamics and microphysical properties to improve atmospheric modeling capabilities.

Solution: Upgrade NASA's Satellite ClOud and Radiation Property retrieval System (SatCORPS)

- Enhanced processing and storage capabilities for SatCORPS.
- New algorithms to ingest Visible Infrared Imaging Radiometer Suite (VIIRS) observations.
- Hourly composites of cloud properties gridded at 3 km globally using data from MODIS, VIIRS, and 5 geostationary satellites.
    - Includes new parameterizations for droplet number concentration and cloud water path, radiative flux computations

Impact:

- Improves representation of clouds and their effects in Earth System Models for energy and related sectoral infrastructure planning.
- Provides insight into convective cloud processes to advance numerical weather forecast models.
- Parameters such as icing potential inform aeronautical engineering decisions and other flight safety considerations.



Visualization of vertically informed liquid water path, one of 21 cloud properties available from the SatCORPS global cloud composites

Links

SatCORPS
Available Test Datasets
Global Cloud Composites from SatCORPS

GEOS Atmospheric Composition Reanalysis (GEOS-CR)

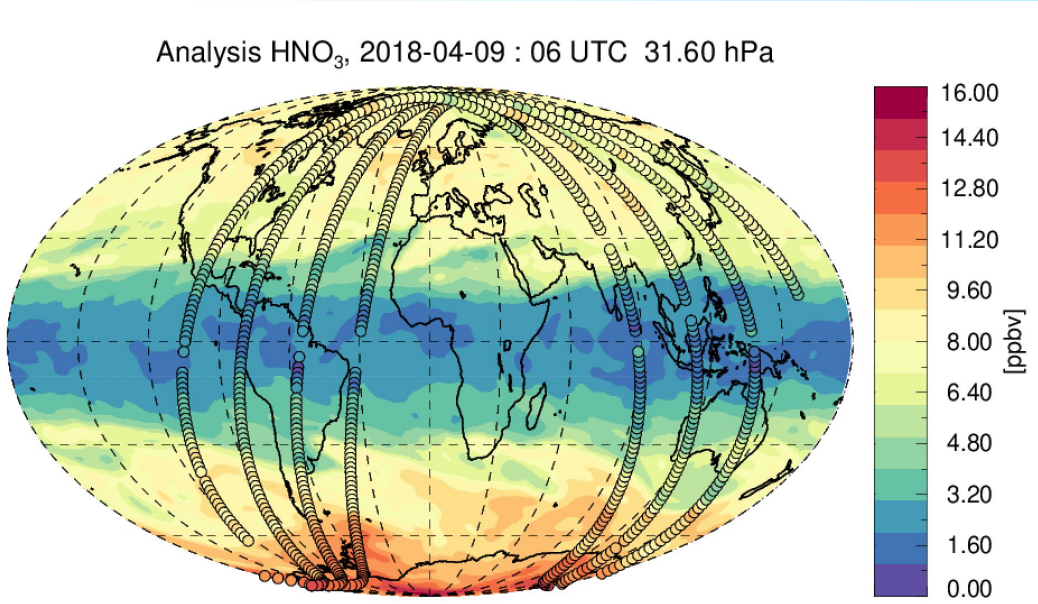
Need: Improved modeling and forecasting capabilities for atmospheric composition.

Solution: Atmospheric composition reanalysis product within the Goddard Earth Observing System (GEOS)

- Reanalysis conducted for the period 2009 - 2018.
- Global, 3-D characterization of atmospheric composition at 3-hourly intervals (hourly for select 2-D fields)
- Assimilates aerosol and trace gas concentrations from satellite and ground observations:
  - Aerosols, O_3, H_2O, HCl, HNO_3, N_2O, CO, CO_2, CH_4, NO_2

Impact:

- Provides a consistent, long-term look at past air quality conditions for analysis of historical trends and outlier events.
- Deepens our understanding of emission and transport processes for various chemical species, informing future monitoring strategies to protect human and ecological health.



Stratospheric nitric acid from GEOS-CR test and satellite observations

Links

GEOS-CF

GEOS Atmospheric Composition Reanalysis

ICESat-2/ATLAS Quick Look Products

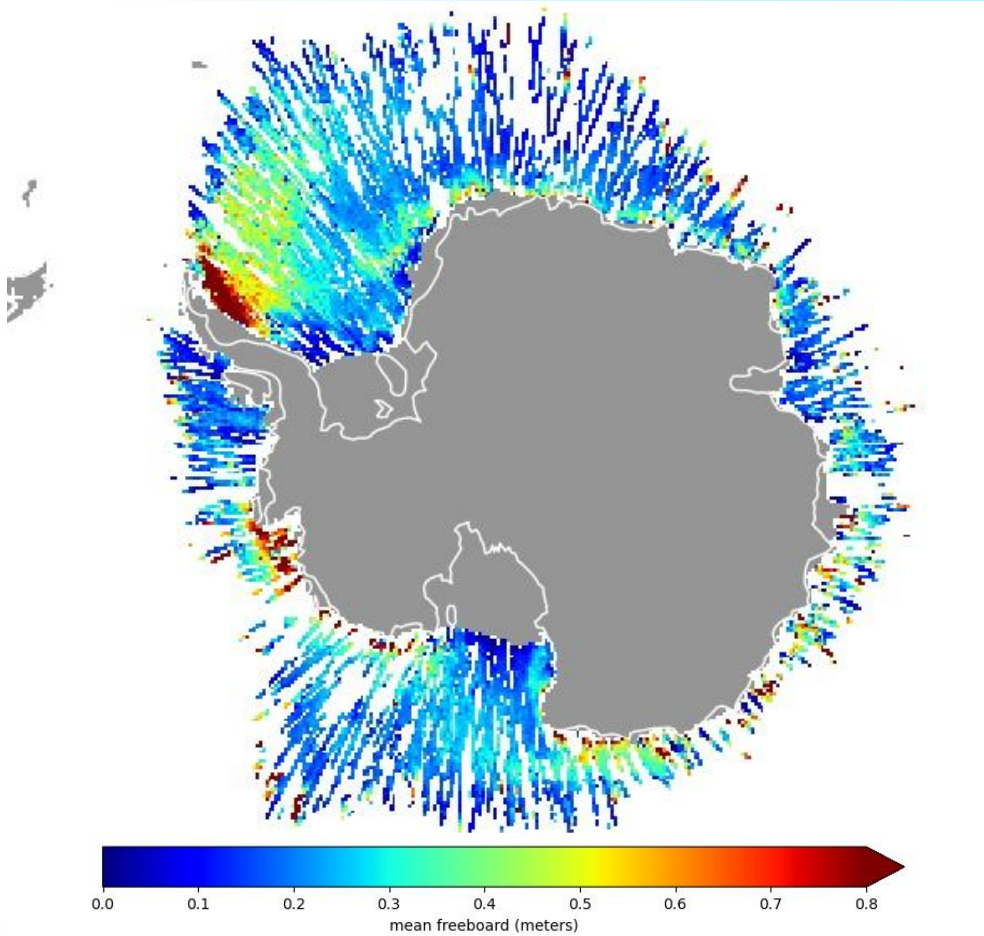
Need: Low latency sea and lake ice information

Solution: Expedited delivery for six ICESat-2/ATLAS data products

- **Reduced latency from 30-45 days to 3 days**
  - Sea ice height
  - Land and vegetation height
  - Atmospheric layer characteristics
  - Sea ice freeboard
  - Inland surface water height
  - Gridded sea ice freeboard

Impact:

- Timely ice mapping for safe and efficient commercial shipping and fishing
- Supports tracking and monitoring of wildfire smoke
- Measures vegetation height to identify fluctuations in biomass
- Informs decision-makers on land and surface water height changes due to hazards such as landslides and flooding



ICESat-2 ATLAS Quick Look image of mean sea ice freeboard for Antarctica from July 27th to August 26th 2026.

Links

NSIDC FAQs: ATLAS Quick Looks
NSIDC ATLAS product overview
QL datasets in LANCE
ICESat-2/ATLAS Quick Looks
ATL07QL, ATL08QL, ATL09QL, ATL10QL, ATL13QL, ATL20QL

Animal Tracking (Internet of Animals)

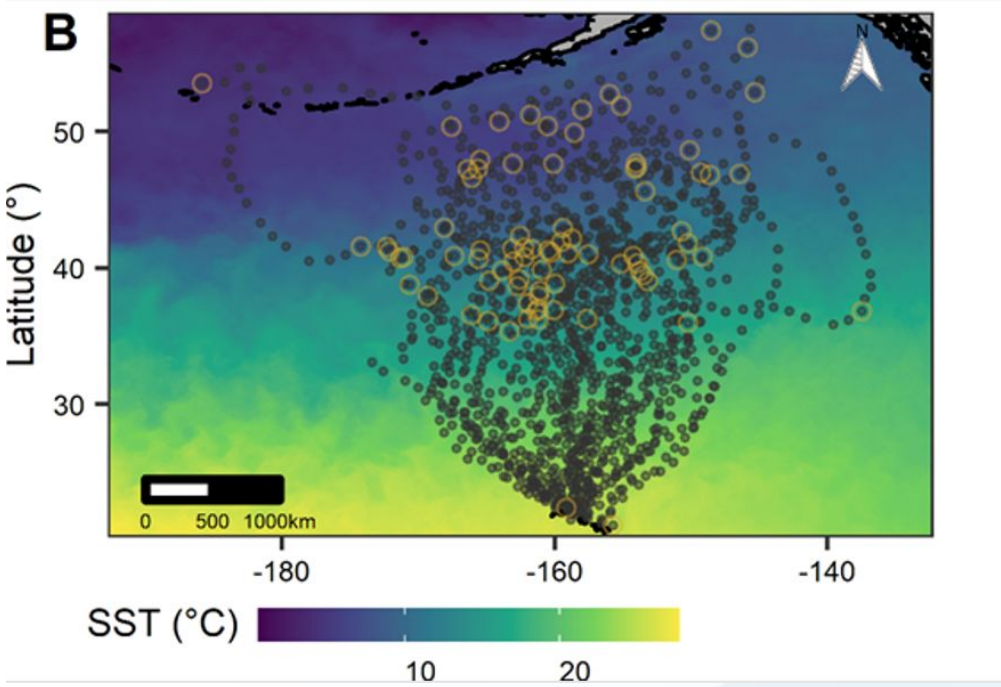
Need: More accurate, timely, and affordable animal tracking data with broader global coverage

