



National Aeronautics and
Space Administration

NASA earth

CESAS Meeting | April 3, 2025

Earth Science Division Highlights

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Director

Earth Science Division



Agenda

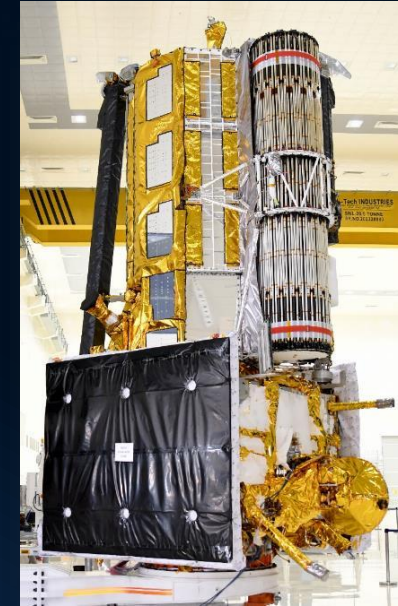
- **Flight: Mission Milestones**
- **Research & Analysis: Discovery**
- **Earth Action: Useful, Useable Science**
- **ESTO: Innovations in Tech**
- **Earth Science Data Systems: Stewardship & Accessibility**
- **Telling our Earth Science Stories**

The background of the slide is an aerial photograph of a river delta, likely the Amazon, showing a complex network of blue water channels and green land. A semi-transparent blue overlay covers the left and bottom-left portions of the image. A dark blue horizontal band runs across the center, containing the title text.

Flight: Mission Milestones

NISAR (NASA-ISRO Synthetic Aperture Radar)

- Joint Earth-observing mission between NASA and the Indian Space Research Organization (ISRO)
- NISAR successfully completed NASA's Operational Readiness Review in Nov 2024 indicating its readiness for launch & operation
- NISAR successfully completed ISRO's Pre-Ship Review in Feb 2025 indicating readiness for shipment to the launch site
- Launch expected in 2025
- NISAR will help NASA meet Decadal Survey Surface Deformation and Change observations



Fully integrated and tested, NISAR satellite is in temporary storage at the UR Rao Satellite Center (URSC) in Bangalore, India. It will be shipped to the Satish Dhawan Space Center (SDSC) in Sriharikota, India, for integration with the GSLV MK II, rocket for launch.



Luce

- Luce is a lidar mission led by the Agenzia Spaziale Italiana (the Italian Space Agency or ASI) with a projected launch in 2032
- NASA's planned contributions to the Luce mission include:
 - the lidar detector system
 - ground station communication via the NASA Near Space Network (NSN)
 - lidar science algorithm development and support
- The lidar will be comprised of a 3-wavelength laser, with 8 receiver channels, providing high-SNR backscatter lidar observations and first-ever measurements of laser-induced Raman scattering and fluorescence from space
- The mission will address the Decadal Survey's ACCP science measurements identified for the AOS lidar instrument

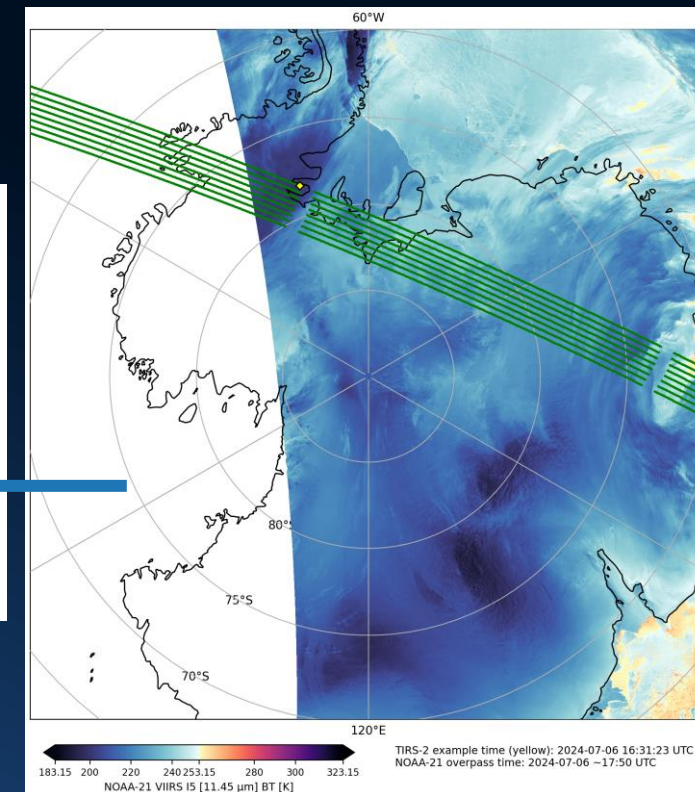
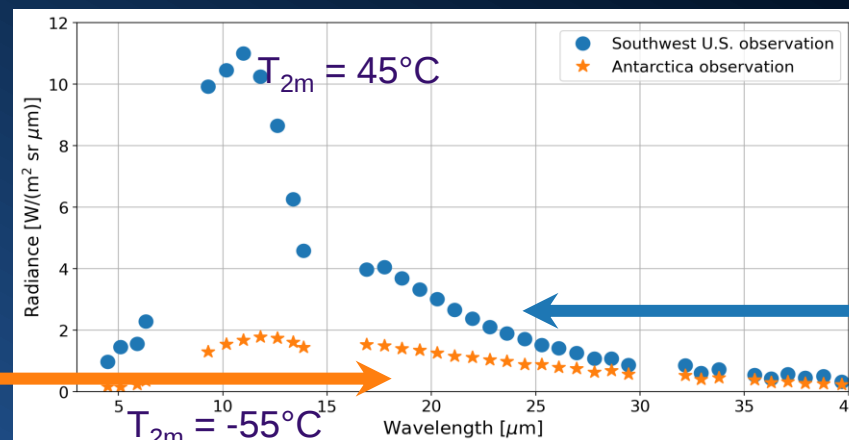
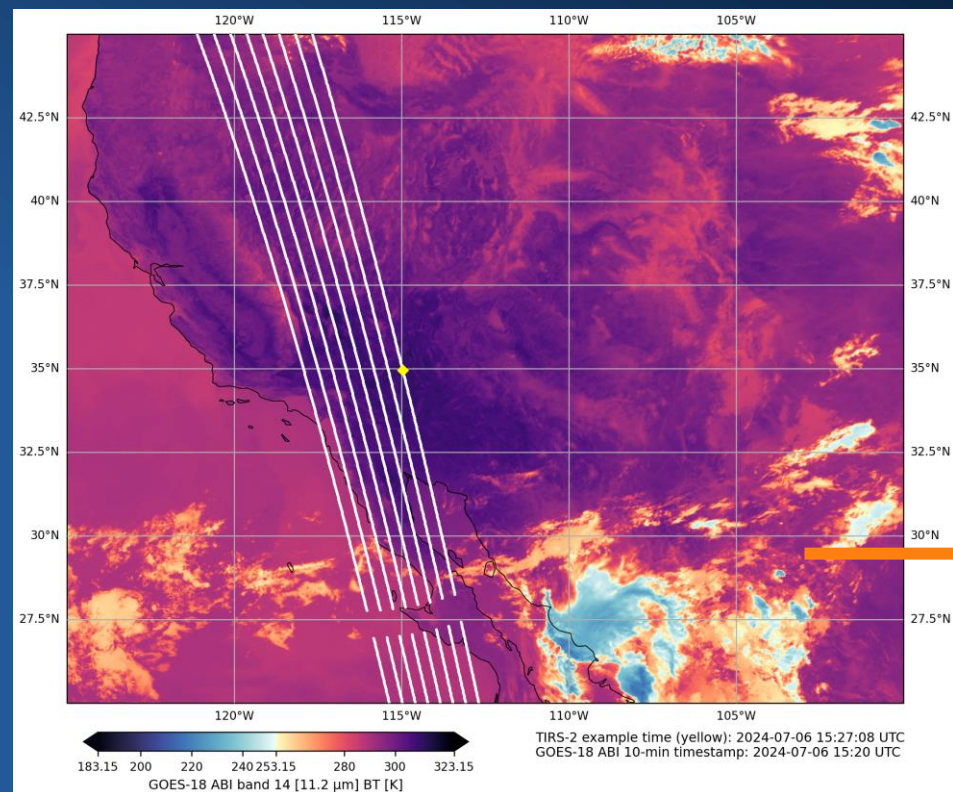


PREFIRE makes the first systematic global measurements of far infrared radiation

Extreme heatwave in the
Southwestern U.S.

Mid-winter in Antarctica

Emission Spectra Spanning
100°C in One Orbit



Earth Science Flight Opportunities (FY25)

Mission	Mission Type	Release	Selection	Major Milestone
EVS-1 (EV-1) (AirMoss, ATTREX, CARVE, DISCOVER-AQ, HS3)	5 Suborbital Airborne Campaigns	2009	2010	Completed KDP-F
EVM-1 (CYGNSS)	Class D SmallSat Constellation	2011	2012	Launched December 2016
EVI-1 (TEMPO)	Class C Geostationary Hosted Instrument	2012	2012	Launched April 2023
EVI-2 (ECOSTRESS & GEDI)	Class C & Class D ISS-hosted Instruments	2013	2014	Launched June & December 2018
EVS-2 (ACT-America, ATOM, NAAMES, ORACLES, OMG, CORAL)	6 Suborbital Airborne Campaigns	2013	2014	Completed KDP-F
EVI-3 (MAIA & TROPICS)	Class C LEO Hosted Instrument & Class D CubeSat Constellation	2015	2016	MAIA Delivery 2022; TROPICS Launched in May 2023
EVM-2 (GeoCarb)	Class D Geostationary Hosted Instrument	2015	2016	Cancelled
EVI-4 (EMIT & PREFIRE)	Class C ISS-hosted Instrument & Class D Twin CubeSats	2016	2018	EMIT launched to ISS July 2022; PREFIRE launched May/June 2024
EVS-3 (ACTIVATE, DCOTSS, IMPACTS, Delta-X, SMODE)	5 Suborbital Airborne Campaigns	2017	2018	All in post-deployment phase.
EVI-5 (GLIMR)	Class C Geostationary Hosted Instrument	2018	2019	Delivery NLT 2024
EVC-1 (Libera)	Class C JPSS-Hosted Radiation Budget Instrument	2018	2020	Delivery NLT 2025
EVM-3 (INCUS)	Class D SmallSats	2020	2021	Launch ~2027
EVI-6 (PoSIR)	Class D CubeSats	2022	2023	Delivery NLT 2027
EVS-4 (FORTE, INSPYRE, HAMAQ, LACCE, Snow4Flow, FarmFlux)	Suborbital Airborne Campaigns	2023	2024	Selections announced April 2024
ESE (STRIVE, ODYSEA, EDGE, Carbon-I)	Explorer Mission	2023	2025	Launch ~2030 & ~2032; step-1 selections announced May 2024
AOS-Cloud	Radar cloud and convection profiling mission	2025	2027	Launch ~2031; Community Announcement released April 2024
EVX*	Orbital instrument, mission, or continuity	2026	2027	Launch ~2032
EVS-5	Suborbital Airborne Campaigns through ROSES	2027	2028	N/A
EVX*	Orbital instrument, mission, or continuity	2028	2029	Launch ~2034
ESE	Explorer Mission	2029	2031	Launch ~2037
EVX*	Orbital instrument, mission, or continuity	2030	2031	Launch ~2036

EVS
Sustained sub-orbital investigations (~4 years)

EVX
Small-size orbital instruments and missions (~2 years)

ESE
Medium-size orbital instruments and missions (~3 years)

Open solicitation/In review

Completed solicitation

*EVX Mission type will be dictated by PoR needs when AO is released.

This fits into ESD strategy for portfolio flexibility and resilience

An aerial photograph of a river delta, likely the Amazon, showing a complex network of channels and islands. The land is green, and the water is a deep blue. A semi-transparent blue overlay covers the left and bottom portions of the image, creating a layered effect.

Research & Analysis: Discovery

NASA Earth Science Forecasts Support Crewed Spaceflight Returns

For Crew Dragon, Orion, or any future human spaceflight vehicles, NASA relies on Goddard Earth Observing System (GEOS) forecast data to ensure safe and precise Entry, Descent, and Landing (EDL) simulations by the NASA Engineering Safety Center (NESC). Atmospheric conditions, such as wind speeds, turbulence, and temperature variations, throughout the atmosphere significantly impact a spacecraft's return to Earth.

NASA Earth Science global missions provide the only information to ensure safer and more reliable landings for astronauts returning from space. The GEOS forecasts produced by the GMAO (Global Modeling and Assimilation Office) leverage a broad set of Earth science mission observations to provide this critical data for human spaceflight.

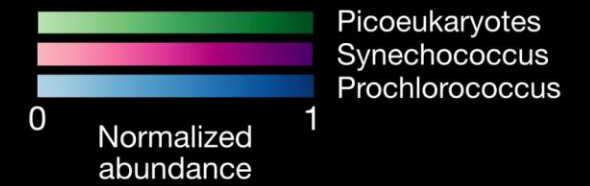
GEOS Data Improves EDL Simulations:

- Accurate Landing Predictions
- Enhanced Crew Safety
- Adaptive Mission Planning
- Informed Decision-Making





RELATIVE DOMINANCE OF INDIVIDUAL PLANKTON GROUPS

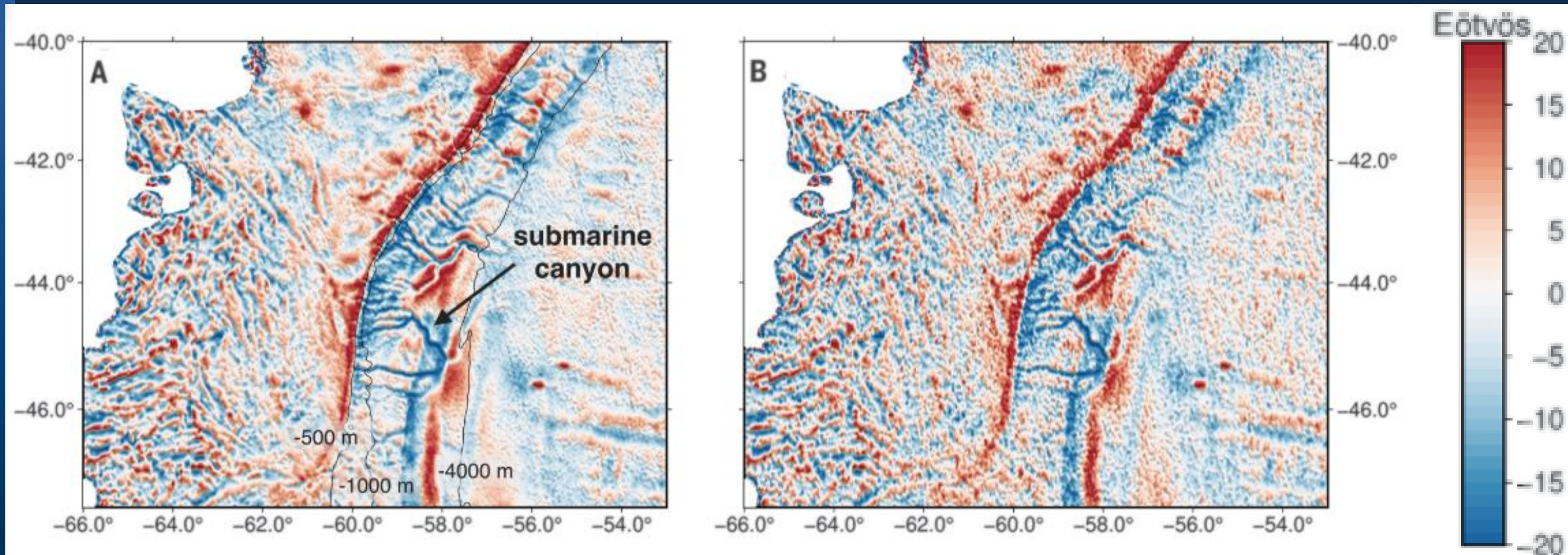


Mar 2024

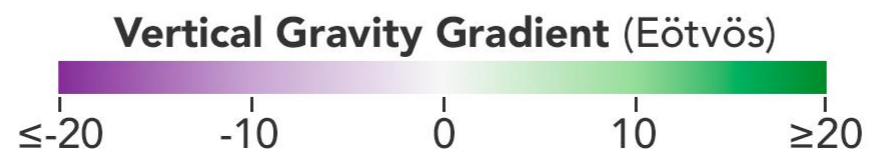
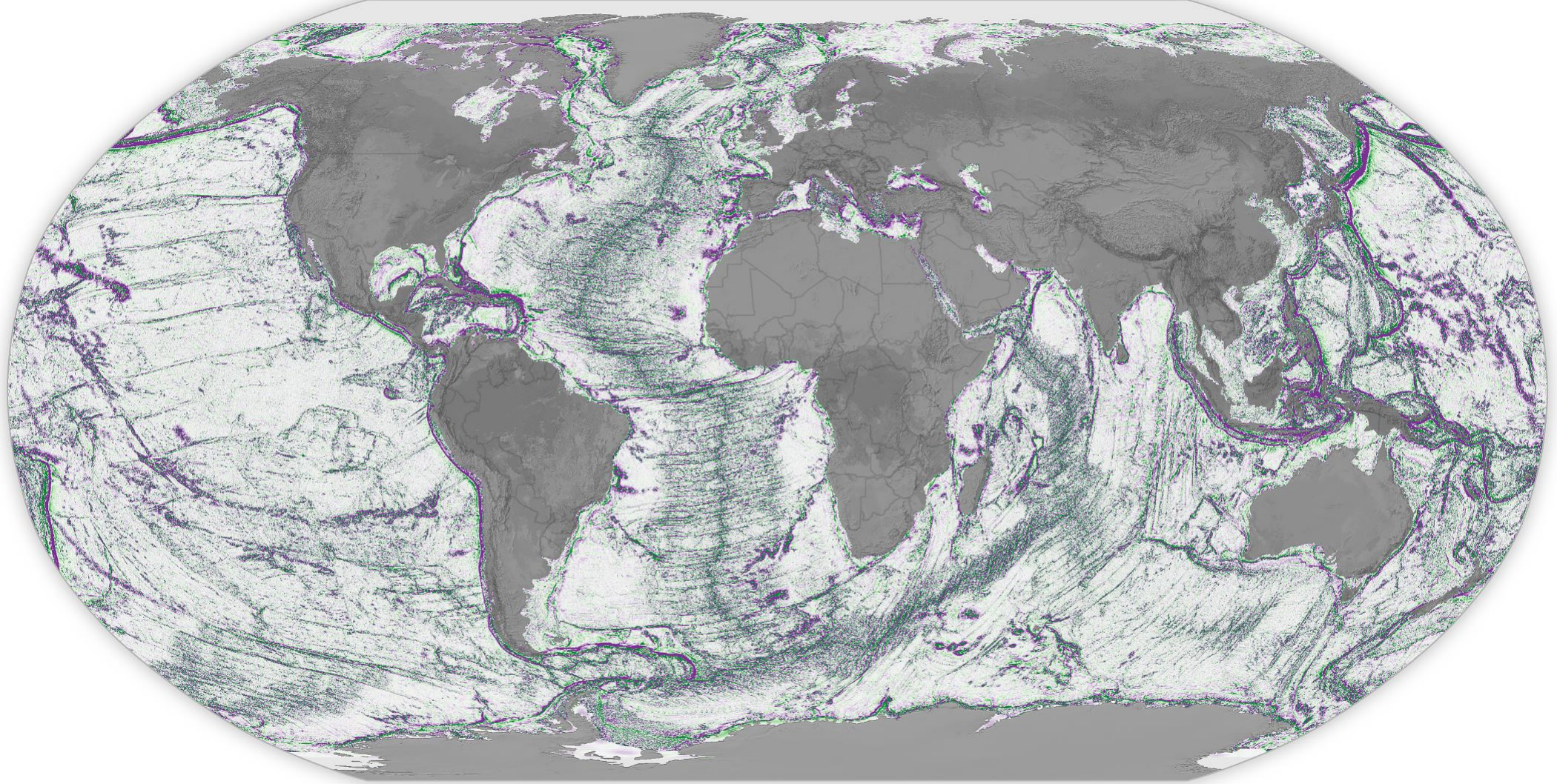
MOANA algorithm PACE - OCI