Solution: Improvement of global animal tracking

- Assess animal tracking needs
- Design a next-generation satellite system
- Integrate animal movement data with NASA remote sensing and environmental models
- Strengthen collaboration and data sharing between users through the Animal Movement Biodiversity Observation Network (Move BON)

Impact:

- Improves wildlife conservation, protected-area planning, and migratory corridors
- Supports early detection of invasive species and population declines or disease
- Enables proactive management of human-wildlife conflicts
- Advances animal tracking technologies for agriculture and public safety



Laysan albatross GPS tracks overlaid on sea surface temperature (SST) raster in the Northern Pacific Ocean.

Links

Animal Tracking Project Background
Animal Tracking (Internet of Animals)

TEMPO / GOES Near Real-Time Products

Need: TEMPO products need to be made available more rapidly to assist in forecasting and modeling efforts.

Solution: Near Real-Time Air Quality Measurements

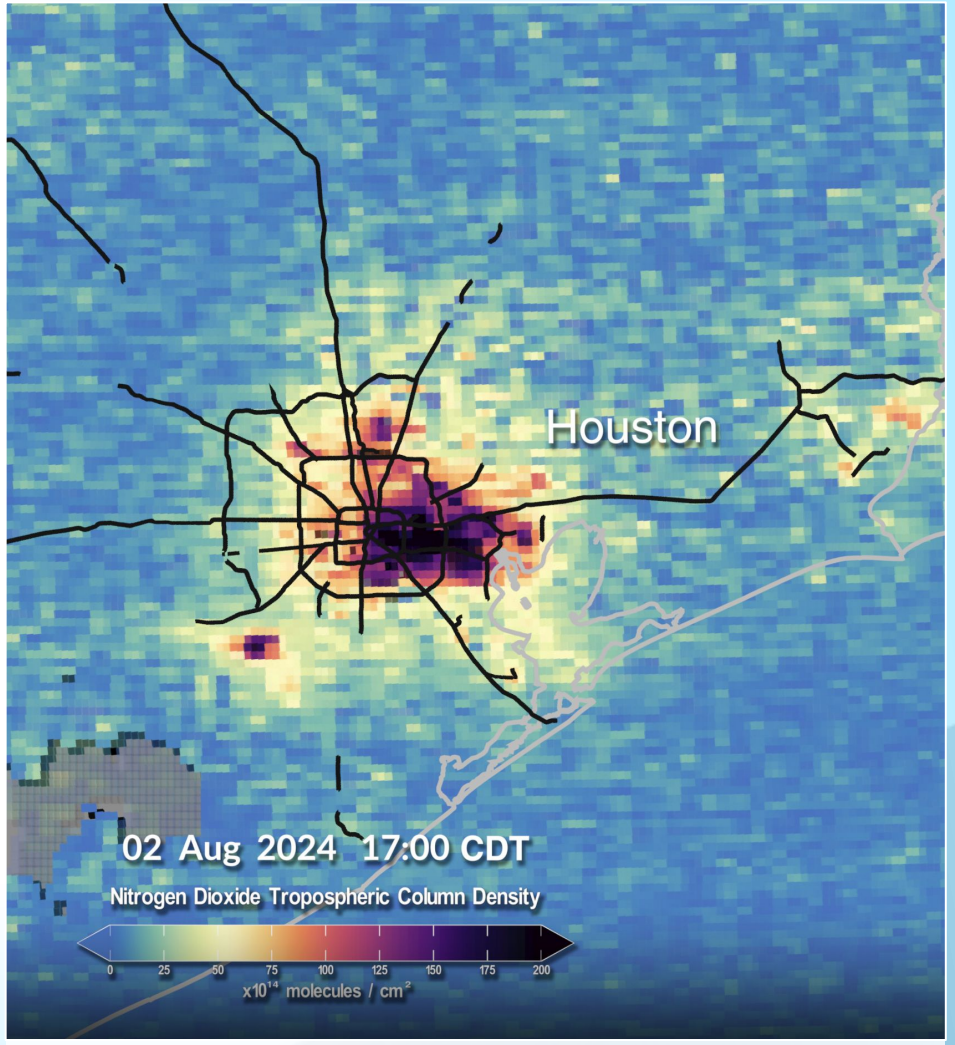
- Hourly NRT air quality products for nitrogen dioxide (NO_2), formaldehyde (HCHO), and clouds (using O_2-O_2 absorption) over North America, available within 3 hours of observation.
- NRT aerosol products from NOAA.

Impact:

- Helps federal, state, and local air quality monitoring officials alert the public to poor air quality in a more timely manner.
- Supports pollution transport modeling and weather and climate analysis.

Links

TEMPO Mission Site
TEMPO/GOES NRT Products
NASA Worldview TEMPO Data



TEMPO measurements of nitrogen dioxide over the city of Houston, TX and the Houston Ship Channel on August 2, 2024. Darker reds and blacks indicate higher concentrations of nitrogen dioxide.

Air Quality Sensors and Forecasts

Need: Accurate air quality information for key health and safety decisions especially in rural areas of the United States and abroad. Americans living and traveling in these areas are at risk of breathing harmful pollutants.

Solution – Expanded Network of Air Quality Sensors & Forecasts:

- Coordinate with federal agencies to add Pandora, AERONET, and other air quality sensors at sites owned and suggested by the agencies.
- Assimilate the new data into the GEOS-Composition Forecast model and provide forecasts for sites of interest, including U.S. embassies abroad.
- Generate precise historical analysis and 5-day forecasts: PM2.5 forecasts are available for 270 embassy locations; NO2 forecasts are available for Pandora sites; and O3 forecasts are being developed.
- Forecasts and supporting data will be provided through a unified web portal that is currently undergoing prototype testing by Department of State.

Impact:

- Accurate air quality measurements and forecasts relevant to human health in data-scarce areas.
- Supports federal agencies and other decision-makers to better understand, anticipate, and mitigate human exposure to harmful air pollution.



Sensor installations (above) are ongoing while DoS users evaluate the updated forecasts.

Links

SNWG Solution Page
NASA Pandora Project
Pandonia Global Network
Access Pandora Data
AERONET Data Explorer
Clarity OpenMap
Air Quality Forecast ($PM_{2.5}$)
Air Quality Forecast (prototype)

Ongoing and Mobile Pandora Measurements in Smoky Regions

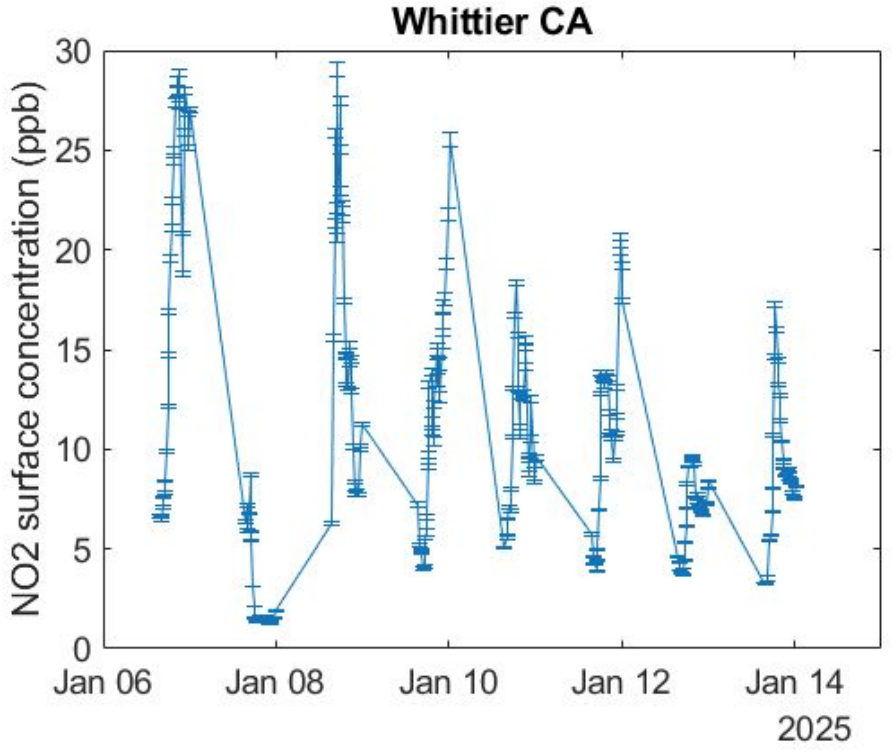
Need: Access to high-resolution data for understanding of fire behavior, smoke movement, and impacts on communities and landscapes

Solution: Strengthen monitoring of fires and smoke

- Install Pandora instruments in frequently smoky regions
- Co-locate instruments with AERONET and National Atmospheric Deposition Program (NADP) sites
- Use Pandora observations to interpret hourly TEMPO data
- Deploy mobile units at prescribed and pile burns

Impact:

- Improves monitoring of smoke emissions and transport
- Clarifies community exposure to smoke
- Supports prescribed burn planning and evacuation
- Strengthens post-fire vegetation and landscape assessments



Pandora sensors, used internationally for air quality forecasts, can provide vital information about fire behavior and smoke plume data. The example above shows elevated levels of nitrogen dioxide (NO2), a precursor to ozone, from the recent Los Angeles fires.