One Year of SWOT Data Offers More Detailed Info than 30 Years of Satellite Nadir Altimetry

Vertical Gravity Gradient



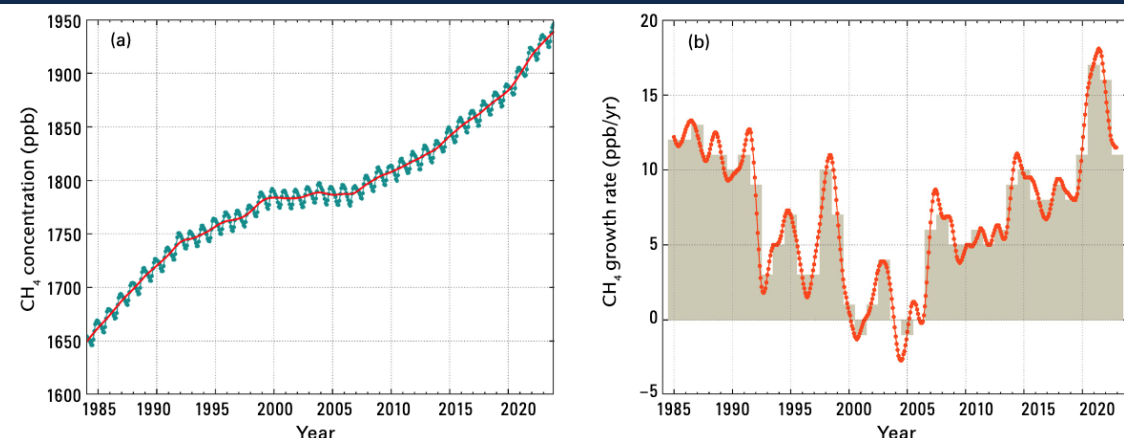
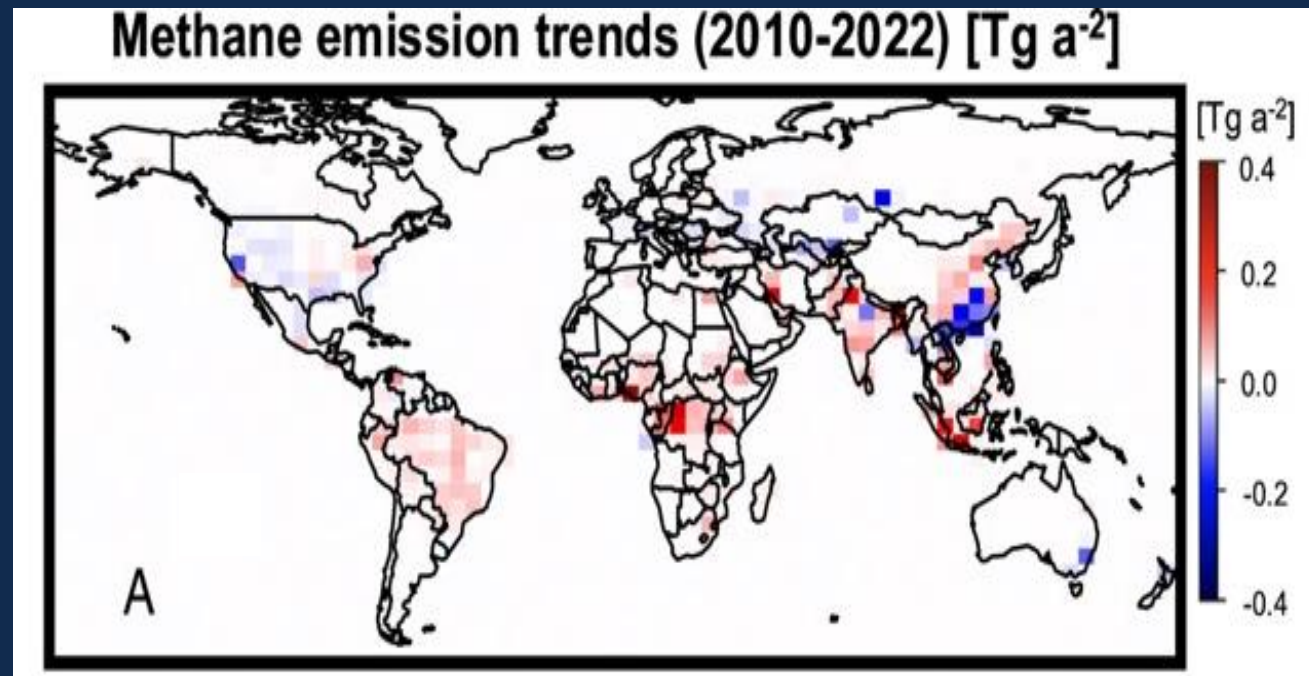
Yao Yu et al., *Abyssal marine tectonics from the SWOT mission*. *Science* 386,1251–1256(2024).
DOI:10.1126/science.ads4472



Increased wetland activity in tropics – not increased fossil fuel extraction – likely cause of global methane rise

- After a lull in the growth of CH_4 concentrations, emissions have steadily increased afterwards
- Analysis of CH_4 retrieved from GOSAT suggest all the increase in trends are occurring in the tropics
- GRACE shows increases in tropical total water storage in that same time period
- The trends are small to negative in fossil fuel production regions of the world
- Changes in tropical land use and agriculture practices are a likely significant contributor

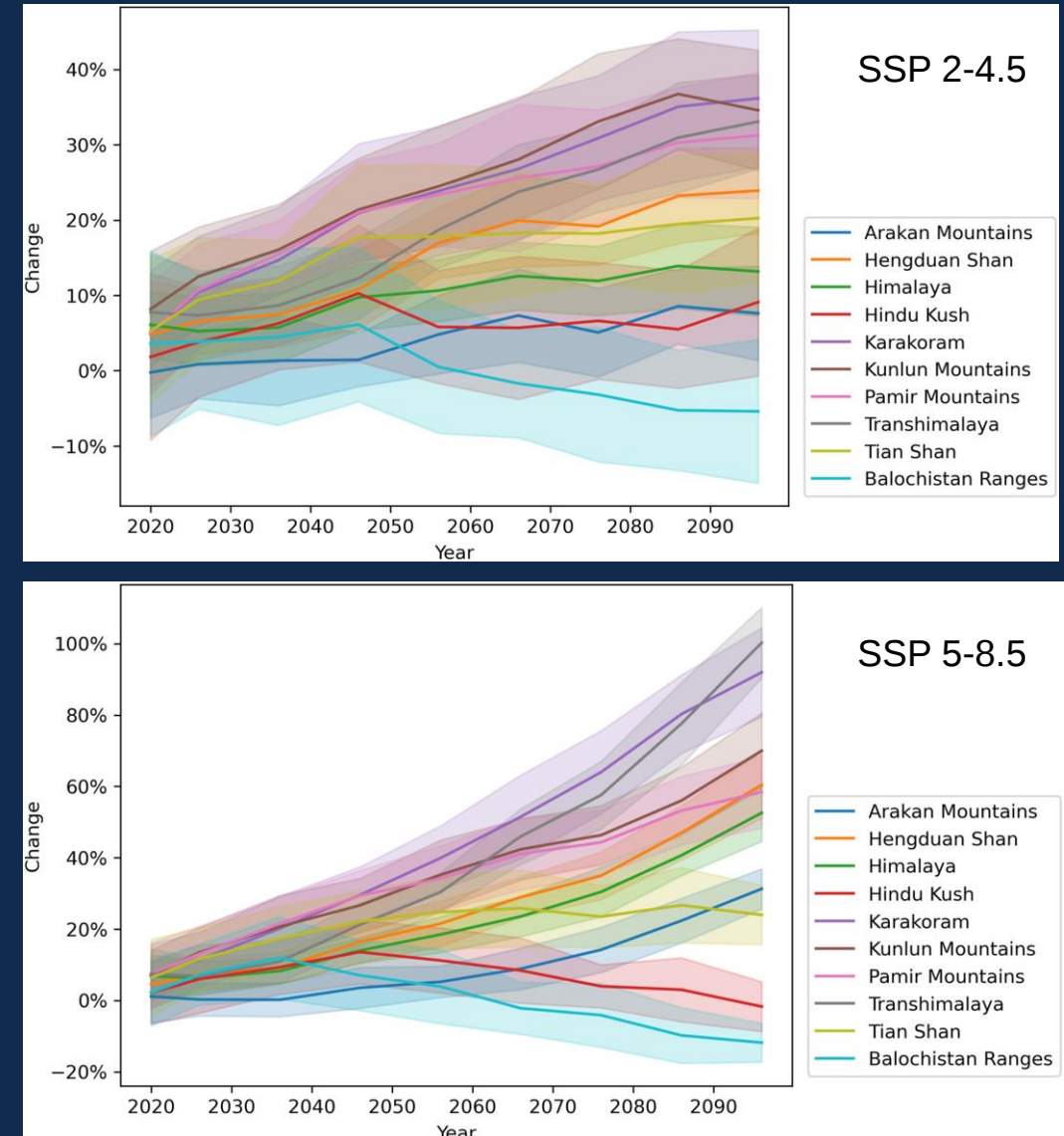
Z. Qu, D. J. Jacob, A. A. Bloom, J. R. Worden, R. J. Parker, and H. Boesch
PNAS 2024 121 (40),
<https://www.pnas.org/doi/10.1073/pnas.2402730121>



Landslide hazard is projected to increase across High Mountain Asia

- Landslide hazards triggered by rainfall will increase in every major mountain range at some point in the twenty-first century
- Result implies need for continued vigilance by engineers, planners, and emergency responders across High Mountain Asia
- Potential changes mapped under two scenarios:
 - development along current lines; and
 - development that is heavily dependent on the use of fossil fuels

Stanley, T. A., Soobitsky, R. B., Amatya, P. M., & Kirschbaum, D. B. (2024) Earth's Future, 12, e2023EF00432
<https://doi.org/10.1029/2023EF004325>



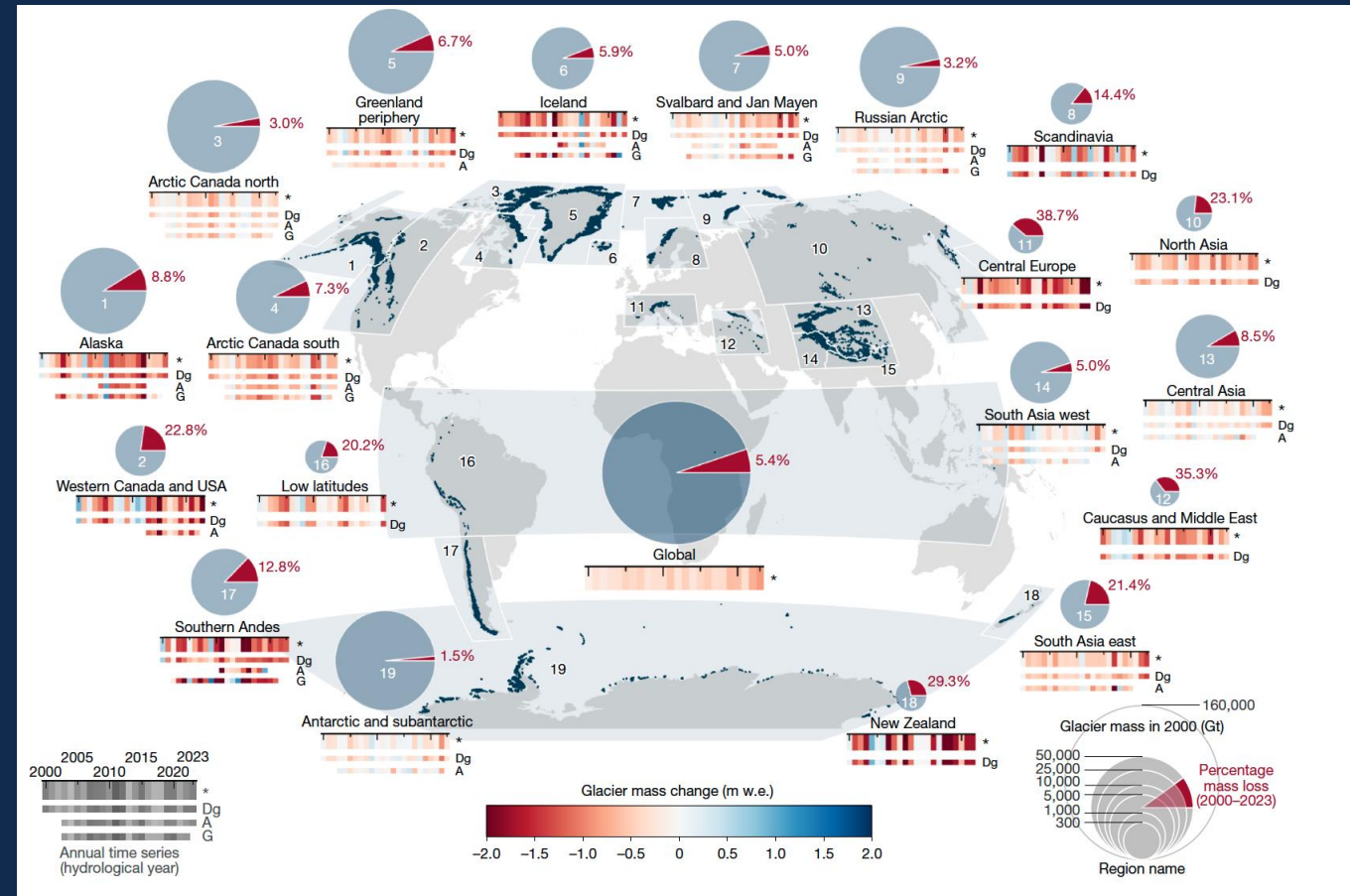
Change in the Landslide Hazard Indicator for most major mountain ranges relative to the base period 1990–2014. Shaded areas represent one std dev.

Community estimate of global glacier mass changes from 2000 to 2023

Melting of glaciers represents a significant loss of regional freshwater resources, a major contribution to rising sea levels as well as a driver of local geohazards

Globally glaciers contain 1% of global land ice, with the remaining 99% held in the Greenland and Antarctic ice sheets

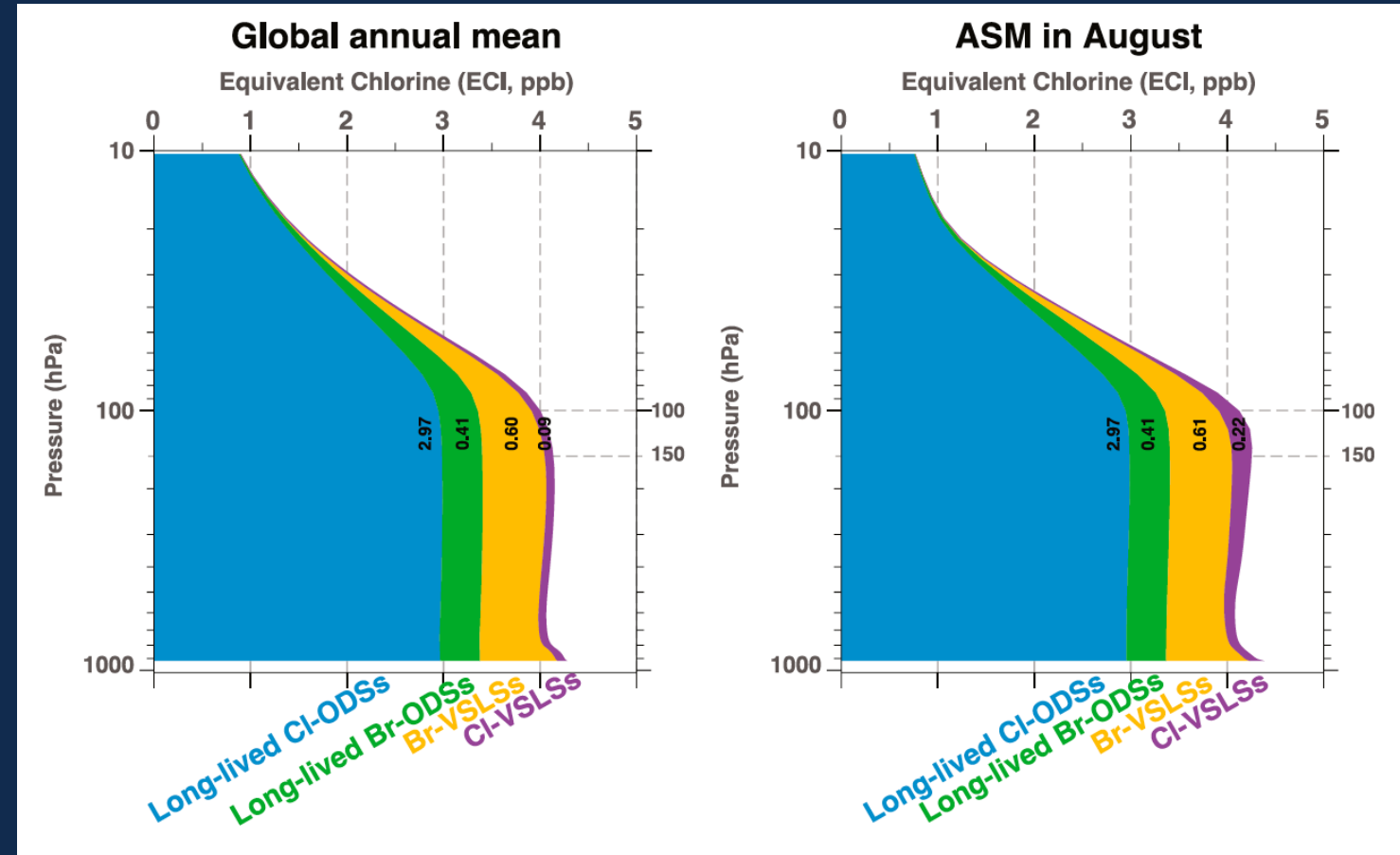
Between 2000 and 2023 glaciers lost over 6,500 gigatons of mass, twice the amount lost from the Antarctic ice sheet, with the largest regional losses coming from Alaska



Estimates of the changes in glacier mass at regional to global scales derive from NASA satellites and instruments: ICESat-2, GRACE, GRACE-FO, ASTER and GEDI, as well as the MEaSUREs ITS_LIVE data product

Asian Summer Monsoon Anticyclone – The Primary Entryway for Chlorinated Very-Short-Lived Substances to the Stratosphere

- Rapid growth in developing nations is increasing the rate of chlorinated very-short-lived substances – specifically, dichloromethane (CH_2Cl_2)
- This study found that from 2020-2022 these compounds added about 100 pptv to total stratospheric chlorine – about 3.3 percent of total, with only a ~ 1 percent impact of ozone
- However, Asian Summer Monsoon is primary in troposphere-to-stratosphere transport for these molecules

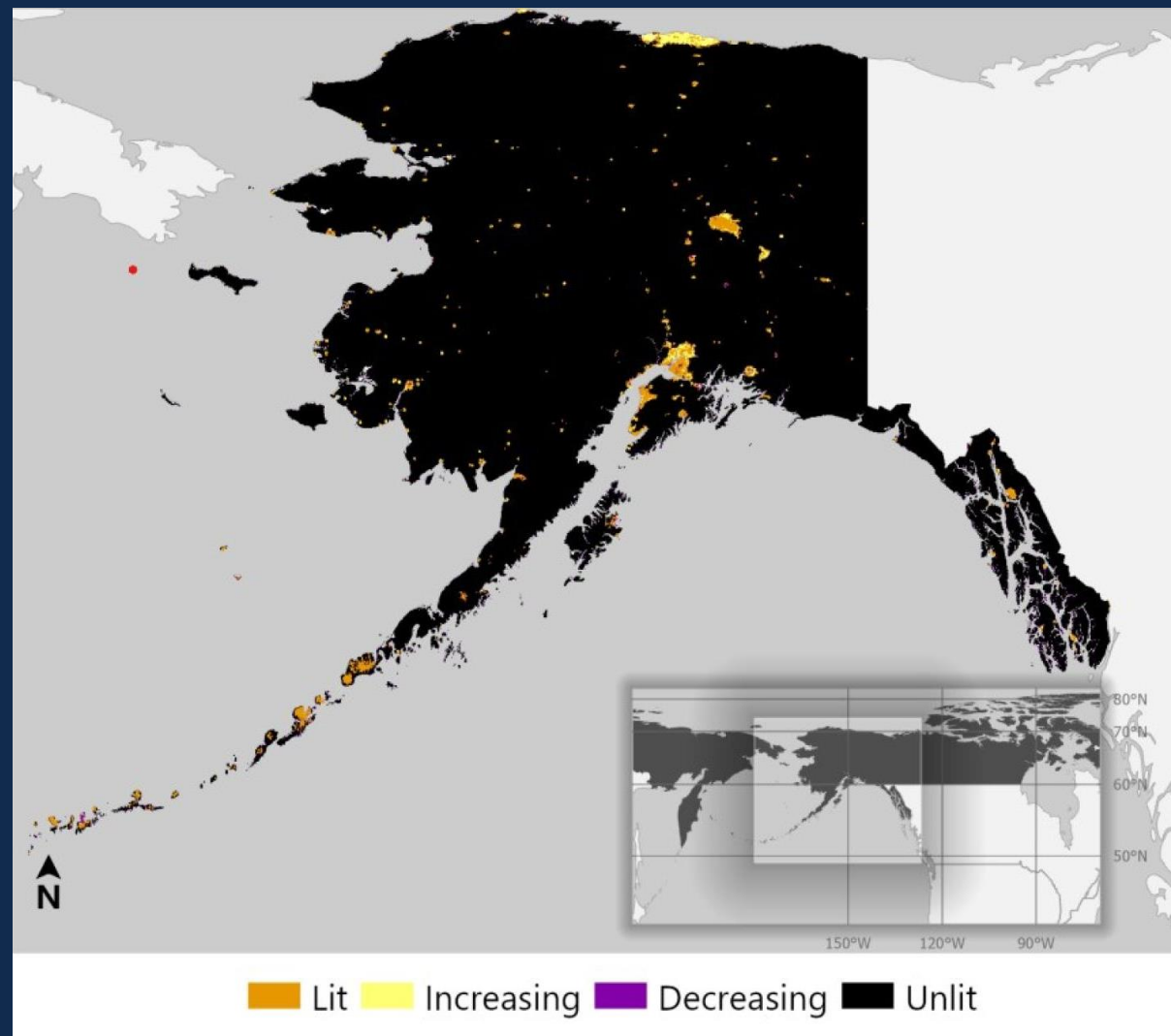


Q. Liang, P. A. Newmn, E. L. Fleming, L. R. Lait, E. Atlas, L. Pan, D. Kinnison, L. M. Westersn, S. Schauffler, K. Smith, V. Treadaway, R. Hendershot, S. Donnelly, and R. Luch, *Geophys. Res. Lett.* 2025, <https://doi.org/10.1029/2024GL110248>

Artificial light at night reveals hotspots and rapid development of industrial activity in the Arctic

As climate warming opens access to the Arctic, there is no comprehensive overview of industrial and urban development

To quantify hotspots and areas of light-emitting human activity, scientists used satellite-derived artificial night light data (from DMSP) across the Arctic from 1992 to 2013

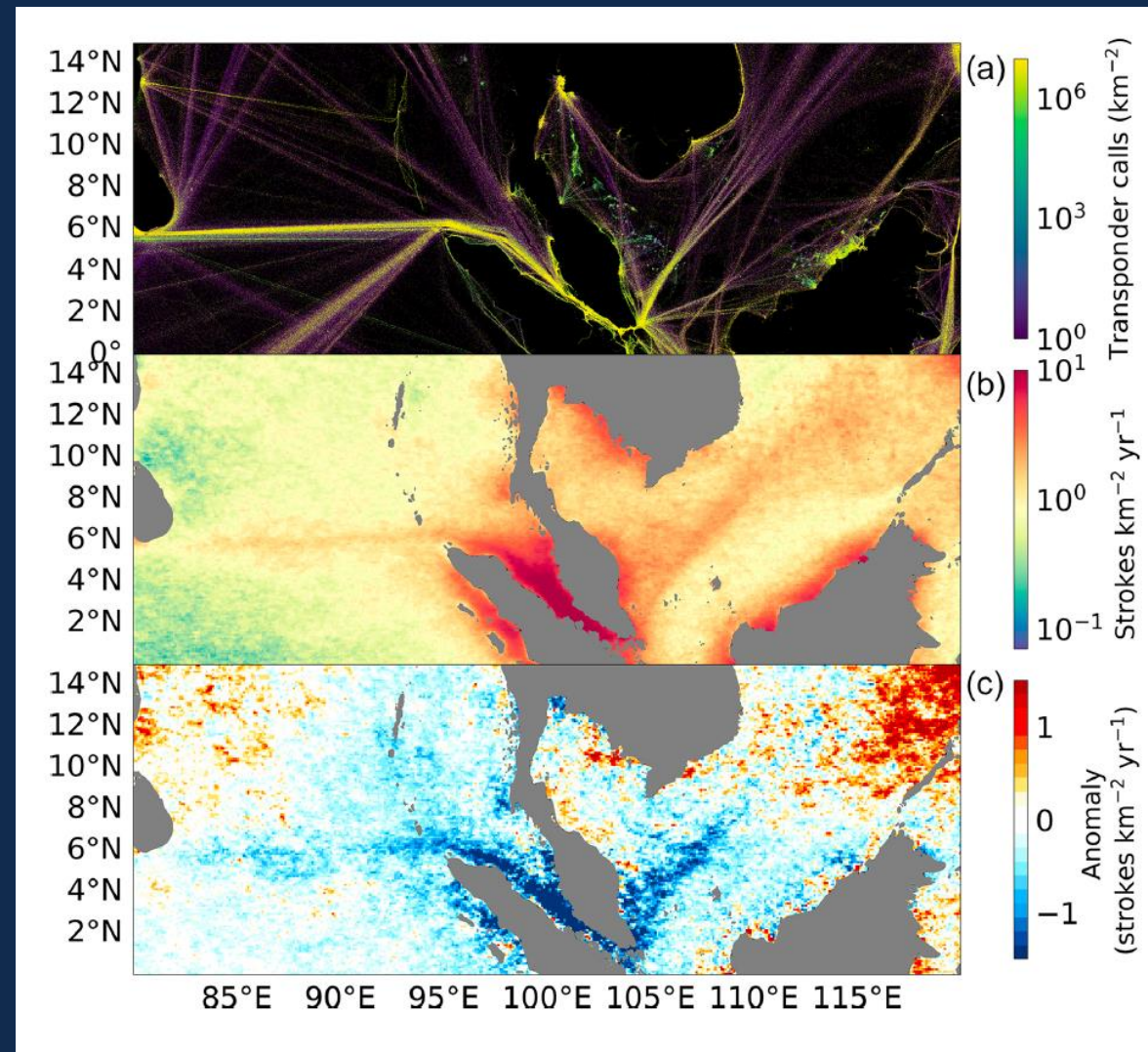


Lightning declines over shipping lanes following regulation of fuel sulfur emissions

In studies of two of the world's busiest shipping corridors, scientists found a significant decrease ($\sim 40\%$) in lightning activity after global policy changes reducing allowable sulfur emissions in maritime shipping

This suggests that the enhanced lightning seen in the ship corridor was at least partially aerosol-enhanced

C. J. Wright, J. A. Thornton, L. Jaegle, Y. Cao, Y. Zhu, J. Liu, R. Jones II, R. Holzworth, D. Raosenfeld, R. Wood, P. Blossey, and D. Kim, *Atmos. Chem. Phys.*, 25, 2937-2946, <https://doi.org/10.5194/acp-25-2937-2025>



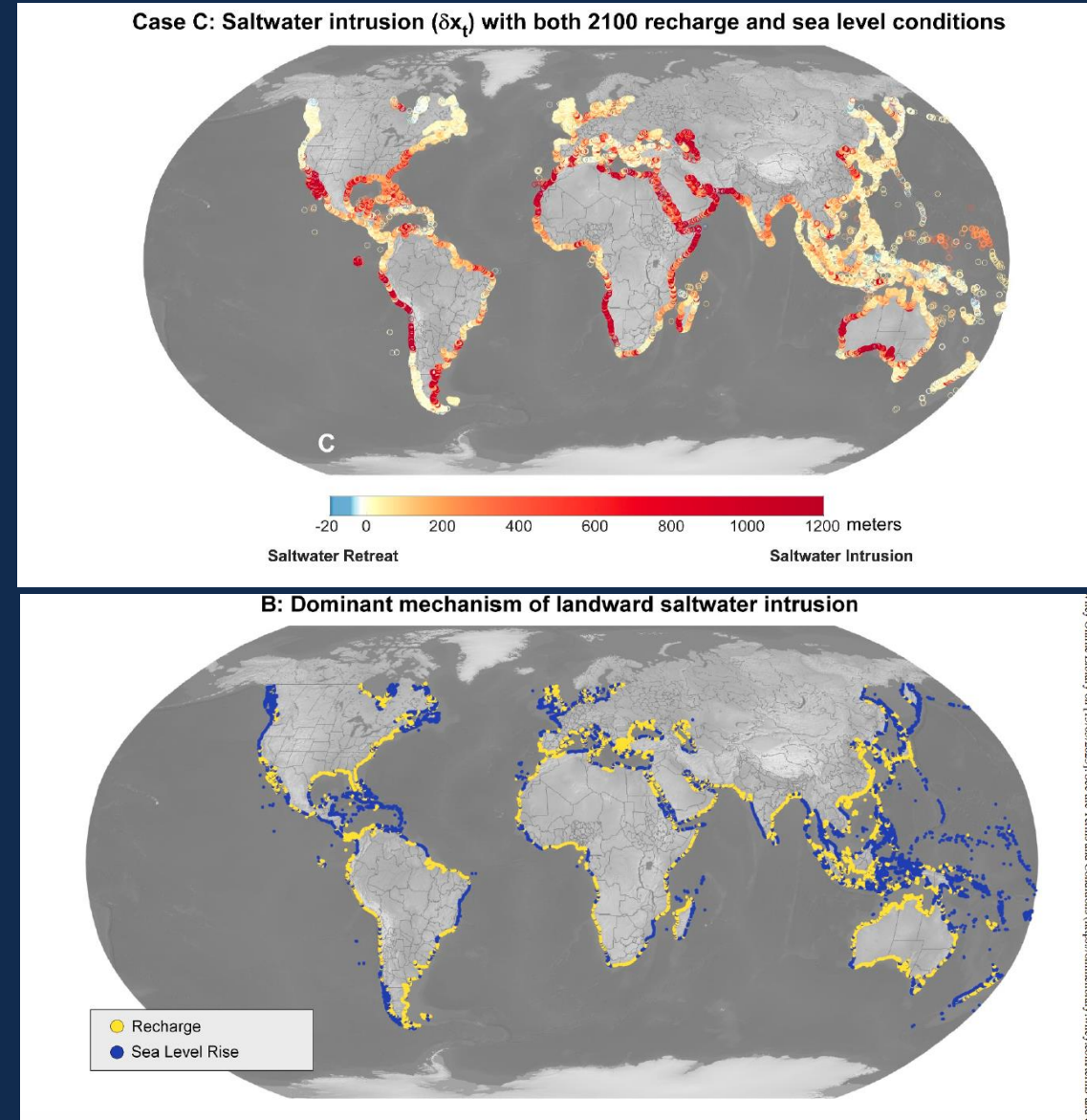
NASA's Earth Science Division's IMERG, MERRA, MODIS, and TRMM instruments contributed to the observations of this discovery.

Climate-Induced Saltwater Intrusion in 2100: Recharge-Driven Severity, Sea Level-Driven Prevalence

Saltwater intrusion is a critical concern for coastal communities due to its impacts on fresh ecosystems and civil infrastructure

The first global assessment of saltwater intrusion risk shows that nearly 77 percent of global coastal areas below 60° north will undergo saltwater intrusion by 2100

K. H. Adams J. T. Reager, B. A. Buzzanga, C. H. David, A. H. Sawyer,
and B. D. Hamlington, 51, e2024GL110359.
<https://doi.org/10.1029/2024GL110359> Geophys. Res. Lett.,

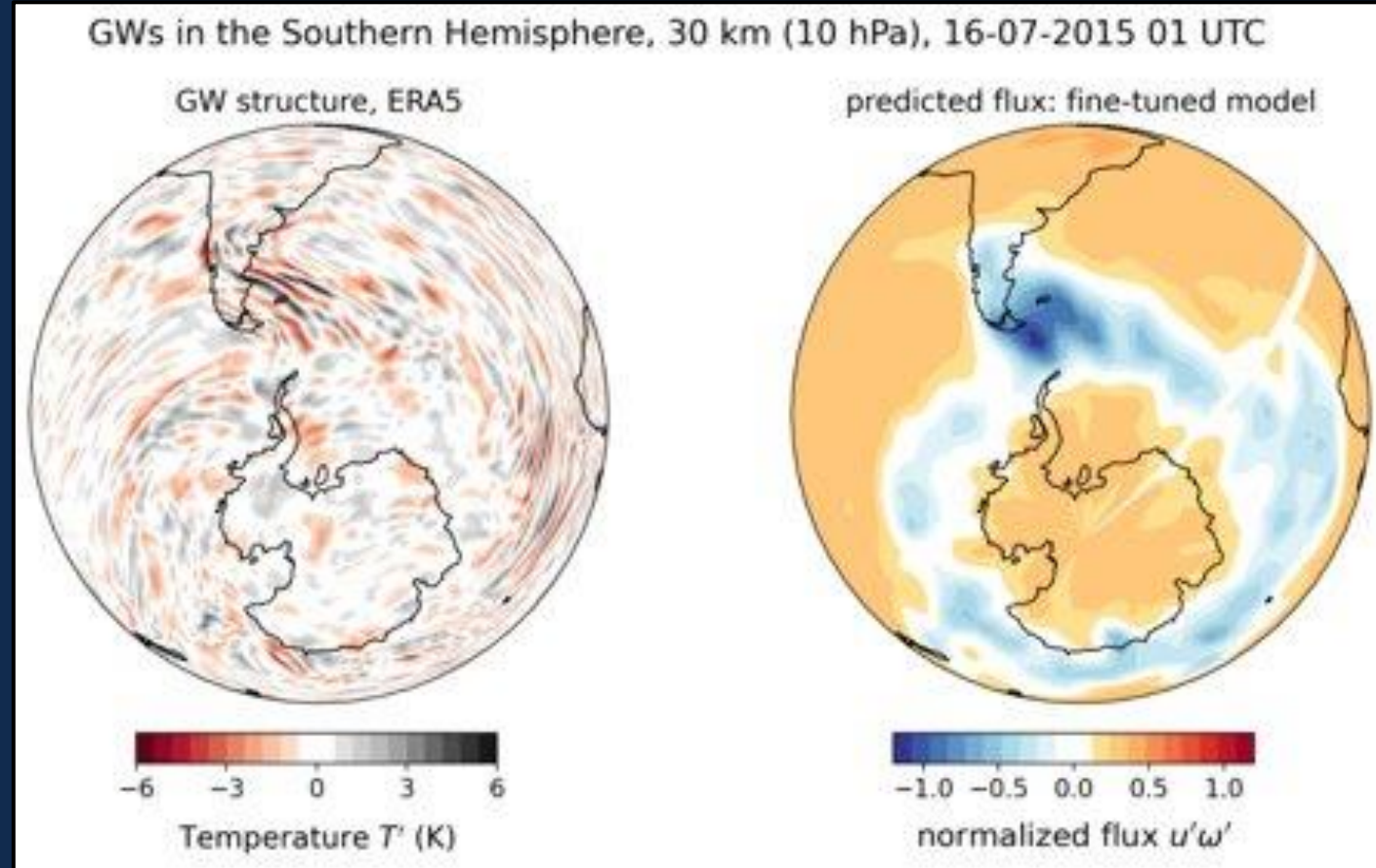


Prithvi WxC: Foundation AI/ML Model for Weather and Climate

Prithvi WxC is a Foundation Model capable of reconstructing atmospheric states from partial data and forecasting future states