Merged Planetary Boundary Layer (PBL) Temperature and Water Vapor Products

Need: Improving the characterization of the PBL will support understanding of biosphere-atmosphere interactions, diurnal, seasonal, and climate-scale atmospheric processes, and cloud formation and pollutant dispersion.

Solution: Merged PBL Temperature, Height, and Water Vapor Products

- Merged global PBL product combining hyperspectral infrared, microwave sounder, and GNSS-RO data, including PBL height.
- Two-phase rollout: data fusion product in mid-2026 and joint retrieval/machine learning product in mid-2028.

Impact:

- The merged product will deliver accurate 3D profiles of temperature and water vapor in the atmosphere's lowest ~2 km, supporting weather and air quality forecasting and applications that include aviation, communications, defense operations, and renewable energy.



PBL controls the interaction between the atmosphere and the other components of the Earth System and has tremendous impact on human health, safety, and economy

Links

Merged PBL Products

Sea Surface Salinity with Sea Ice Mask

Need: Better understanding of near-shore and near-sea ice edge sea surface salinity.

Solution: A Sea Ice Mask with the NASA SMAP Sea Surface Salinity

- The version 5.0 and 6.0 SMAP SSS datasets include flags that allow users to identify the sea-ice fraction in each pixel and access salinity values close to the sea ice edge.

Impact:

- Improvement of sea ice ocean forecasting systems.



NASA produces salinity values from SMAP close to the sea ice edge

Links

Earthdata announcement
RSS SMAP Sea Surface Salinity
Sea Surface Salinity with Sea Ice Mask

TEMPO NRT SO_2 and Enhanced Products

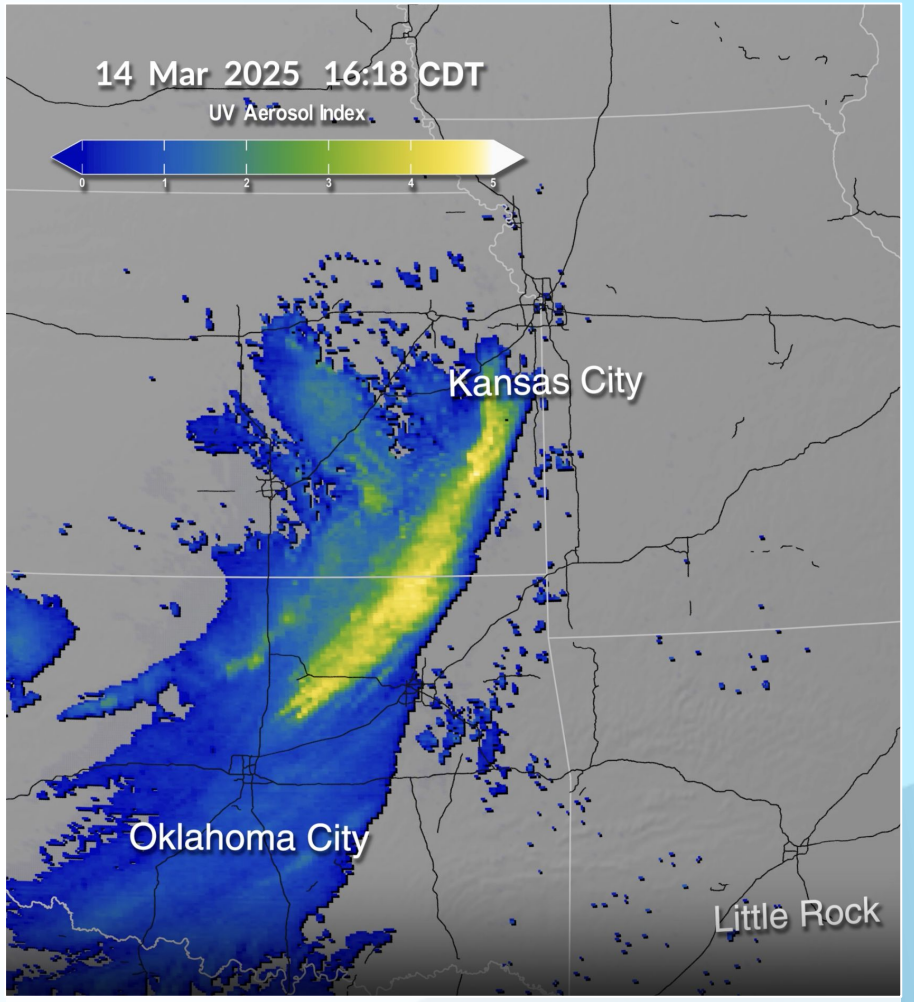
Need: Augment the SNWG TEMPO / GOES Near Real-Time Products to include near real-time (NRT) sulfur dioxide (SO_2) and total ozone (O_3), and additional science-quality trace gas and aerosol products.

Solution: Near Real-Time SO_2 and Enhanced Products for TEMPO

- Hourly SO2 concentration and total ozone, available within 3 hours of observation.
- Seven science-quality products including SO2, ultraviolet aerosol optical depth (UVAER), aerosol height (AOCH), water (H2O), ultraviolet index (UVI), glyoxal (CHOCHO), and bromine monoxide (BrO).

Impact:

- Enables real-time monitoring of SO_2 and ozone which impact both human health and the environment.
- Expands the TEMPO NRT product suite to provide a more comprehensive view of trace gas and aerosol constituents, important for the air quality forecasting and modeling communities.



TEMPO ultraviolet (UV) aerosol index data indicating the presence of dust and smoke from the dust storm/grassland fire event in the U.S. central plains on March 14, 2025

Links

TEMPO Mission Site
Earthdata Search
NRT SO_2 and Enhanced Products

Targeted Remote Sensing Training

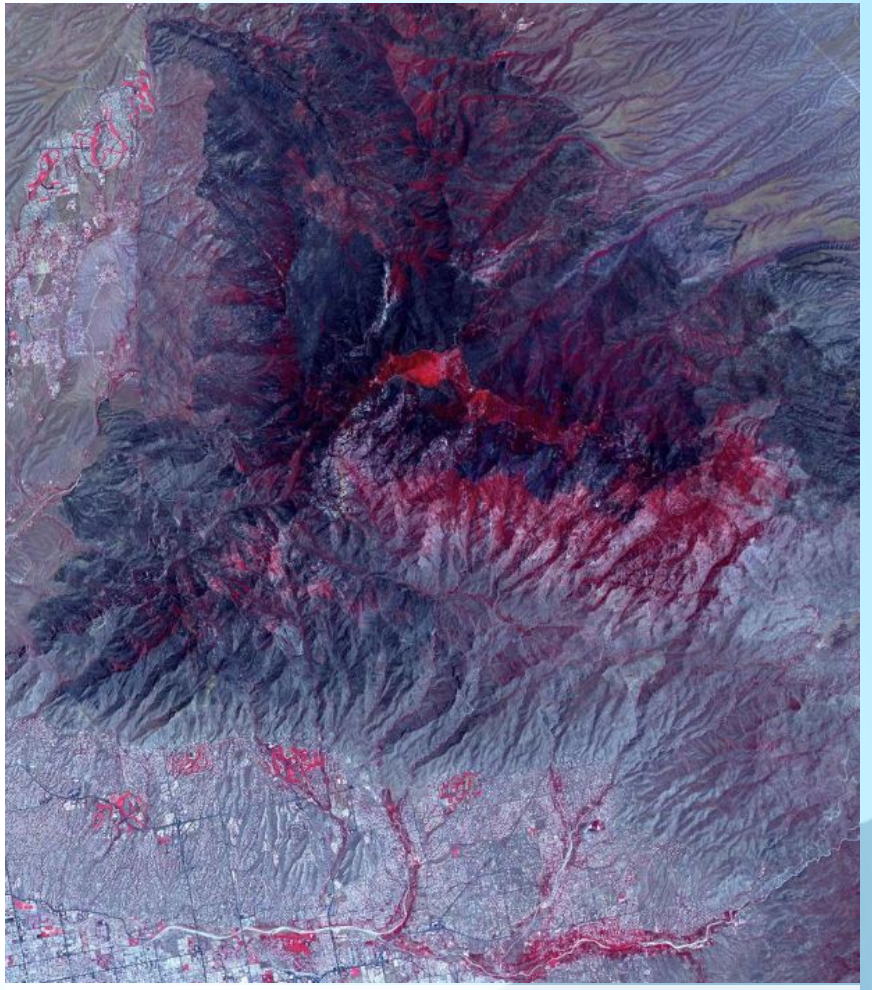
Need: Specialized remote sensing training to find, access, and apply NASA Earth observation data

Solution: Expand access to specialized remote sensing training

- Assess agency-specific training and data needs
- Connect agencies with relevant NASA data, tools, and products
- Address thematic topics of relevance to each agency (e.g. disasters, natural resource management, etc.)
- Collaborate with existing NASA remote sensing initiatives

Impact:

- Expands agencies' use of NASA Earth observations
- Improves integration of satellite data into research and decision-making
- Builds agency capacity to address targeted Earth observation needs



Burned areas in the Arizona Bighorn Fire of 2020, north of Tucson. Agencies often request specialized training to help them understand the impacts of natural disasters such as this one.