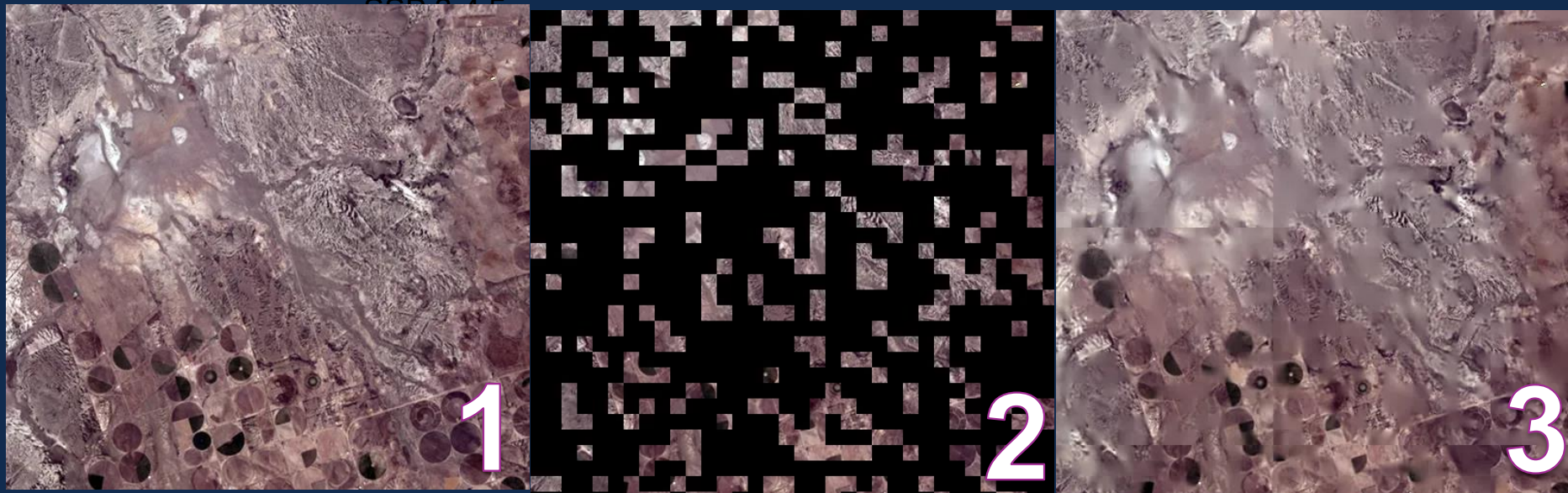
The Prithi ExCmodel:

- 2.3 billion parameters
- Trained on 160 variables provided in the MERRA-2 dataset produced by the Global Modeling and Assimilation Office at GSFC
- Partners: NASA, IBM Research, Oak Ridge National Laboratory, Department of Energy



Gravity wave structure analysis from ERA5 reanalysis and the predicted momentum fluxes from Prithvi WxC model.

Prithvi HLS: A Geospatial Foundation Model



1. Original image

2. Masked image

3. Prithvi HLS constructed image from the masked image

Prithvi HLS is a first of its kind temporal Vision Transformer trained on version 2 of Harmonized Landsat-Sentinel (HLS) dataset over the continental United States

- Uses a self-supervised Vision Transformer (ViT) architecture with a Masked Auto Encoder (MAE) strategy
- Supports downstream applications like burn scar detection, flood segmentation, and land cover classification

Partners: NASA and IBM Research

NASA's Cal/Val as the Global Gold Standard: ESA/JAXA EarthCARE Satellite

EarthCARE launched May 2024 from Vandenberg Space Force carrying four instruments:

- Atmospheric Lidar (ATLID)
- Broad-Band Radiometer (BBR)
- Cloud Profiling Radar (CPR)
- Multi-Spectral Imager (MSI)



Proposed Deployment:
KCG baseline air
pollution station

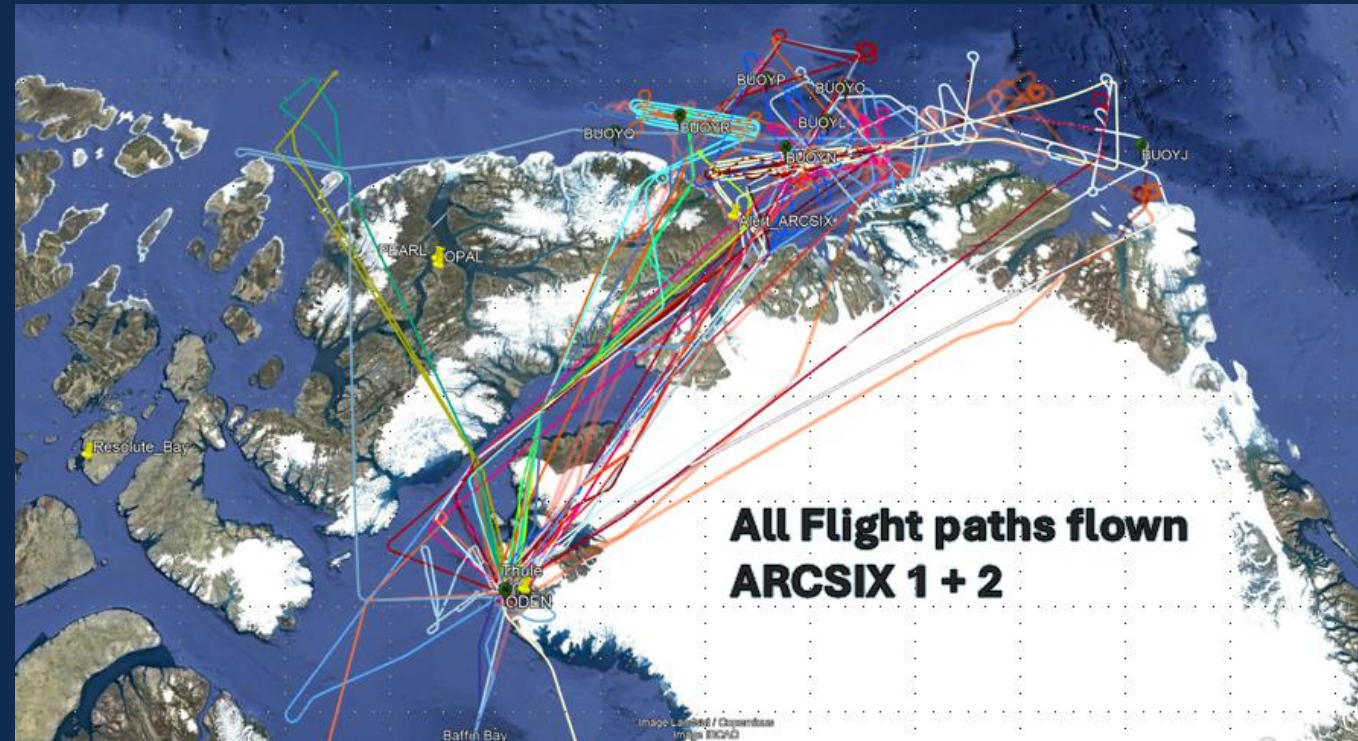


ACHIEVE trailer

Arctic Radiation-Cloud-Aerosol-Surface-Interaction Experiment (ARCSIX)

Late Spring Early Summer 2024 Flights:

- Understand how coupling between radiative processes and sea ice surface properties influence summer sea ice melt
- Understand the processes controlling the predominant Arctic cloud regimes and their properties
- Improve our ability to monitor Arctic cloud, radiation, and sea ice processes from space
- Data processing complete, science just beginning



Airborne Assets:

- Low-flying, in situ platform (P-3), ~175 Flight hours
- High-flying, remote sensing platform (G-III), ~150 Flight hours

Satellite Assets:

- Available passive instruments (e.g., MODIS/VIIRS, CERES)
- Available active instruments (e.g., EarthCARE, ICESat-2)

Modeling Assets:

- Real-time atmosphere and sea ice forecasts and trajectories
- Multi-scale modeling for post-campaign analysis

PACE Postlaunch Airborne eXperiment: An airborne field mission to validate the NASA PACE mission with coordinated observations



The acquired dataset will support the validation of PACE and EarthCARE and also allow for the development of new algorithms, that combine the power of multiple instruments deployed aboard these satellites

PACE-PAX acquired observations of major simultaneous fires in the Los Angeles region, including the Bridge, Line, and Airport fires

Flew September 2024 in California and nearby coastal areas

GLOVE Field Campaign

GSFC Lidar Observation and Validation Experiment

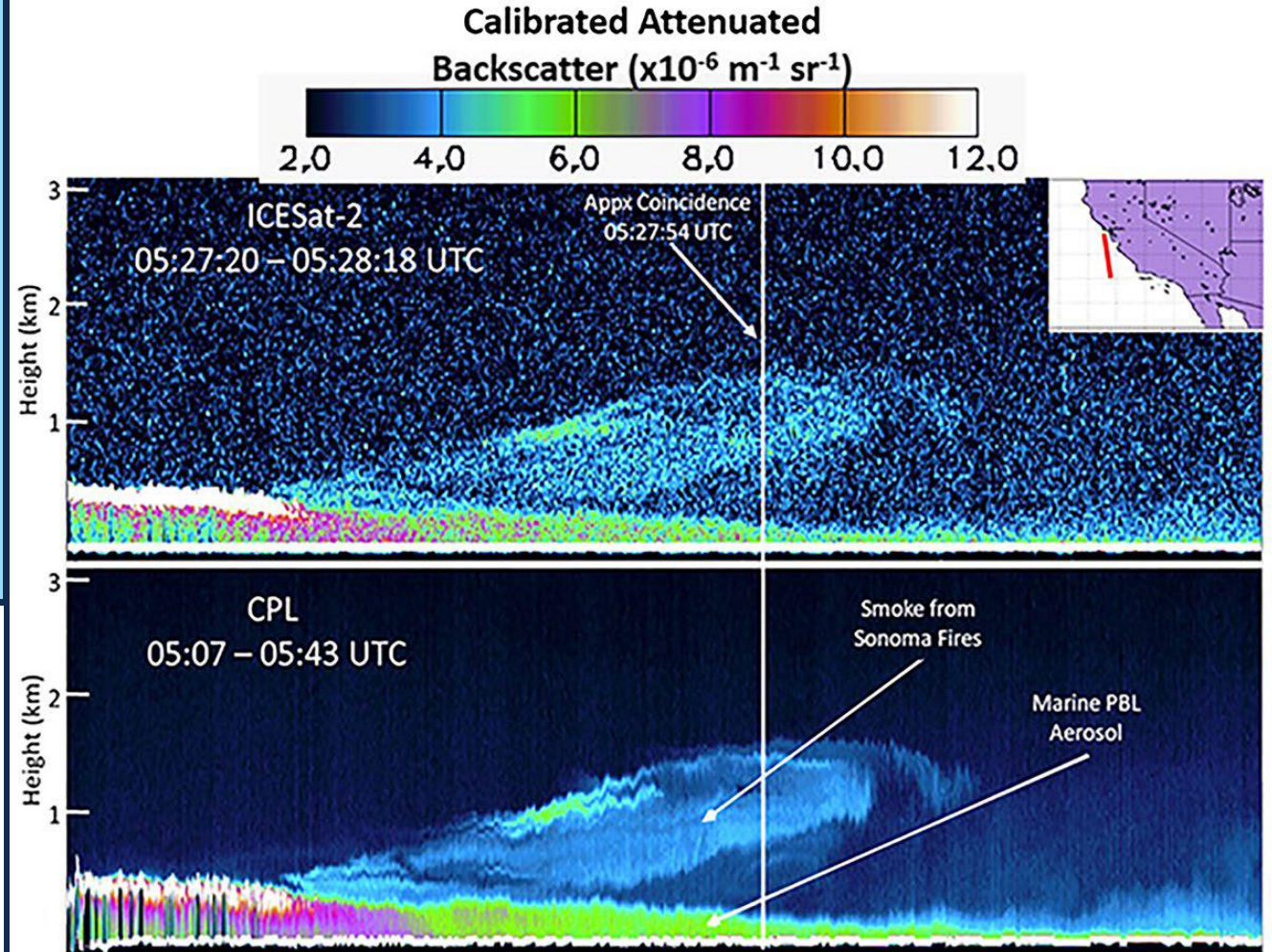
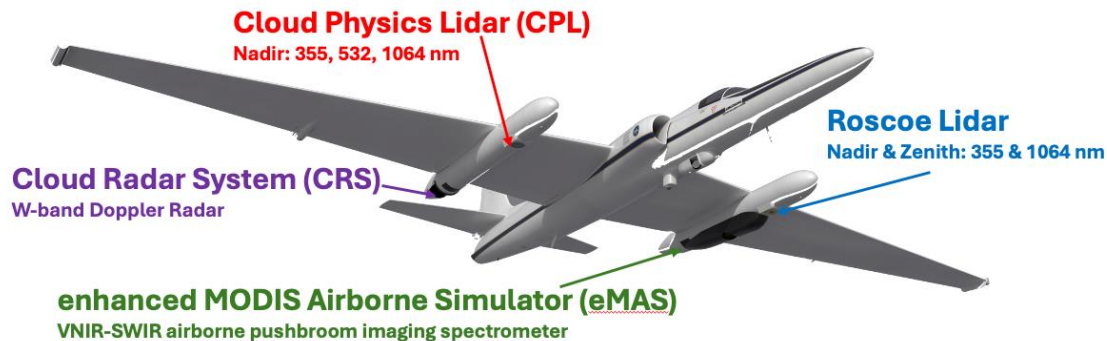
GLOVE Details:

When: Jan. 27-Feb. 28, 2025

Where: Edwards AFB, California

Objectives:

- (1) Validate new ICESat-2 atmospheric data products
- (2) Validate EarthCARE lidar, radar, spectrometer data products
- (3) Test receiver alignment of new Roscoe lidar instrument



Integrated campaign to calibrate a new class of space-borne imagers including PACE for tropical vegetation and oceans research

AVUELO combined field sampling in forests and coastal waters with airborne and satellite observations

As a Bring Your Own Science campaign, NASA encouraged other researchers to participate in the campaign as unfunded collaborators



AVIRIS Acquisitions - Panama and Costa Rica Feb. 6-28, 2025

Airborne Science: Passing the Baton



B777 Dropsonde/Sonobuoy Tube Installation



DC-8

- Completed its NASA flights on return from ASIA AQ campaign (winter, 2024)
- Was transferred to Idaho State University to support aviation education
- ESD and NASA History Office collaborated on workshop on history of DC-8 at NASA

B-777

- Shipped to contractor (L3 Harris, Waco, TX)
- Drop-sonde tube installed prior to shipping, NASA installed drop-sonde tube
- First planned campaign is North American Upstream Feature-Resolving and Tropopause Uncertainty Reconnaissance Experiment (NURTURE) in January 2027 (for weather/atmospheric dynamics)

Early Career Research Program

Striving for Excellence in Earth Science



Record number of
FINESST proposals
32% Increase

Annual Reports and
Release of FIES2A

Released 3rd
ECR Excellence
Newsletter and Launched
ECR Webinar Series

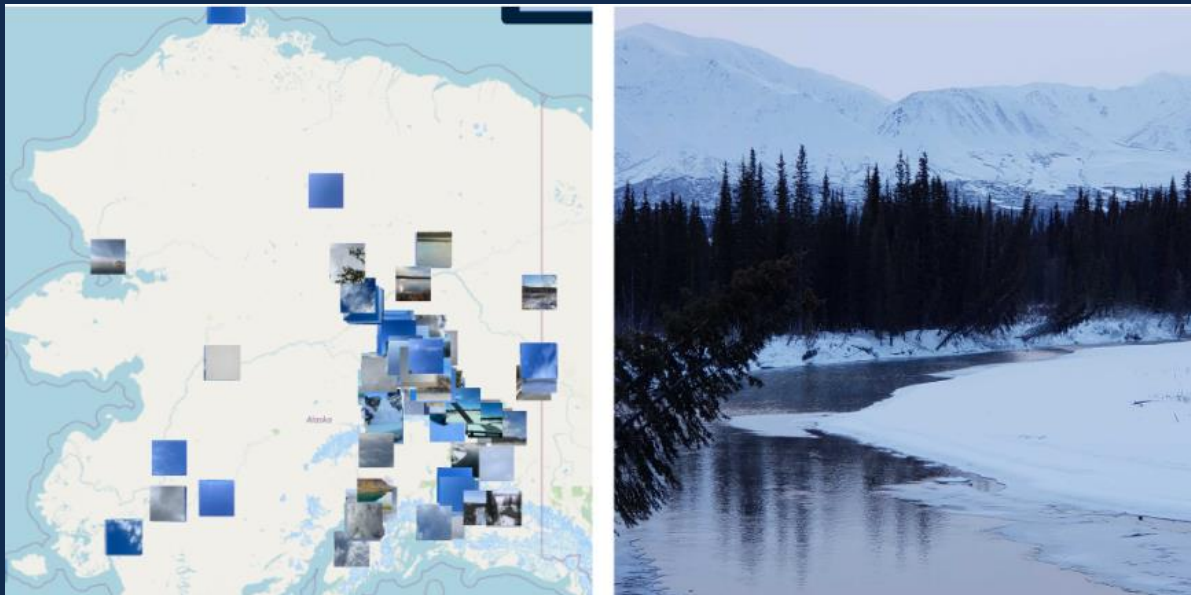
Full House at the
First ECR AGU Town Hall and 2nd
AMS Early Career/Student Workshop

Record number of SARP
Applications
48% Increase
Year 3 of West/East
Cohort



*Click here for Teams link to April 8
webinar on Effective Science
Communications!*

GLOBE Fresh Eyes on Ice



The Fresh Eyes on Ice program blends multi-satellite observations including Sentinel and Landsat with citizen science data

The resulting monitoring system is capable of accurately detecting and monitoring river ice conditions

Citizen science contributions:

- Validation of remote sensing products (including VIIRS River Ice Product)
- Filling remotely sensed data gaps due to clouds
- Providing ice thickness info to combine with ice extent derived from remote sensing
- Critical contribution to near-real time National Weather Service flood forecasting and winter travel warnings

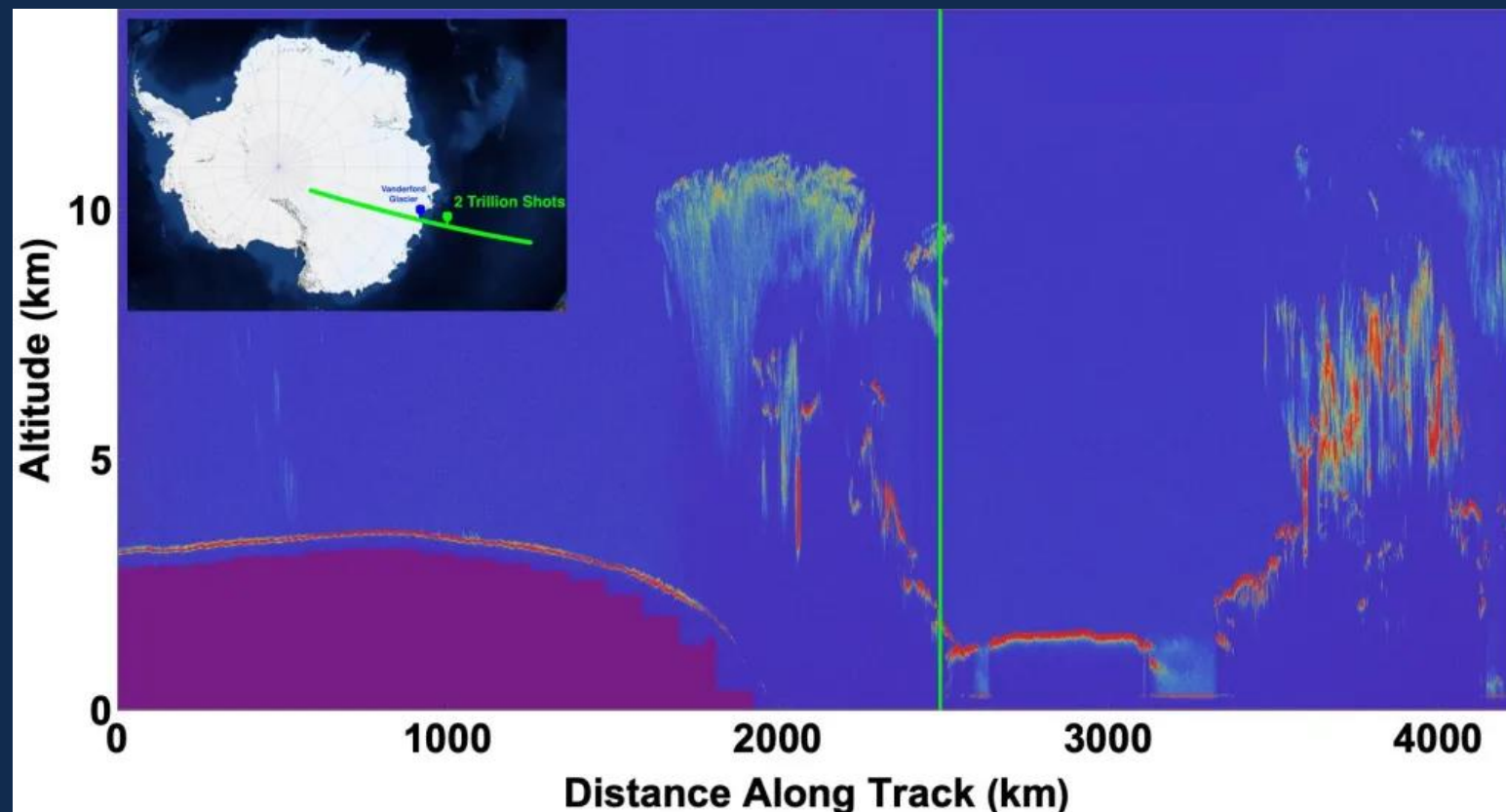


ICESat-2's Laser Fires 2 Trillion Shots

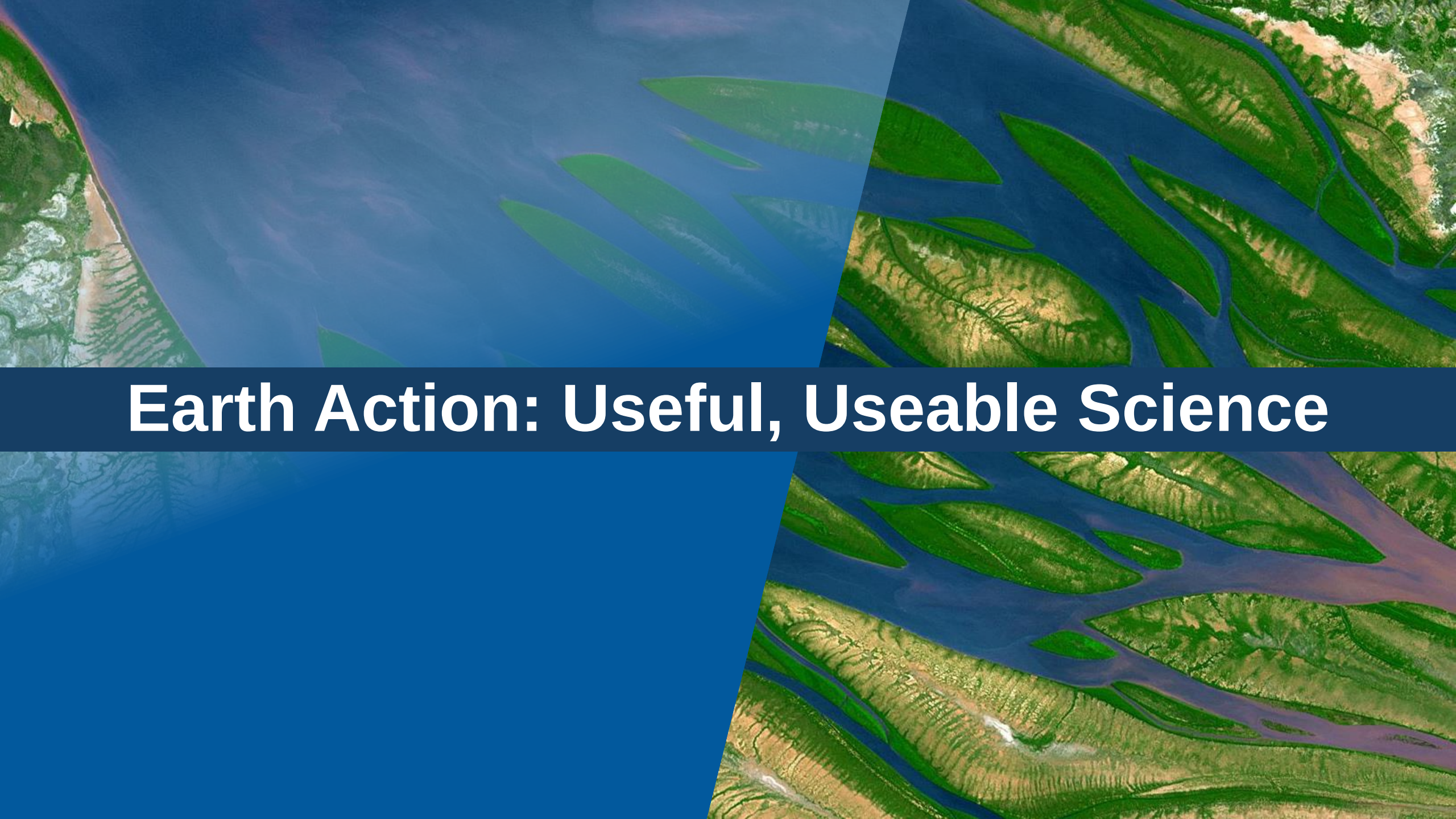
Advanced Topographic Laser Altimeter System (ATLAS) uses rapid pulses of green laser light and a precise clock system to track the height of Earth's surface

10,000x second: height profiles of glaciers, sea ice, water reservoirs, forests and more

Proving longevity of laser altimetry from space – fuel may be the limiting factor



ICESat-2's height-measuring laser instrument, ATLAS, fired its 2 trillionth shot on March 9, detecting clouds off the coast of East Antarctica. This data plot of surface heights marks that milestone with a vertical green line. In the few minutes before and after the shot, ICESat-2 measured the surface of the ice sheet and high clouds over the coast (in the left of the image), followed by clouds and a couple breaks where the ocean surface is detected. (Credit: NASA/A. Martino)

An aerial photograph of a river delta, likely the Amazon, showing a complex network of channels and islands. The land is green with some brown patches, and the water is a deep blue. A semi-transparent blue overlay covers the left and bottom portions of the image, creating a layered effect.

Earth Action: Useful, Useable Science

NASA's Disaster Response Coordination System (DRCS)

32

NASA's Earth Science Division focused on:

- Damage Assessments
- Analysis of Ash Toxicity
- Air Quality Assessments

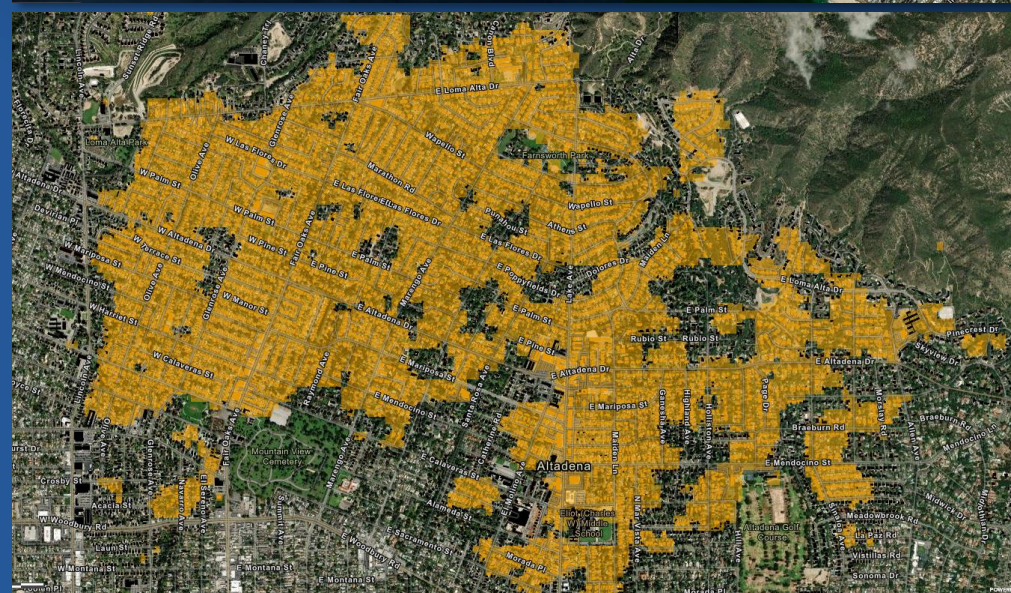
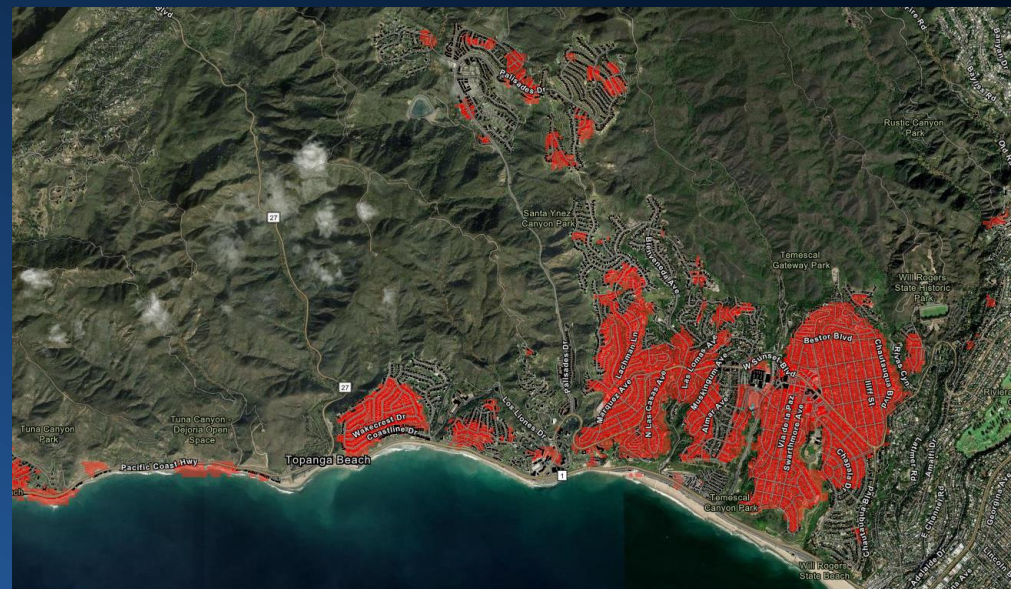
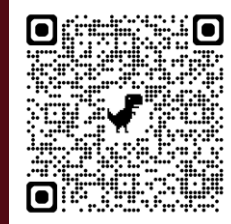
Looking Ahead

- Imminent release of community announcement for rapid response projects



NASA's Disaster Response Coordination System (DRCS)

Supported federal, state, and local emergency response for the Los Angeles-area wildfires



- DRCS was activated from Jan. 7 – 31, 2025 for the LA Wildfires
- **Assessed impacts to homes and infrastructure**
 - Burned area analysis and possible impacts to infrastructure through multispectral imagery (Sentinel 2, Landsat, Maxar analysis) and SAR (Sentinel 1)
 - Identify potential gas leaks - hyperspectral imagery (AVIRIS)
 - Nighttime lights - Black Marble for power outage awareness (VIIRS Day/Night Band (DNB) radiances)
- **Assessed impacts to air quality and hazard locations**
 - Understand emissions and adverse health risks (targeted TEMPO scans)
 - Monitored and tracked methane emissions (AVIRIS, GHGsats)

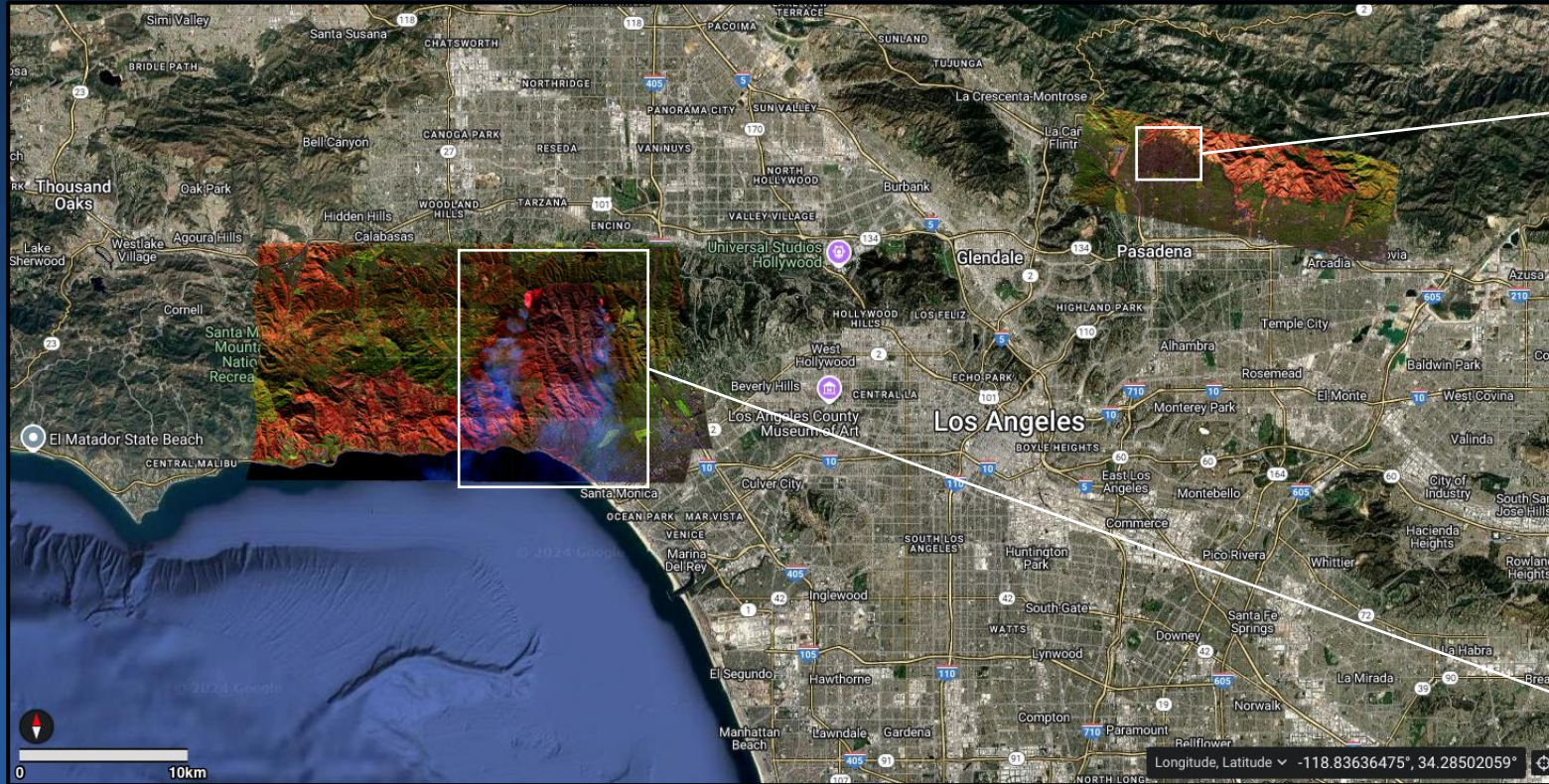
Imagery of estimated damage to infrastructure in Pacific Palisades fire (top) (1/14) and Eaton fire (bottom) (1/9) using Copernicus Sentinel-1 imagery. Red/Yellow signifies damaged buildings.

Source: [Corey Scher](#) of CUNY Graduate Center and [Jamon Van Den Hoek](#) of Oregon State University.

Note: These visualizations are experimental and not considered a final product.