Links

Quick Guide for SNWG Partners: Getting Started with NASA Data
Targeted Remote Sensing Training

Multisensor Worldwide Ocean Winds (MWOW) Product

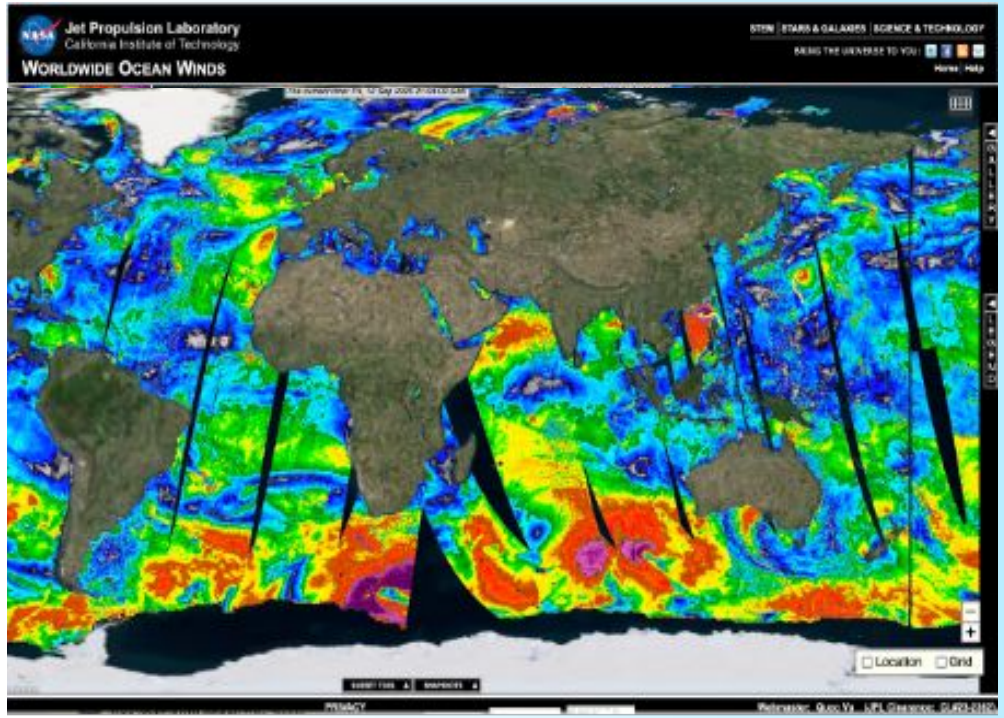
Need: Reliable ocean surface wind observations that harmonize the array of available satellite data from various sensor types into a single product

Solution: A Unified Wind Product Combining Multiple Satellite Instruments

- Single-source, analysis-ready, harmonized wind dataset combined from scatterometers (ASCAT-B/C, OSCAT-3), SAR missions (Sentinel-1, RADARSAT-2, NISAR, ALOS-4, SWOT, commercial SAR), and passive microwave radiometers (COWVR, GMI, SMAP, SSMIS, AMSR-2/3)
- Produces gridded wind speed every ~6 hours
- Provides wind direction where available
- Improved uncertainty characterization across instruments
- Consistent wind observations available with greatly expanded spatial coverage and temporal resolution

Impact:

- Better forecasting and modeling for hurricanes and storms, marine navigation, ocean-atmosphere modeling, and offshore wind energy operations
- Faster, more accurate disaster preparedness and response



Links

Multisensor Worldwide Ocean Winds Product

Version 0.2 data:

5 sensors, 1/8 degree resolution: https://doi.org/10.5067/MWOW-6H-V02

4 sensors, 1/64 degree resolution: https://doi.org/10.5067/MWOW-6HHR-V02

7 sensors, 1/8 degree resolution: https://doi.org/10.5067/MWOW-6H-V02E

6 sensors, 1/64 degree resolution: https://doi.org/10.5067/MWOW-6HHR-V02E

Note: These are preliminary products intended for stakeholder testing

An MWOW open-source toolkit is available with ready-to-use functions for opening files, extracting time series, matching ship tracks, selecting regions, inter-sensor collocation, comparison statistics/plots, and more.

Global Algal Blooms Assessment Network (GABAN)

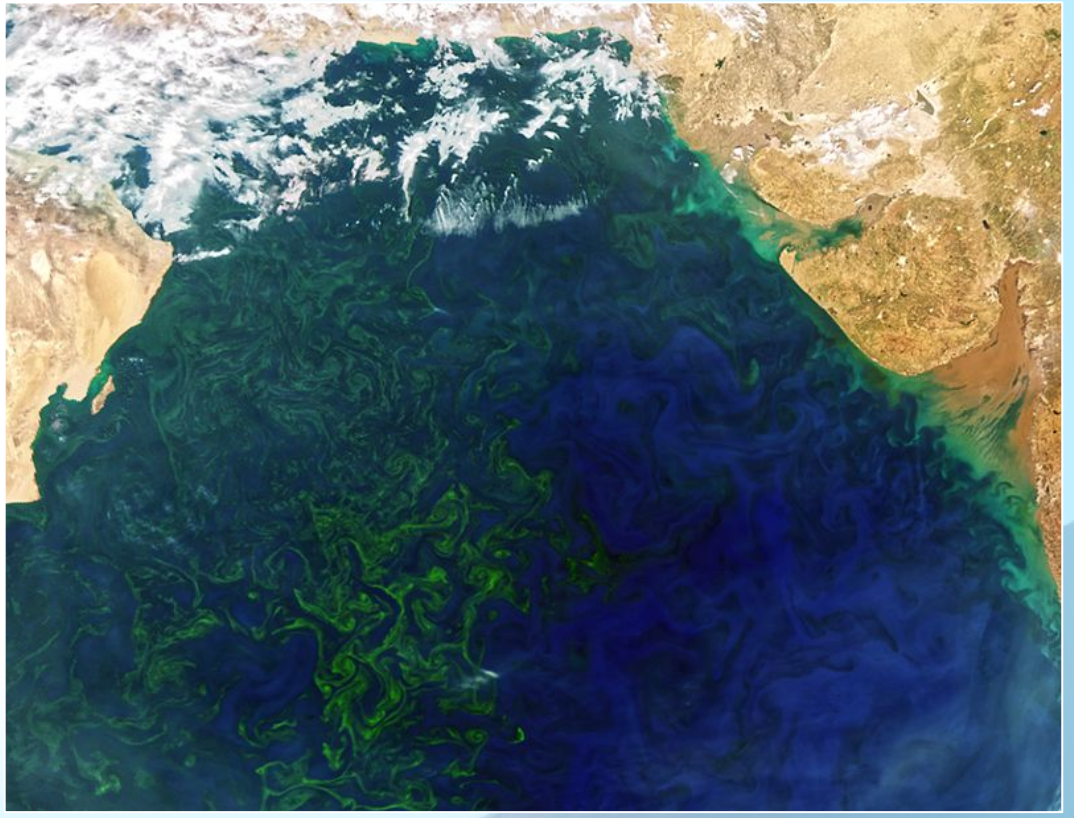
Need: Development of a global mechanism to identify harmful algal blooms (HABs)

Solution: Automated algal bloom hotspot product based on satellite data from multiple ocean color sensors

- MODIS-Aqua, VIIRS NPP, JPSS-1,2, OLCI-Sentinel-3, and PACE; commercial systems may be considered
- Uses a merged chlorophyll product to monitor coastal waters and large lakes
- Applies an existing statistical method based on 30-day running average to identify global anomalous chlorophyll conditions
- Can be tailored to regional conditions and local end-user needs

Impact:

- Provides earlier awareness of potential HABS, supporting efforts to mitigate or avoid threats to human health, fisheries, and water resources