AVIRIS Data with FireSense

Link to AVIRIS map: https://popo.jpl.nasa.gov/mmgis-aviris/?mission=LA_Fires



Eaton Fire (Altadena)



Palisades Fire (Malibu)

- On Jan 11, NASA's Wildland Fires Program funded an airborne campaign to fly the AVIRIS (Airborne Visible/Infrared Imaging Spectrometer) sensor over the Eaton and Palisades fires
- AVIRIS data may help us understand the **chemical composition and toxic nature of ash** in the post fire environment, as well as informing damage assessments

High Public Ranking of Earth Information Center (EIC) Exhibit at the National Museum of Natural History: Survey



- An evaluation of 473 visitors, targeting youth ages 13-18 and their caretakers
- Survey results showed visitors had strong agreement that the:
 - science was **trustworthy** (4.5/5)
 - exhibit **increased understanding** (4.3/5)
 - exhibit left them **wanting to learn more** (4.2/5)
- NASA Earth Science's major public exhibit debut sets a promising precedent for the upcoming EIC at Kennedy Space Center

The Earth Information Center at the National Museum of Natural History (NMNH) opened in October 2024. More than 4 million people visit the NMNH every year. With an immersive Hyperwall, interpretive panels, and 3 AV displays, the EIC tells the story of our changing planet

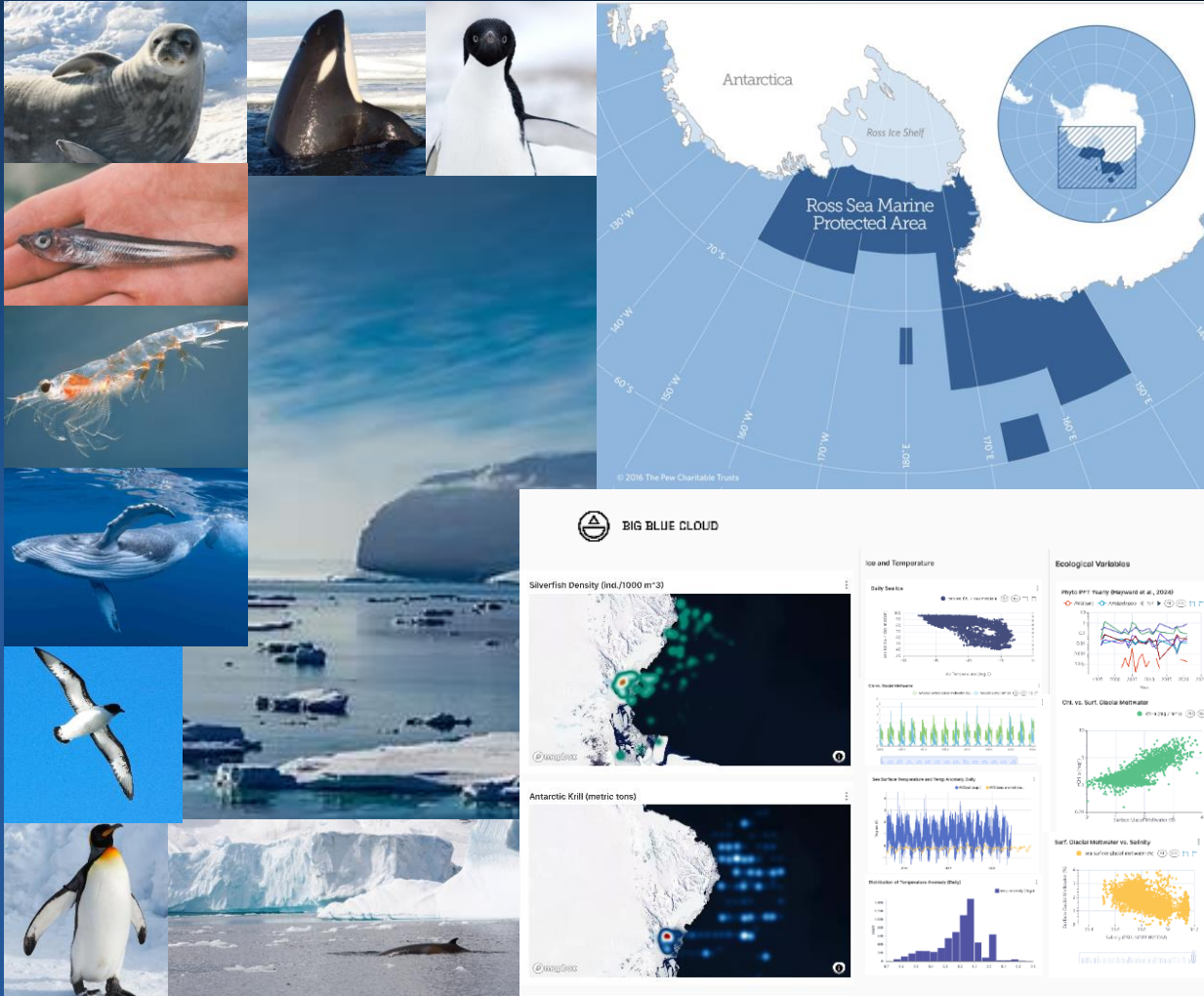
“Excellent new exhibit by NMNH and NASA showing the effects of climate change on the Earth. This is a very important addition to the museum!”

-NMNH visitor

The Big Blue Cloud: Safeguarding Critical Marine Habitats



Ocean Motion



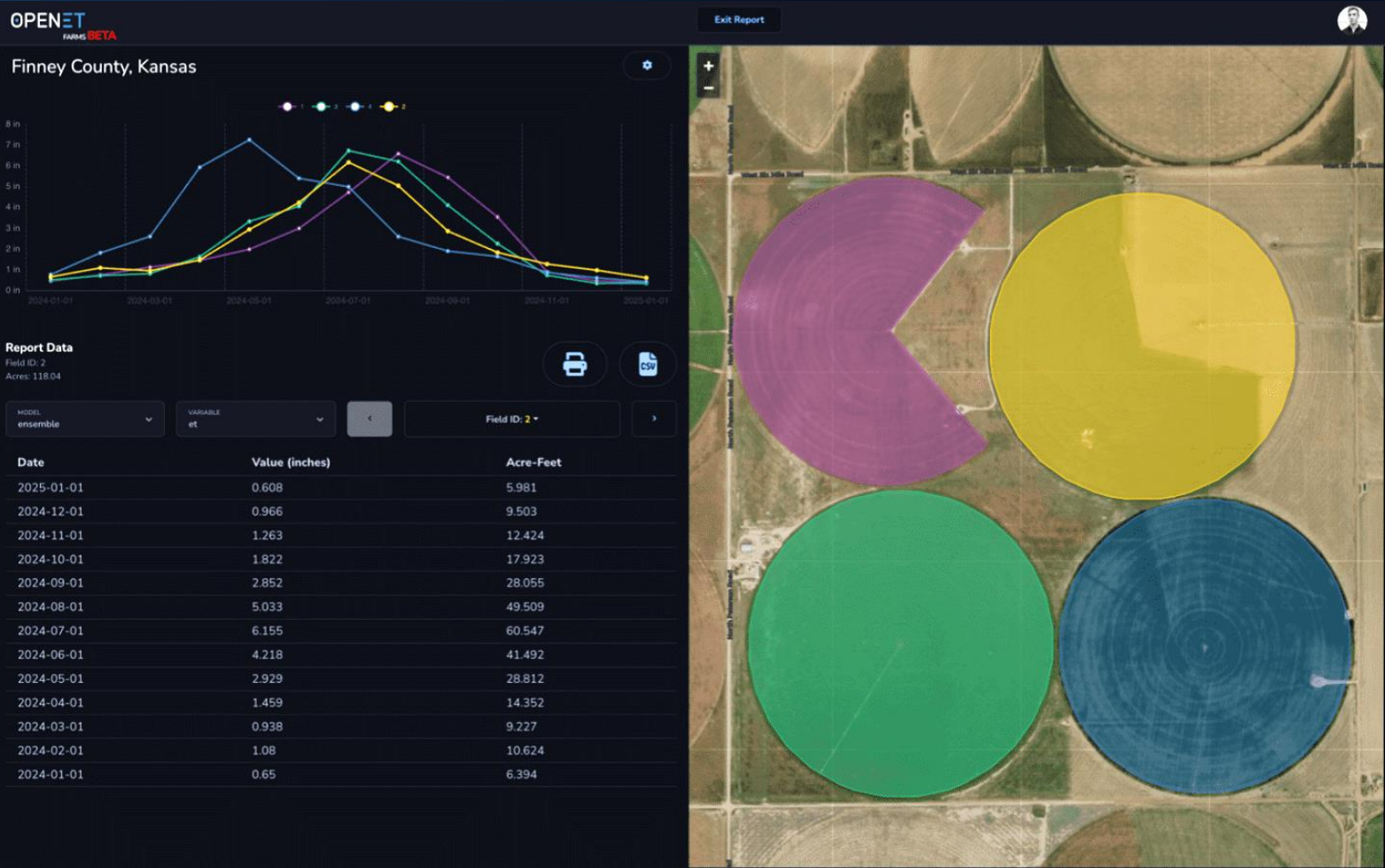
- NASA is building a cutting-edge cloud-based data platform, The Big Blue Cloud (TBBC), for the Ross Sea Marine Protected Area (RSMMPA)
 - TBBC is critical to protecting one of Earth's most important marine ecosystems
- Earth observations used: **PACE, MODIS-Aqua, and VIIRS, AMSR2, SSM/I, SMAP, Sentinel-1, and Sentinel-3**
- TBBC advances U.S. interests and priorities, reinforcing scientific excellence, international leadership, and strategic influence in Antarctic governance

Top Right: The RSMMPA is the largest marine park on the planet

Bottom Right: Snapshot of the user-friendly, customizable dashboard

FARMing with Data: OpenET Launches new Tool for Farmers and Ranchers

Check out the article!



(Above) The new OpenET FARMS interface displaying 2024 evapotranspiration data in monthly intervals. Each color line corresponds to the color field on the map.

- Farm and Ranch Management Support (FARMS): A new, tailored tool delivering high-resolution water data directly to farmers, based on user feedback
- Landsat data is combined with agricultural data to calculate final evapotranspiration data
- Quarter-acre resolution offers a more practical and effective scale for farmers and ranchers
- Supports decision-making around agricultural planning, water conservation, and water efficiency
- Building greater resilience in local and regional agricultural communities

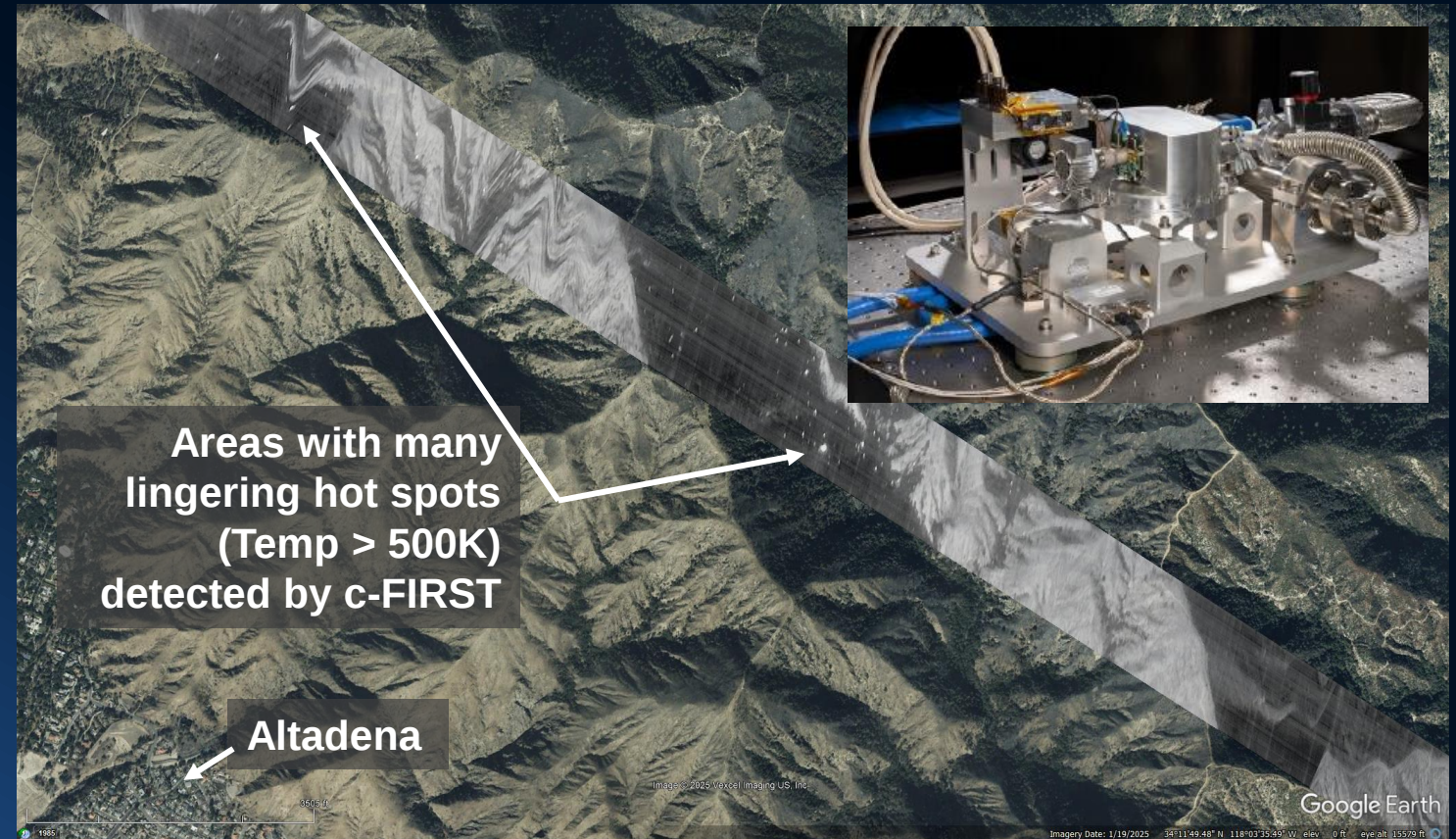
An aerial photograph of a river delta, likely the Amazon, showing a complex network of channels and islands. A semi-transparent blue overlay covers the left and top portions of the image, creating a modern, tech-oriented aesthetic.

ESTO: Innovations in Tech

Technology Highlights: c-FIRST Fire Imager

39

- The Compact Fire Infrared Radiance Spectral Tracker (c-FIRST) – a new imager can capture the full dynamic range of wildfires, from hot spots to cooling embers – flew for the first time on Jan. 13
- C-FIRST detects active fire, provides estimates of fuel loads, and monitors lingering hot spots to improve wildfire preparedness and response



Above: A c-FIRST swath (3.8-micron channel) from the Eaton Canyon Fire region near Altadena, CA, superimposed onto Google Earth. Although no active fire was present, several hot spots, which can reignite during favorable winds, are clearly visible in the San Gabriel mountains. Inset: The c-FIRST instrument in airborne configuration. (All images Credit: NASA/JPL)

Technology Highlights: Decadal Survey Incubation

WH²yMSIE Campaign

- ESTO brought together new instruments and algorithms for the West-coast & Heartland Hyperspectral Microwave Sensor Intensive Experiment (WH²yMSIE)
- The airborne campaign was a first step toward an integrated, intelligent, and affordable system for improved Planetary Boundary Layer (PBL) measurements
- WH²yMSIE represents the ***beginning of a new era in PBL sensing***, particularly in hyperspectral microwave sounding

Why Planetary Boundary Layer?

Improved observations of the PBL and its interactions with the ocean, land, and ice surfaces could advance science on several fronts, including improvements to both short-term weather and air quality forecasts, climate modeling, and estimates of trace gas emissions and transport



Above: inside the NASA G-III aircraft.
The AWP instrument is on the left and
HALO is on the right. Credit: NASA

Technology Highlights: New FireSense Projects

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With four additional selections in December, the FireSense Technology program's 2024 cohort of seven projects will develop innovative Earth system observation capabilities to predict, monitor, and manage wildfires and their impacts

Pre-Fire Risk

Subcanopy UAS Development for Watershed-Scale Surface and Ladder Fuel Quantification

- Jonathan Greenberg, University of Nevada, Reno

Near Real-Time Updated Wildfire Risk Map Model Informed by Powerline Fault Status

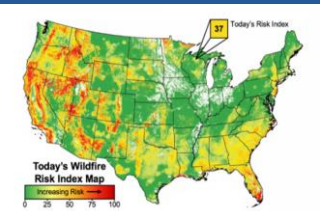
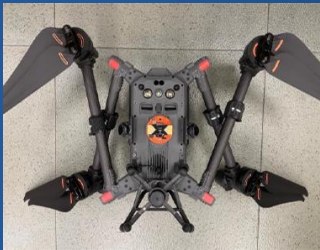
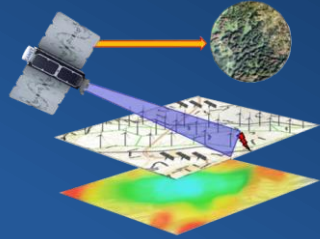
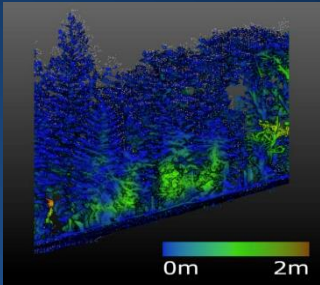
- Hamidreza Nazaripouya, Oklahoma State

UAS-Mounted Canopy Penetrating Radar-Tag System for Understory Fuel Sensing

- Elahe Soltanaghahi, University of Illinois

Fuel-Driven Wildfire Risk Mapping Over CONUS to Guide Targeted Resources Allocation

- Kiley Yeakel, MIT, Lincoln Laboratory



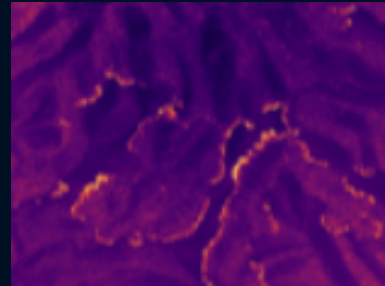
Active-Fire Risk

Hot Spot: High-Resolution Real-Time Wildfire Detection, Mapping, and Communication Relay System

- Jared Leidich, Urban Sky Theory, Inc

Wide Area Motion Imagery (WAMI) for Support of Wildland Fire Science, Management, and Disaster Mitigation

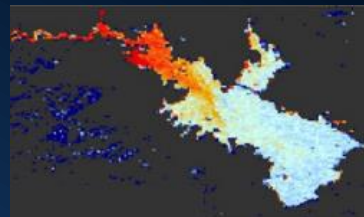
- Christopher Stellman, Logos Technologies LLC



Post-Fire Risk

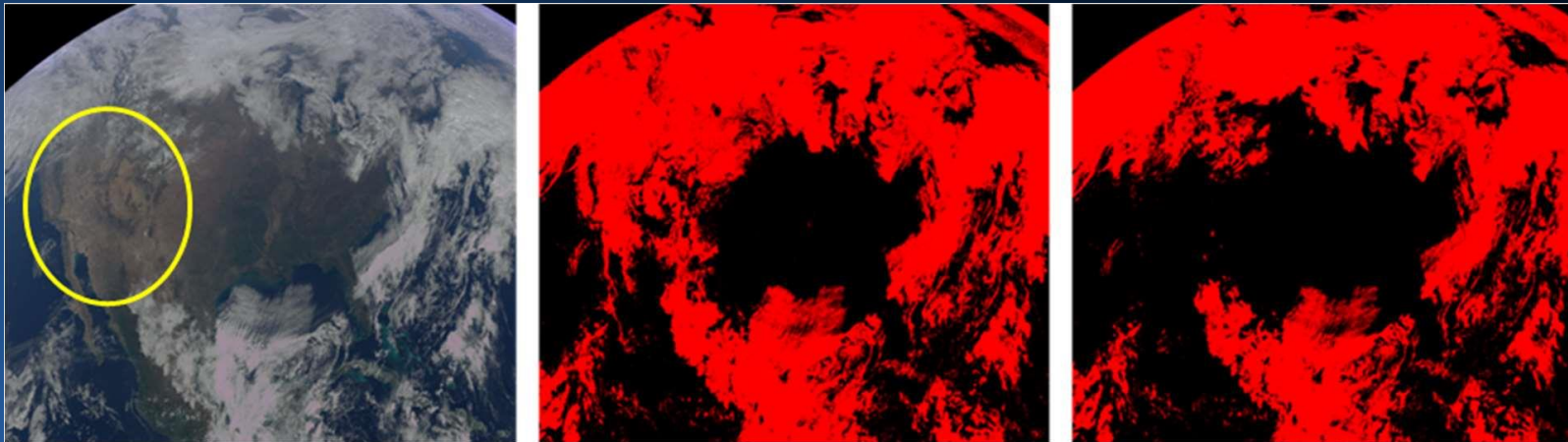
Sediment Plumes and Blooms: Using Earth Observations and Modeling to Forecast Post-Fire impacts to Reservoir Water Quality and Quantity

- Mary Miller, Michigan Technological University



Technology Highlights: New AIST & AMT Projects

- In December 2024, the Advanced Information Systems Technology (AIST) Program awarded 24 new projects that will provide novel information systems and computer science technologies to:
 - Reduce the risk, cost and development time of NASA missions
 - Grow scientific understanding of the Earth's systems
 - Improve predictive capabilities for Earth science
- These awards have been allocated within ESTO's Intelligent Systems Group into both AIST and the newly-created Advanced Modeling Technologies (AMT) program



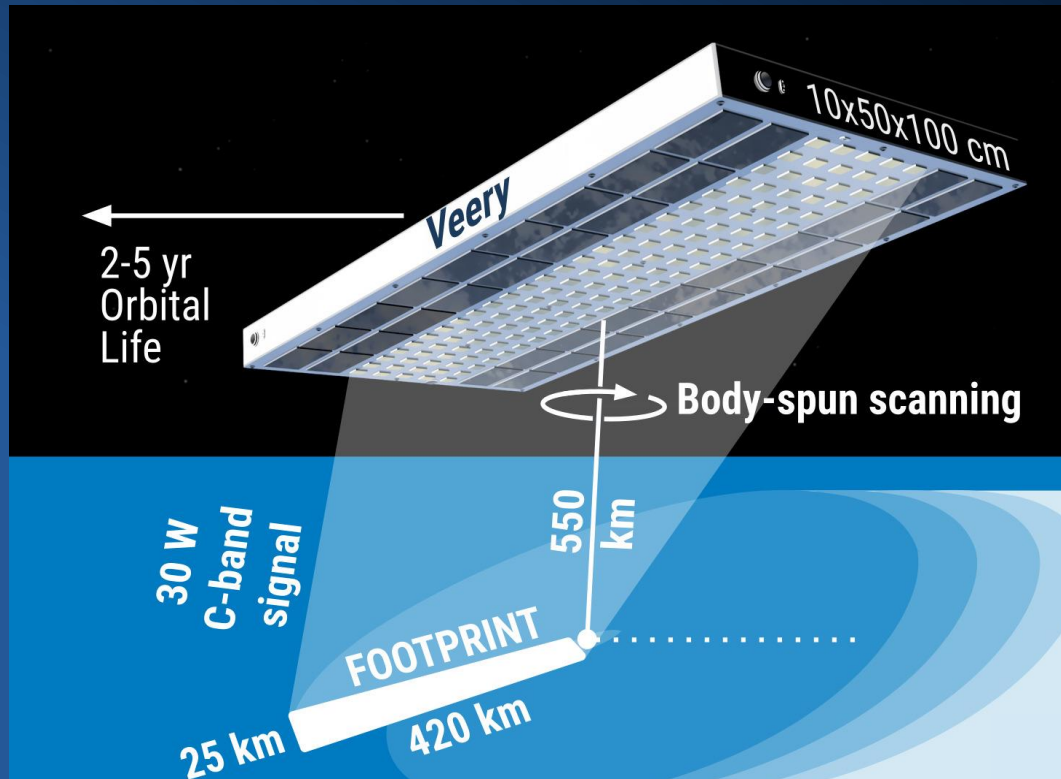
Highlight Award: Explainable AI Model Development

A TEMPO RGB image (left) is compared with current data processing (center) and potential XAI processing (right).

The bright, desert regions near the Baja California peninsula are aliased as clouds in the central L1B cloud mask, while the new model on the right correctly classifies the area.

Technology Highlights: New IIP Projects

- In October 2024, the Instrument Incubator Program (IIP) awarded 11 new technology development activities through a competitive solicitation
- These novel instrument and instrument subsystems will:
 - Enable future Earth science measurements and visionary Earth-observing concepts
 - Reduce the risk, cost, size, mass, and development time of Earth observing instruments



Highlight Award: Scatterometer for Hourly Ocean Surface Winds
PI Michael Walton (Care Weather Technologies) plans to develop **Veery, a flat-panel scatterometer** capable of measuring ocean surface vector winds with state-of-the-art performance at 1/100th the cost

Veery aims to provide a low-cost instrument to enable affordable constellation deployment

Technology Highlights: ARGOS Instrument Launches

- Aerosol Radiometer for Global Observation of the Stratosphere (ARGOS) InVEST technology demonstration mission
- Launched 06:43 UTC March 15 as a hosted payload on Loft Orbital's Yet Another Mission 8 (YAM-8) platform onboard the SpaceX Transporter 13 SmallSat Rideshare

Observations of aerosol distribution in Earth's stratosphere are a key input for Earth system models to characterize atmospheric heating

Good vertical resolution is required to capture variations in aerosol measurements: ARGOS measures scattered light in eight directions simultaneously – a significant advantage in terms of size, mass, power, comms, and more



ARGOS flight hardware. Note the eight apertures arrayed around a central optical hub containing the prism. (credit: M. DeLand)



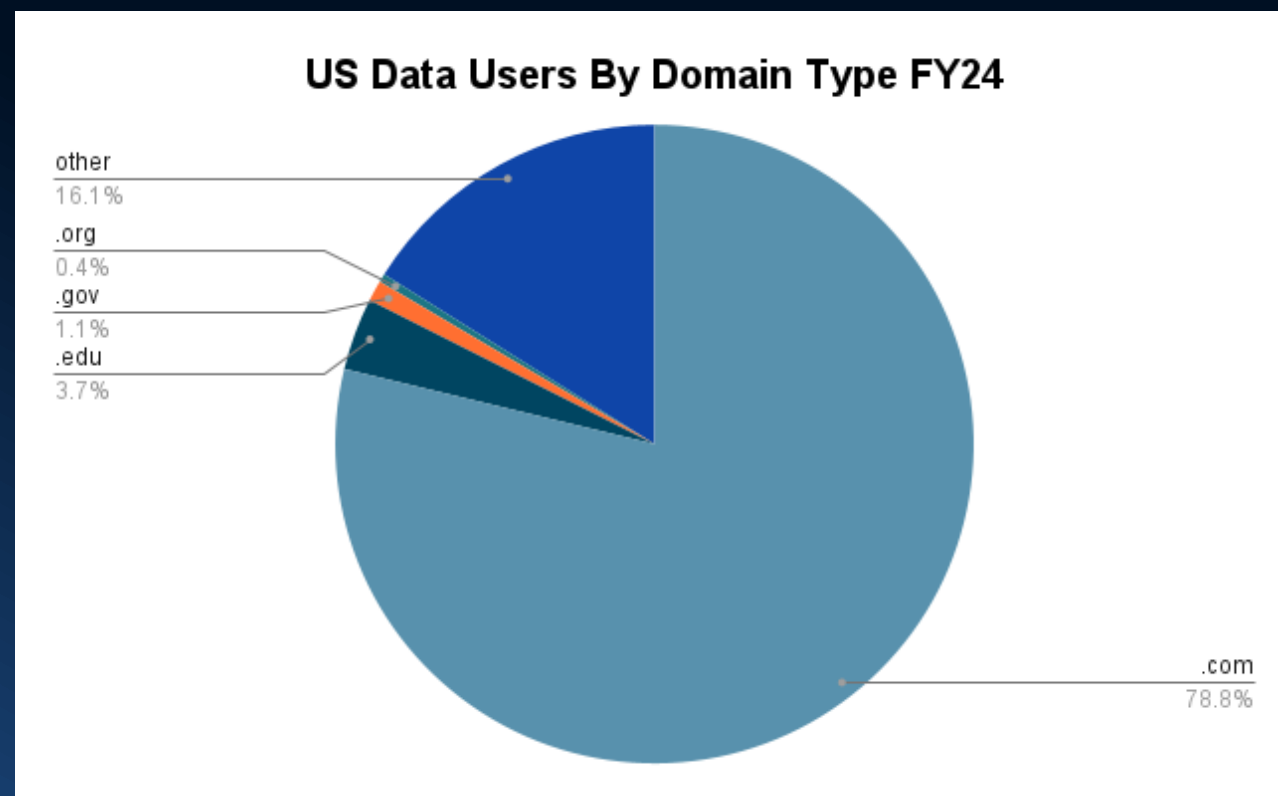
SpaceX Falcon 9 Transporter 13 mission launches from Vandenberg Space Force Base (credit: SpaceX)

The background of the slide is a composite image. The top right and bottom right portions show an aerial photograph of a river delta, likely the Amazon, with numerous green, elongated islands (meanders) separated by blue water channels. The water in some areas has a reddish-brown tint, possibly due to sediment. The top left and bottom left portions are a solid dark blue color. A horizontal dark blue banner with a slight gradient is positioned across the center of the image, containing the title text in white.

Earth Science Data Systems: Stewardship & Accessibility

Earth Science is Intertwined with US Economy

- Earth science data is a critical resource with impact far beyond academia
- Indispensable for businesses in areas such as:
 - Risk assessment
 - Precision agriculture
 - Supply chain management
- This broad usage highlights the dual impact of Earth science data:
 - Advancing scientific research
 - Driving innovation across industries



~80% of US users accessing our data systems were from commercial domains

Critical Commercial Value of Earth Science Data

Without sustained access to trusted, high-quality Earth science data, businesses lose critical tools for risk management, innovation, and growth—ultimately destabilizing markets and economies

Data products and analytics built on them power entire downstream solution ecosystems

Industry Sector	NFILES 2021-24
Technology	856,080,456
E-commerce	5,599,890
Aerospace	3,671,607
Finance	3,314,367
Telecommunications	18,872
Insurance	13,619
Agribusiness	12,705
Energy	3,772
Consumer Goods	3,348
Conglomerate	1,920
Automotive	893
Healthcare	25
Materials	17
Pharmaceuticals	15
Food & Beverage	6
Retail	6
Entertainment	5
Logistics	2

~75% of US Fortune 100 companies have engaged with NASA Earth data

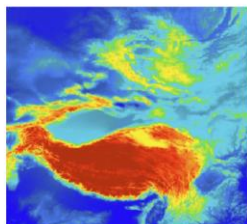
Usage is across all sectors and data types such as:

- Land Use
- Fire Tracking
- Air quality
- Population dynamics
- Global Navigation
- Earth system change modeling

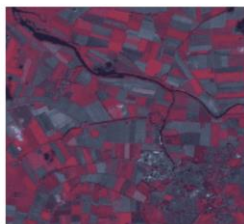
2000 Greenland Mosaic - Greenland Ice Mapping Project (GIMP)



AG100: ASTER Global Emissivity Dataset 100-meter V003



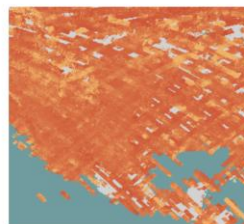
ASTER L1T Radiance



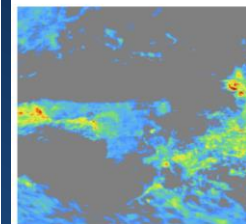
Daymet V4: Daily Surface Weather and Climatological Summaries



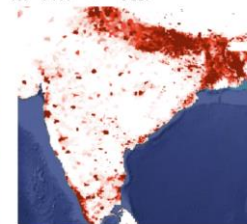
EMIT L1B At-Sensor Calibrated Radiance and Geolocation Data 60 m



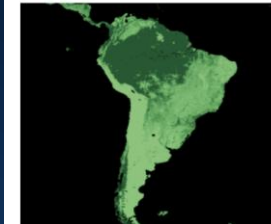
GPM: Monthly Global Precipitation Measurement (GPM) vRelease 07



GPWv411: Adjusted to Match 2015 Revision of UN WPP Country Totals (Gridded Population of the World)



Global Aboveground and Belowground Biomass Carbon Density Maps





Esri Federal GIS Conference 2025

At this year's Fed GIS Conference, Earth Data Officer Katie Baynes delivered a plenary address, highlighting the many ways NASA Earth observation data is used for researchers, decision-makers, local communities, and industry

If you missed the presentation, there is a recap for you in the StoryMap below:



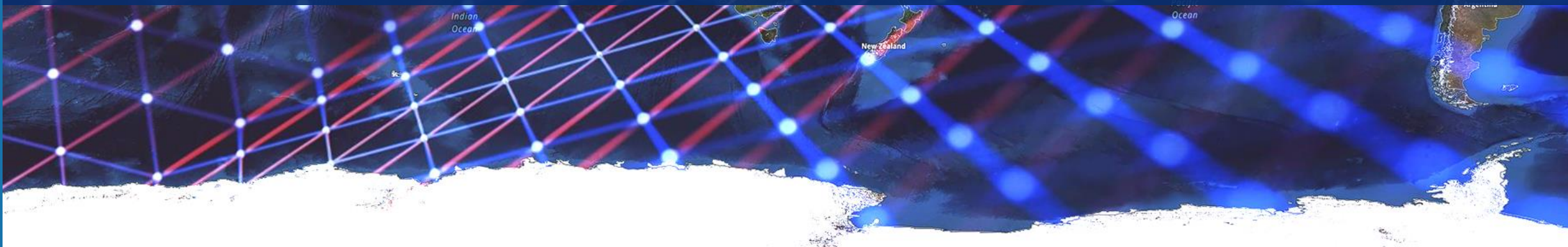
www.earthdata.nasa.gov/learn/gis/storymaps/esri-federal-gis-conference-2025



Intelligent Tiering to Cut Costs

+67PB of publicly available data were migrated from AWS S3 to AWS S3 Intelligent Tiering (INT) to better capitalize on AWS discounted rates

Data less frequently accessed is automatically put in lower cost storage tiers



Support from space for the devastating Los Angeles fires



FEATURE

Why Do Fires on NASA's Maps Sometimes Look Bigger Than They Really Are? (1/13/25)

www.earthdata.nasa.gov/news/feature-articles/why-do-fires-nasas-maps-sometimes-look-bigger-than-really-are



NEWS ANNOUNCEMENT

Los Angeles Wildfires Disrupting DAAC Operations and Data Access (1/9/25)

www.earthdata.nasa.gov/news/los-angeles-wildfires-disrupting-daac-operations-data-access



WORLDVIEW IMAGE OF THE WEEK

Wildfires in Los Angeles, California (1/9/25)

www.earthdata.nasa.gov/news/worldview-image-archive/wildfires-los-angeles-california

NEAR REAL-TIME DATA ALERTS

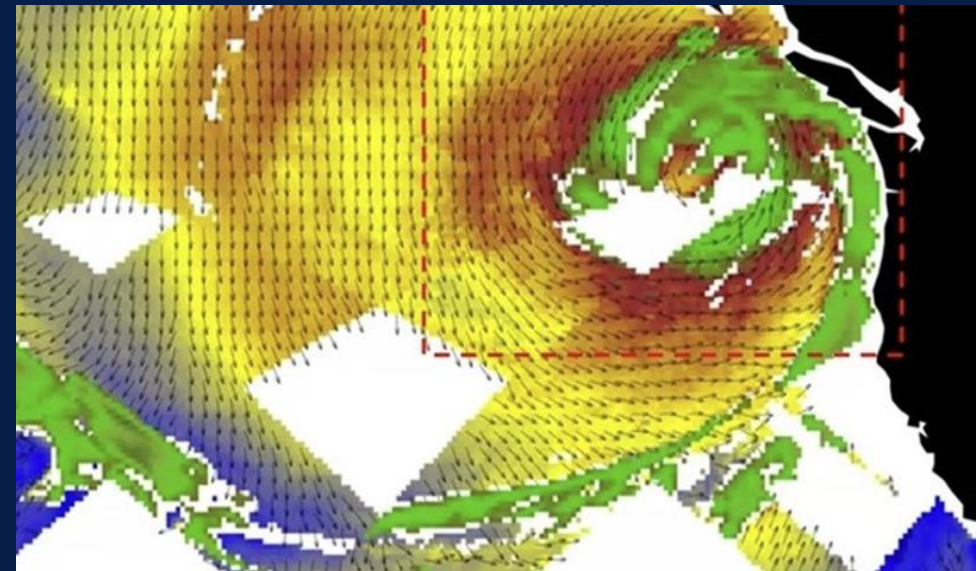
MLS Data are Currently Unavailable
SMAP Data are Currently Unavailable

Potential Operational Disruptions for Sentinel 6-A
Potential Operational Disruptions for SWOT



COWVR and TEMPEST V10 Datasets Available in First Public Release—Potential Cost Savings with Informative Science

- The Compact Ocean Wind Vector Radiometer (COWVR) and Temporal Experiment for Storms and Tropical Systems (TEMPEST) datasets are the first from the Space Test Program - Houston 8 (STP-H8) mission
- STP-H8 = test bed for low-cost, light-weight instruments designed for weather applications



COWVR and TEMPEST wind speed and atmospheric moisture data collected during the "bomb cyclone" over Pacific Northwest, Nov 2024



<https://www.earthdata.nasa.gov/news/cowvr-tempest-v10-datasets-available-first-public-release>

An aerial photograph of a river delta, likely the Amazon, showing a complex network of channels and islands. The land is green with some brown patches, and the water is a deep blue. A semi-transparent blue overlay covers the left and bottom portions of the image, creating a layered effect.