Noctiluca bloom in the Arabian Sea

Links

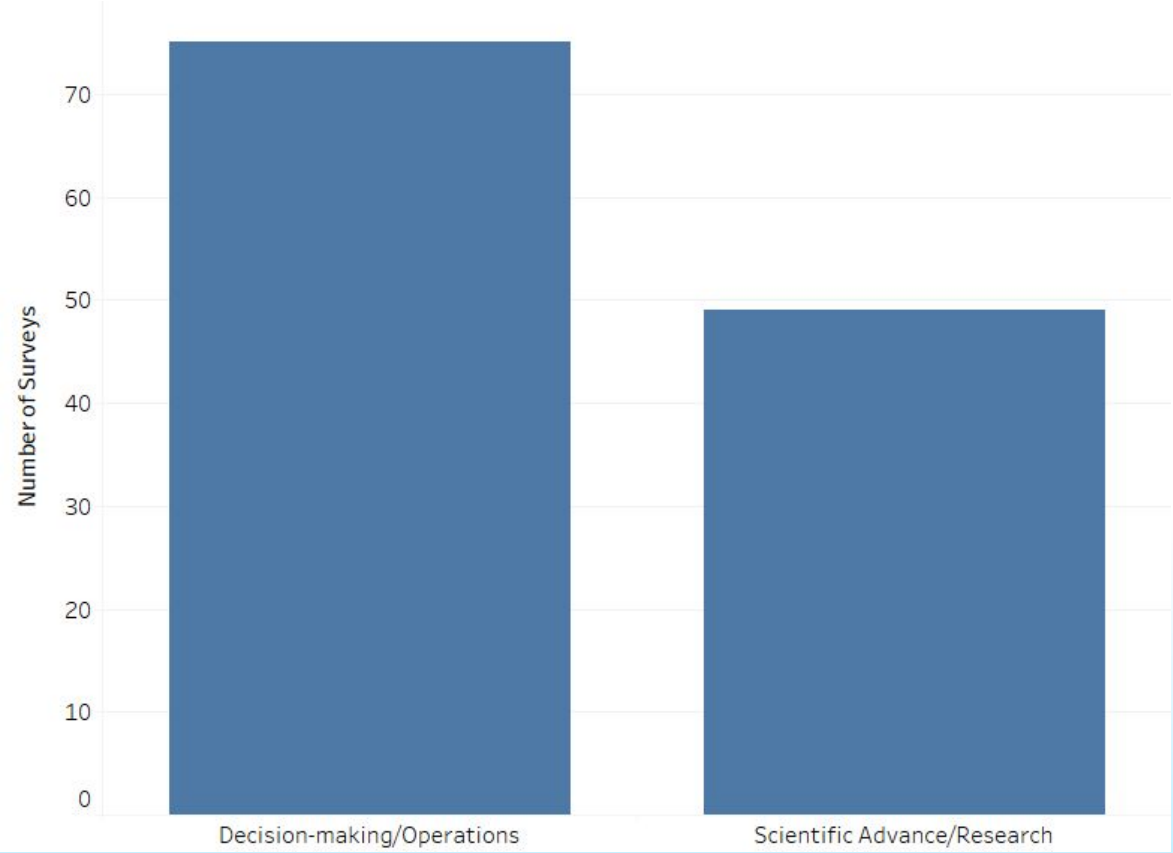
GABAN

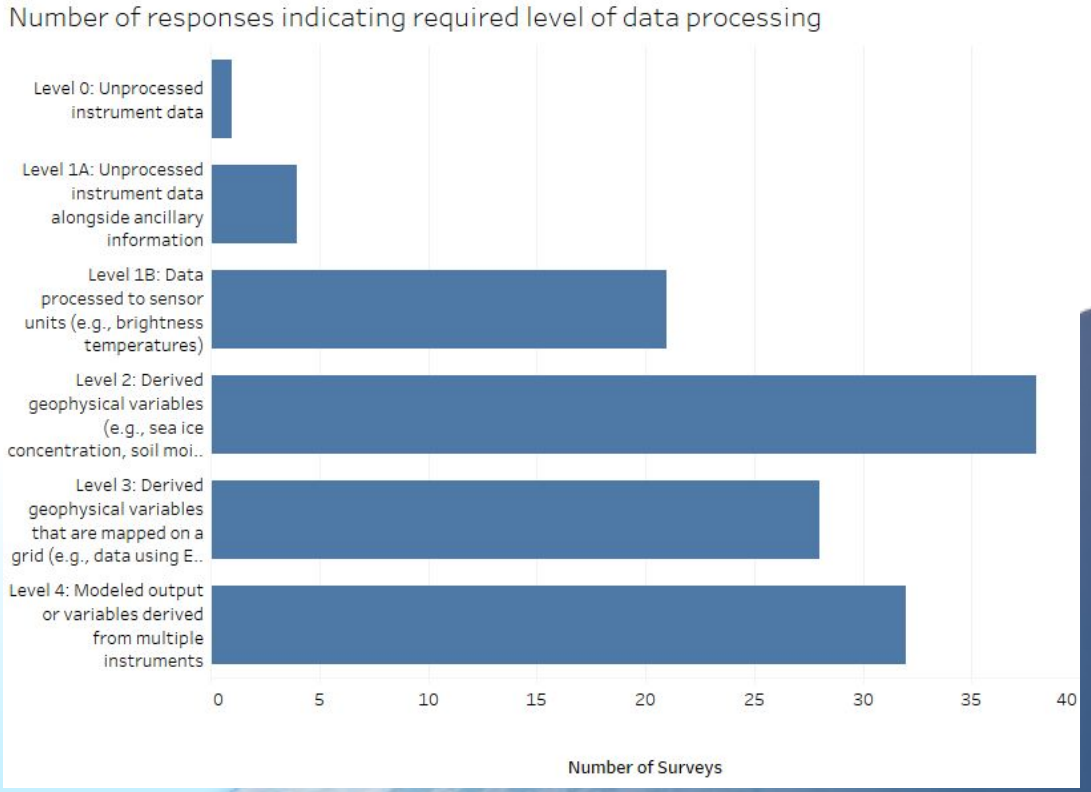


Themes from the 2024 Survey Findings

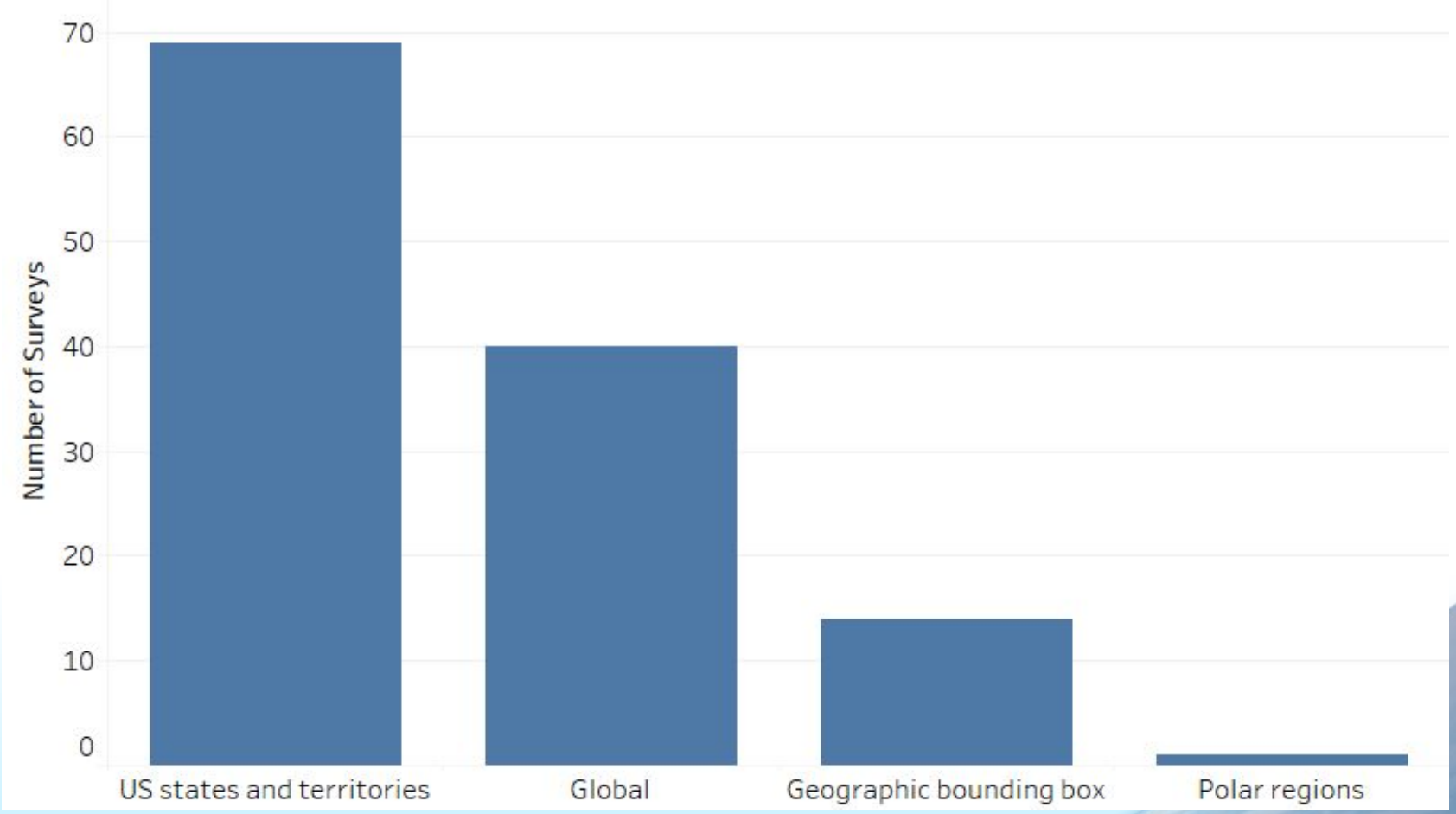
For more information, see here
(2024 Aggregate Statistics Report)

Decision-making and operational requirements constituted 60% of identified needs, often necessitating high-level data products such as gridded datasets harmonized from observations of multiple satellites.