Telling our Earth Science Stories

New Audiences:

53

SXSW EXPO
MARCH 7-15 AUSTIN, TX



More than 22,650 people experienced NASA House

Tech entrepreneurs, families, filmmakers, writers and others took part in hands-on displays, film openings, and panel discussions



ELEVATING EXCELLENCE
◀ IN AGRICULTURE ▶

DENVER | MARCH 2-4, 2025



More than 11,300 attendees at the largest ag conference in the United States

Farmers, ranchers, agronomists, equipment manufacturers, data providers, seed companies, and trade associations interacted with NASA Earth Science



BioSCape – The Movie

The Spectrum of Life Remote Sensing at the Southern Tip of Africa

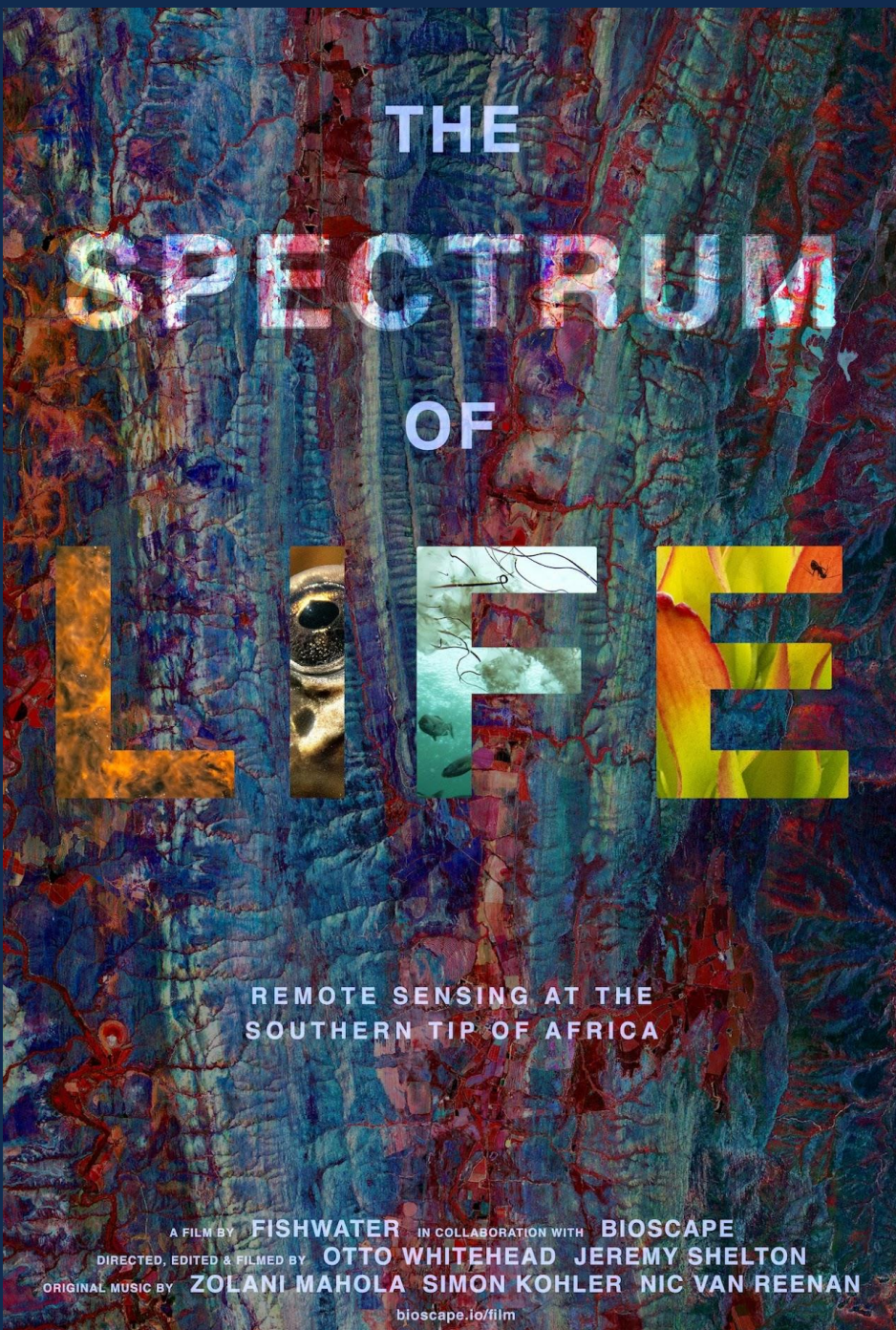
The Spectrum of Life is a short documentary about NASA's first biodiversity airborne campaign in South Africa, BioSCape

The film celebrates local biodiversity, NASA's role, and the potential of next-generation remote sensing to change how we measure and monitor ecosystems around the world

This was shown at the 2024 Fall AGU meeting as Session B11K-1464

The film will be available for online viewing later in 2025

See <https://www.bioscape.io/film> for more information



Swipeable Explainers: informational & highly shareable

Everything you need
to know about the
total solar eclipse
on April 8, 2024



A total solar eclipse occurs
when the Moon passes
between Earth and the Sun.



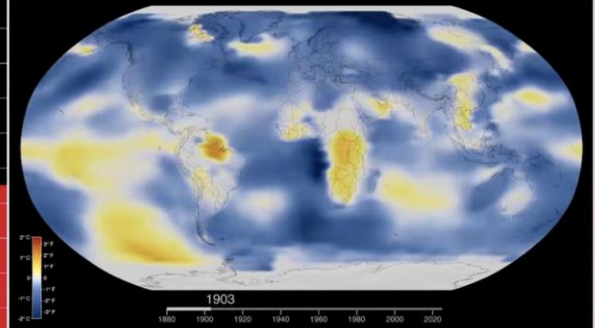
LET'S TALK ABOUT
SEA ICE



Sea ice is frozen seawater
that floats on the ocean.



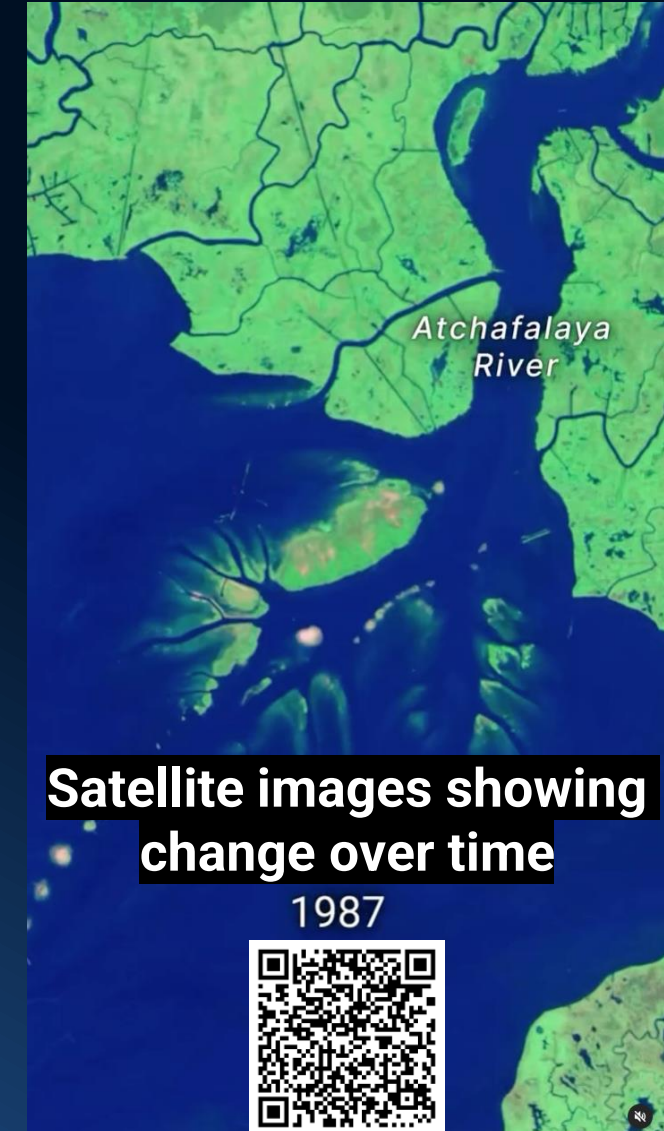
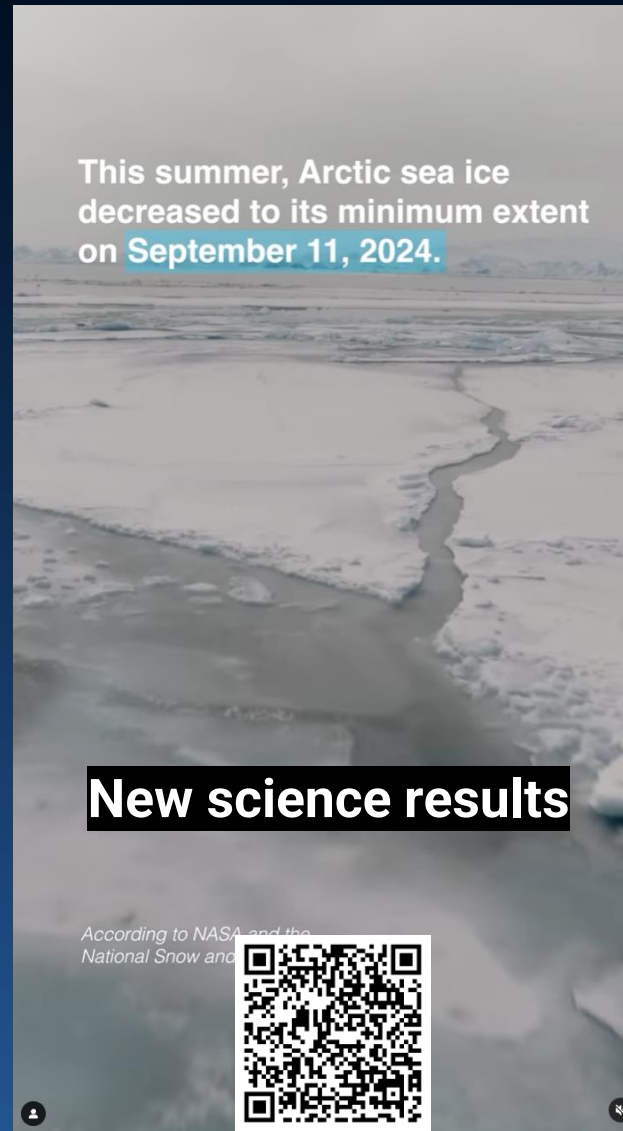
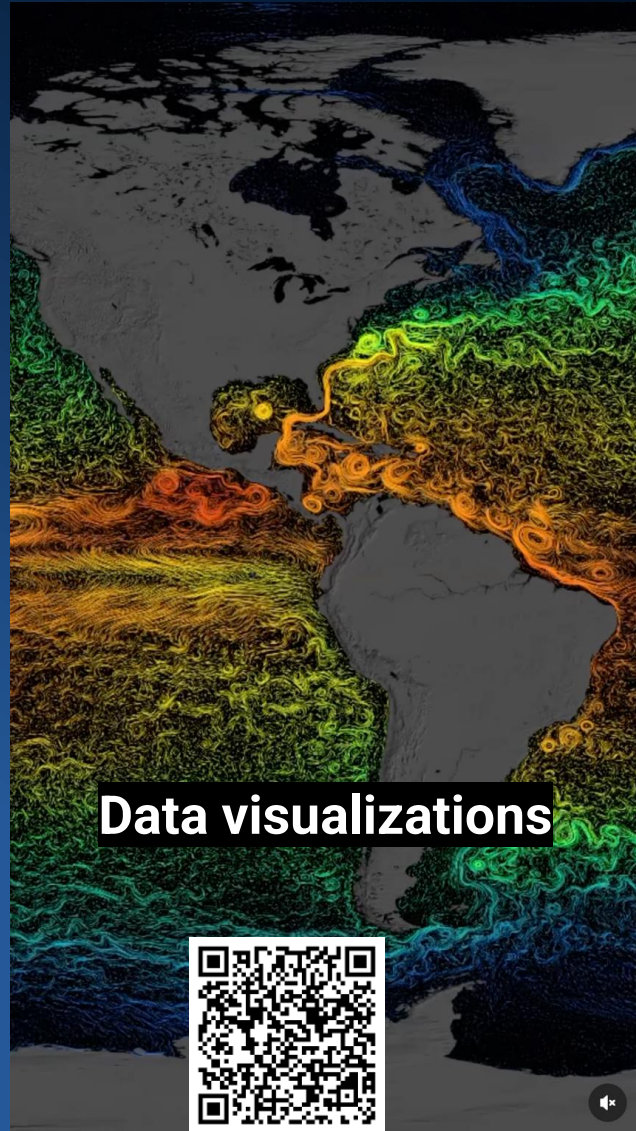
2024 WAS THE **HOTTEST**
YEAR IN NASA'S RECORD.



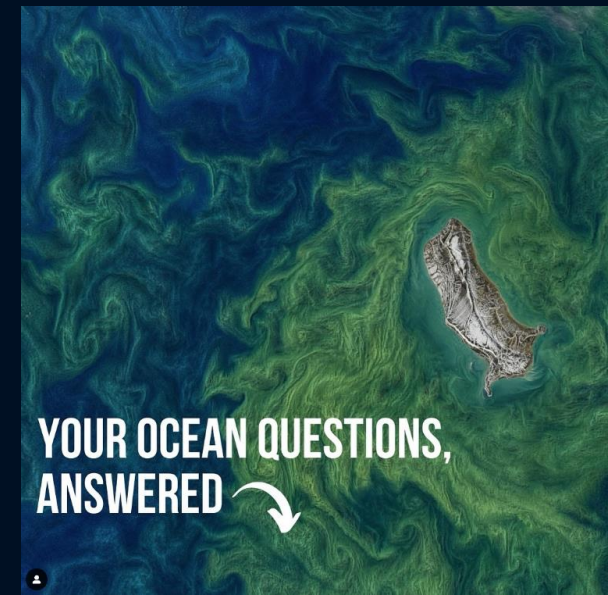
Our record incorporates
millions of measurements
taken at Earth's surface.
Temperature measurements
taken from space confirm
the data.



Short-form videos: newsy and engaging in under 90 seconds



Scientist Q&As: connecting with our audience



iamabhinavagarwal What will happen to earth if all oceans ice start melting ?



fw1ssac How can people start getting educated on the ocean and reducing climate change internationally



dani.fernandez.photos What would you say is the greatest misconception about the ocean, and how would you address it?

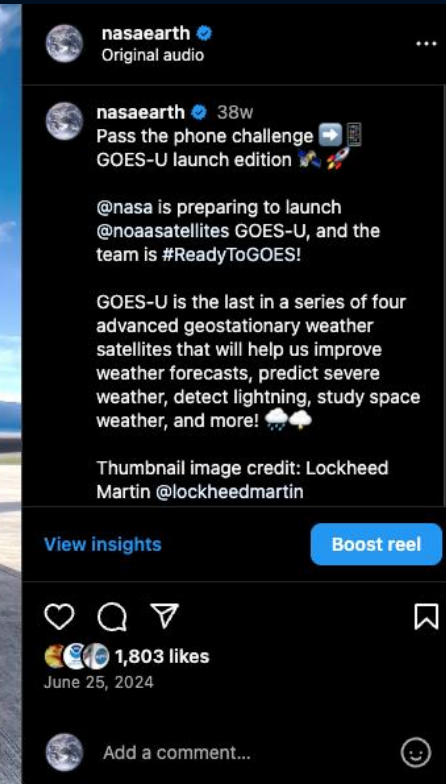


nasajpl 🌐 Where is the best place to get ocean data collected by NASA JPL Earth missions? Asking for a friend.... ;-)

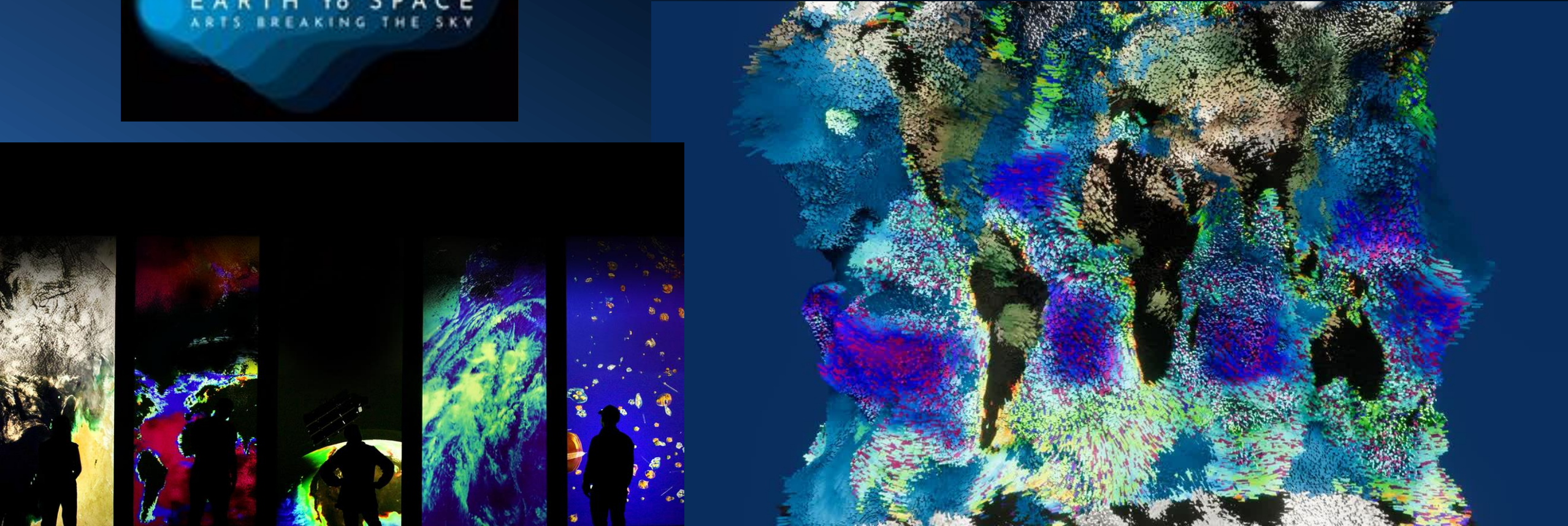


Fun content:

Capitalizing on trends, reaching new audiences



Immersive Experiences: WAVE From Space to Ocean at the Kennedy Center





NASA
earth

science.nasa.gov/earth

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Backup

Priority Guidance from the Decadal

- National Academies provided priorities in the last decadal survey if cancellations were required
- *“The committee places the highest priority on continuity of critical missions, followed by competitive opportunities in the Earth System Explorer and Earth Venture lines, followed by the large missions. However, because the highest overarching priority is a balanced portfolio, it is important that no one aspect of the portfolio be reduced excessively, to keep others intact.”*
 - –Thriving on Our Changing Planet: A Decadal Survey for Earth Observations from Space, 2017
- Reductions should first be accommodated by delaying/terminating the large missions.
- If additional reductions are required, the medium-size Designated missions should be delayed, unless these delays threaten the continuity of data sets that require continuous measurement.
- Should continuity be threatened, the cadence of medium-size competitive missions should be reduced but not to fewer than two competitions in the decade. The budgets for Venture and research and applications should not be reduced by more than 5 percent from their historical averages.

Prioritize Critical Continuity, then AO-selected missions, then directed Systematic Missions