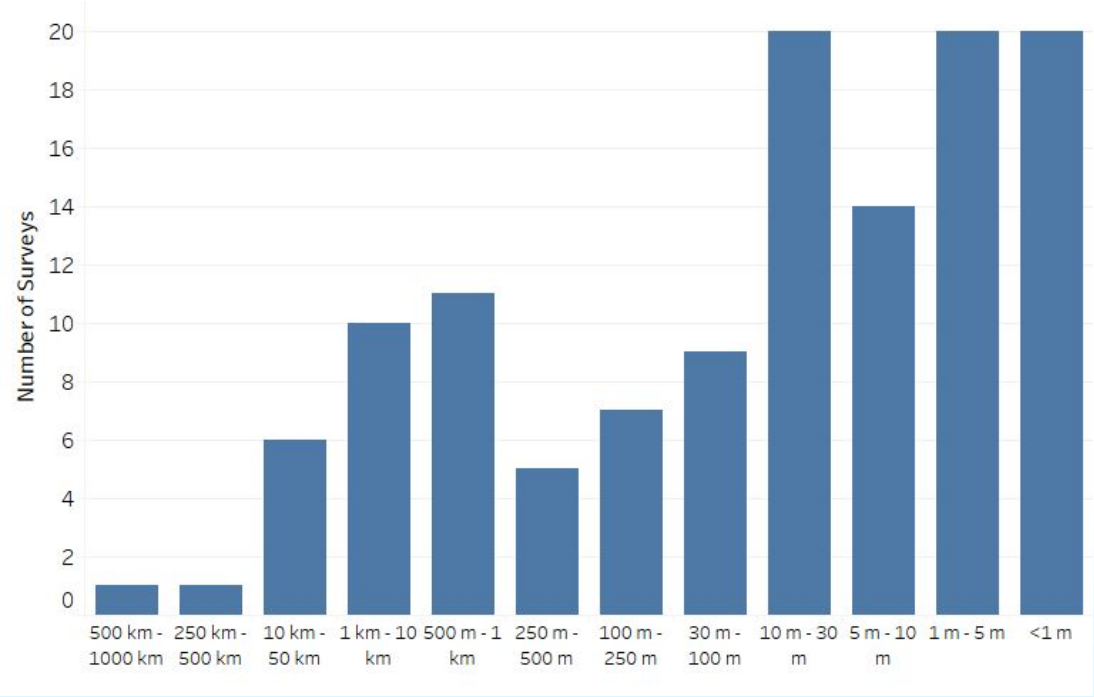


Geographically, the majority of requests were focused on U.S. states and territories, with about one-third requesting global imagery.

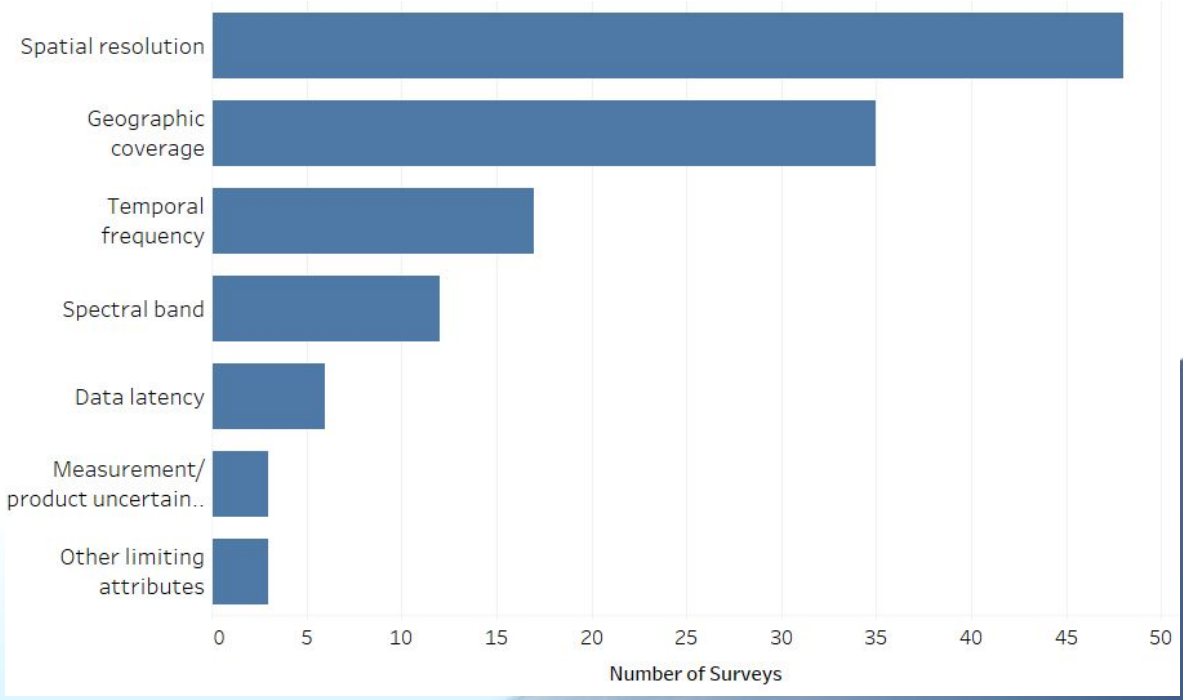


Horizontal spatial resolution remained the most critical attribute to agencies, with a broad need for 10-30 m to <1 m spatial resolution data.

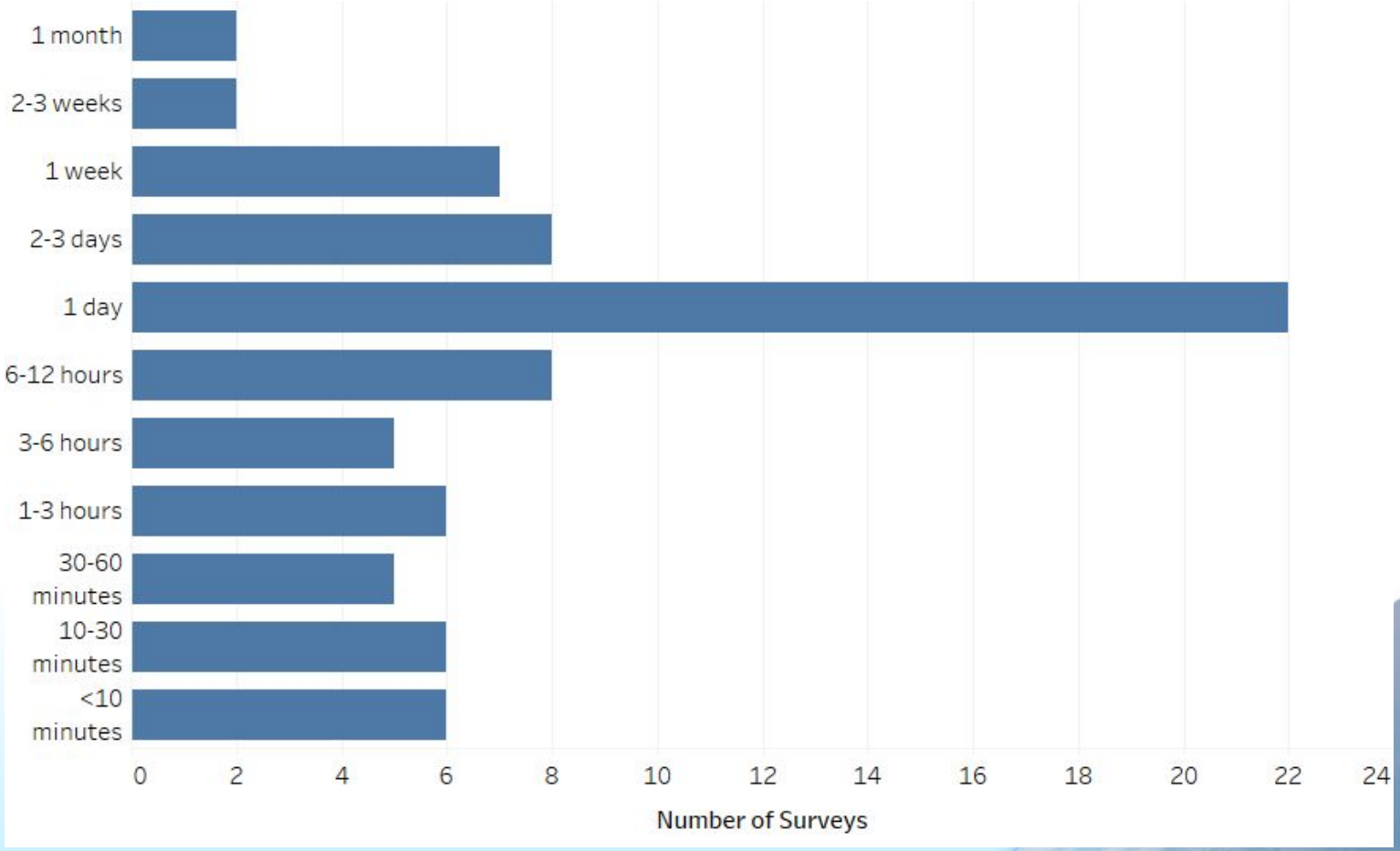
What is the optimal horizontal spatial resolution to meet your need?



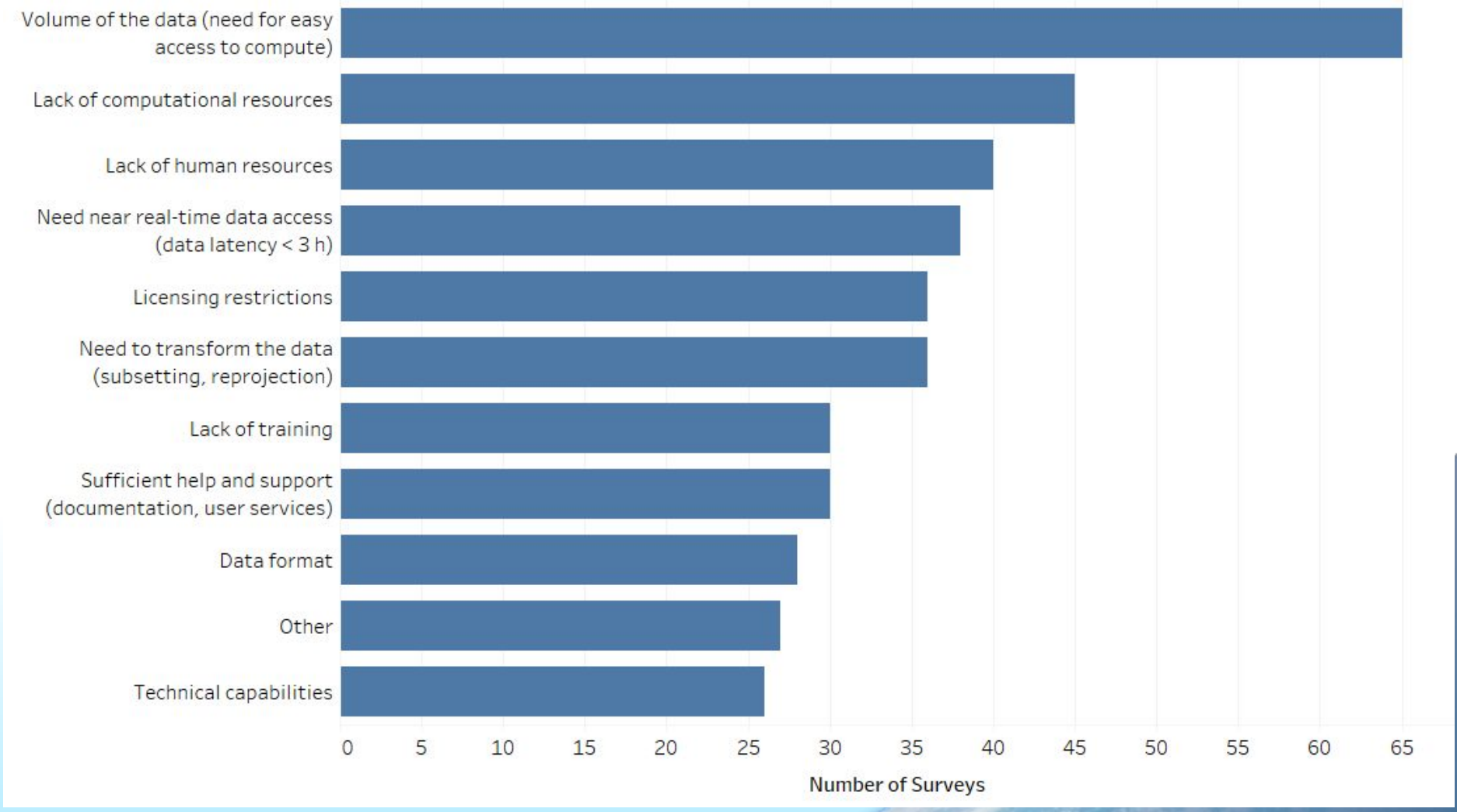
Which attribute is most important for to fill you satellite need?



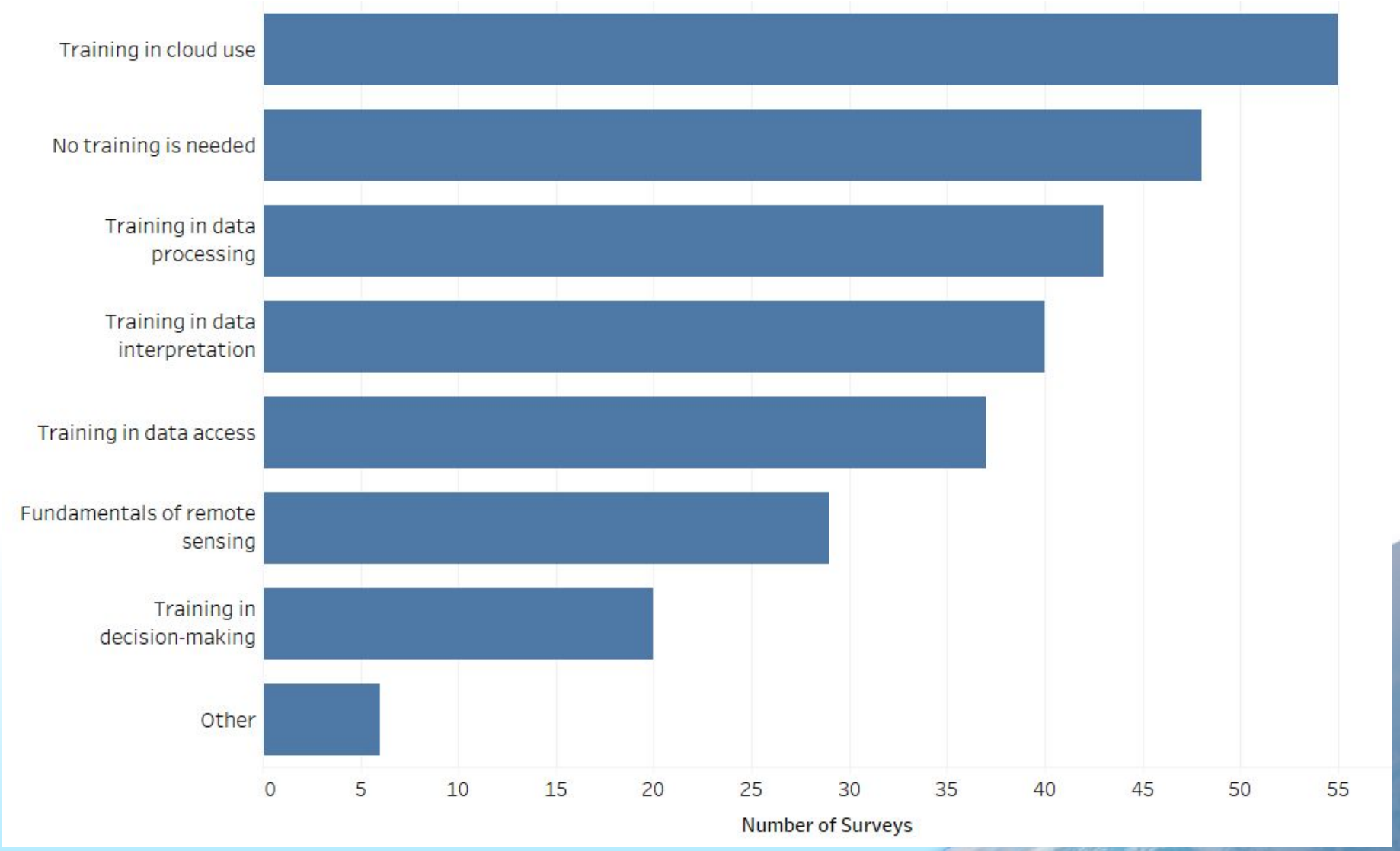
Daily data and one-day latency remained the most common requests, although one-third of submissions continued to request sub-daily frequency and latency.



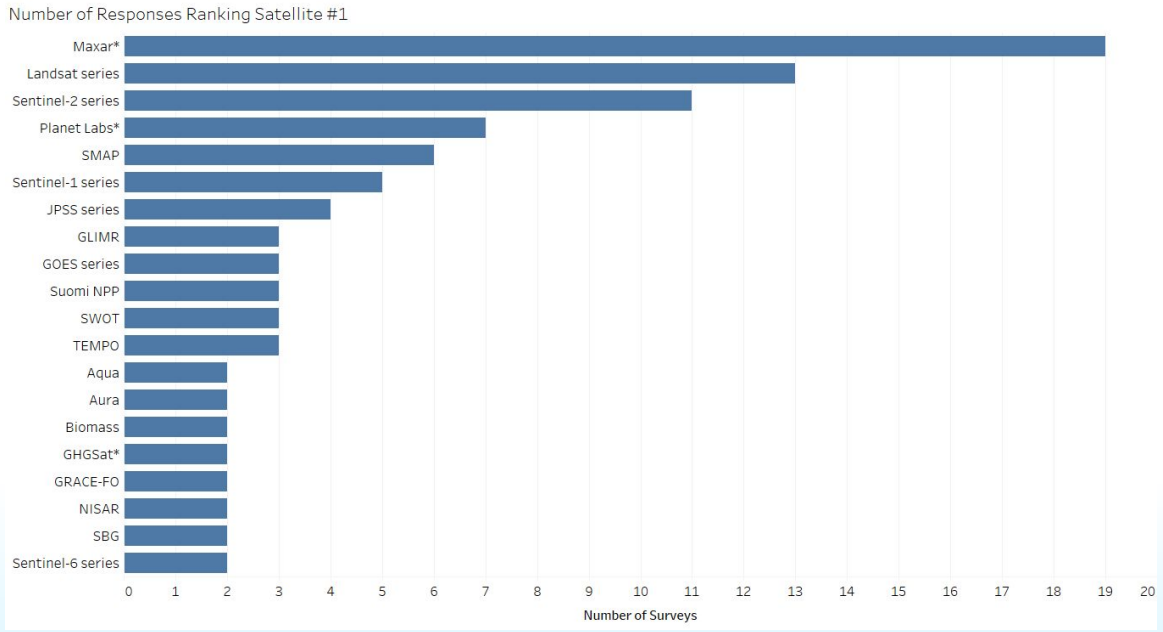
Across cycles, data volume remained the most commonly cited obstacle to the use of satellite data, followed by lack of computational and human resources.

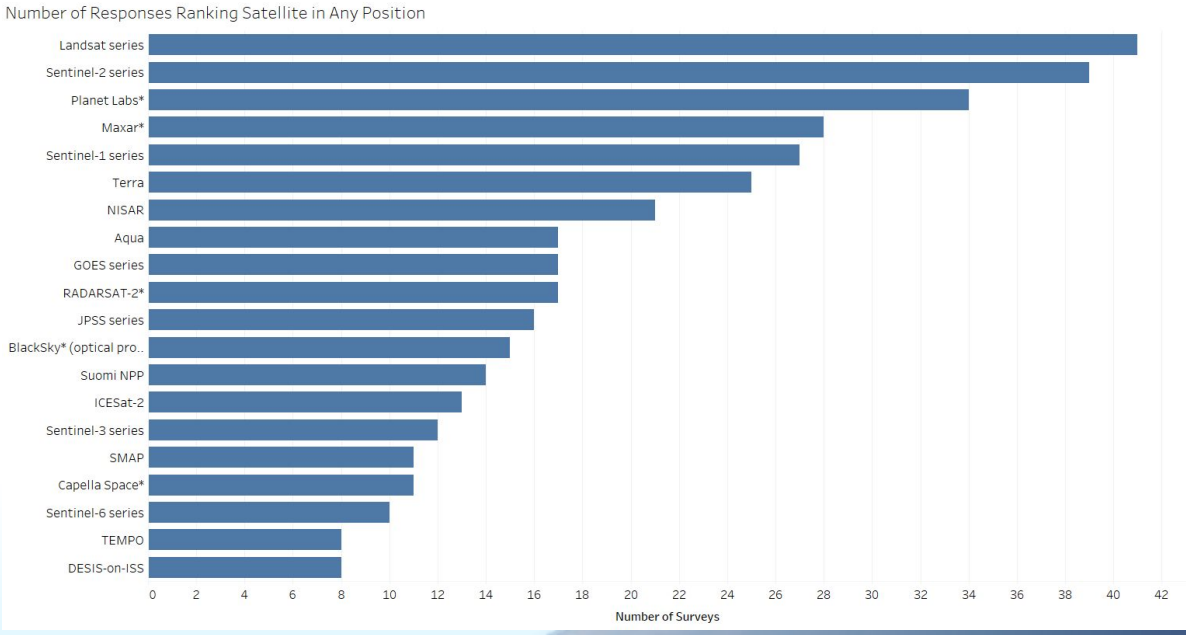


Training in cloud use (44% of surveys), data processing (35%), and data interpretation (32%) were the most-requested training needs.



Optical imagery from the Landsat and Sentinel-2 satellite series continued to be most-identified by agencies as helpful in meeting their needs, with 33% and 31% percent of responses indicating use or interest in these missions respectively. Additionally, over 27% of responses indicated an interest in commercial satellite optical imagery.

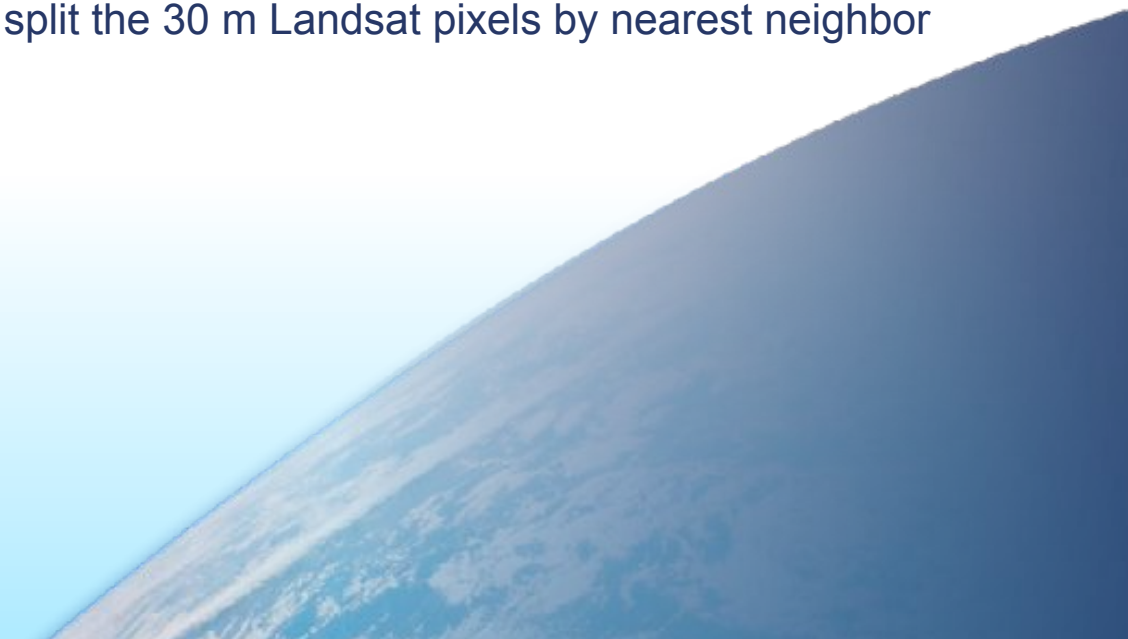




Synthesis of Needs from 2024 Survey

Summarized Needs in Terrestrial Applications: Optical Data at 10 m Spatial Resolution and Daily Temporal Resolution

- In the 2024 SNWG cycle, spatial resolution remained the most critical attribute to agencies. A need exists for routine wall-to-wall collection of optical data at 10 m (or less) spatial resolution and daily or near-daily temporal resolution at low latency, and with a geometric and radiometric quality of Landsat and Sentinel-2.
- The data needs to be analysis-ready (atmospherically corrected, projected, and georeferenced, or “gridded”) and free of charge with an open data policy. The data requested is similar to the data from Landsat and Sentinel-2 but at finer resolutions. This could be addressed by a new mission or by harmonizing/fusing data from multiple sensors.
- Note that no current datastream or product fully meets this requirement: Planet data is not free and the quality is low; Sentinel-2 provides data at 10 m but at insufficient temporal resolution; the upcoming Harmonized Landsat and Sentinel-2 (HLS) product at 10 m spatial resolution will split the 30 m Landsat pixels by nearest neighbor resampling rather than achieving 10 m spatial fidelity.



Summarized Needs in Atmosphere/Weather Applications: Atmospheric Soundings and Temperature/Moisture Profiling

- Agencies need high-resolution vertical profiles of temperature, moisture, and thermodynamic properties for multiple purposes, including operational weather forecasting and numerical weather prediction, prediction of high-impact phenomena (tropical cyclones, mesoscale convective events, severe local storms), and monitoring of rapidly evolving temperature and moisture gradients preceding storm development and intensification, and for planetary boundary layer studies and cloud lifecycle characterization.
- The spatial resolution requirements are 10-50 km (1-10 km preferred for severe weather) horizontally and 100 m to 1 km vertically.
- Required temporal frequency is multiple soundings per hour at a desired latency of <10 minutes, particularly for rapidly evolving severe weather.



Summarized Needs in Water-related Applications: Ocean Color and Coastal Water Quality Monitoring

- Multiple agencies need high-frequency, high-resolution observations of coastal water properties for real-time monitoring and forecasting of water-quality related variables including Chlorophyll-a concentration, Colored Dissolved Organic Matter (CDOM), Harmful algal blooms (HAB), Macroalgae (Sargassum), Oil spill.
- Of importance is the required spatial resolution of 10-30 m with a preference for 10 m to reduce mixed pixels, and a daily or near-daily temporal resolution.
- The data latency requirement is ≤ 1 day.



Summarized Needs in Water-related Applications: Bathymetry and Coastal Topographic Mapping

- Agencies need detailed seafloor and coastal topography information in support of safe navigation, especially after storms, and for lidar mission planning. The desired spatial resolution is 10-30 m. This need is associated with water quality needs for integrated coastal monitoring.
- In addition, detection of shoreline change with water level corrections requires Topobathymetric DEMs (TBDEM) at 1-3 m horizontal spacing with <1 m vertical accuracy for U.S. coastlines.
- The need to could be addressed by acquiring high-resolution optical stereo imagery at 5-10 m resolution (multispectral) or 2-3 m (panchromatic) with 30-40 degree convergence angle, combined with ICESat-2 green lidar.



Other Summarized Needs: Near Real-Time Processing Algorithm Optimization

- Latency is critically underserved. Many stakeholders need sub-hour to same-day delivery for operational decisions depending on the application.
- Users and partners should dictate what algorithm enhancement or near real-time data is needed for what purpose.
- Disaster response and agricultural applications in particular have unmet needs that require near real-time data products.



Other Summarized Needs: Specialized Applications Tools for New Missions

- Users face challenges to adopt data from new missions such as PACE, EMIT, and NISAR given that these involve new capabilities (i.e., SAR and hyperspectral data).
- There is a demand for decision support tools and applications that will increase the accessibility of new mission data, particularly for new users.
- The community has requested generalizable, transferable algorithms and/or user-friendly tools or interfaces for non-expert federal users. These should be co-developed together with users and simultaneously increase capacity to use new mission data for applications.



For more information, contact:

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Satellite Needs Program Manager and NASA Principal to SNWG
NASA Headquarters

Visit the NSITE website to learn more about solutions

https://www.earthdata.nasa.gov/data/projects/nsite





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