



National Aeronautics and
Space Administration

Earth Science Division Update

2026 Hydrosphere
Investigator Meeting
Sept. 1, 2026

Karen St. Germain, PhD
Director, Earth Science Division

NASA Earth

The Upfront:

Increasing the Speed of Earth Science

NASA's Earth Science Division is accelerating functions and simplifying processes with the goal of **increasing speed of science** and **scale of impact**:

- Speed to orbit
- Speed to science and scientific discovery
- Speed and scale of impact of science
- Accelerating pace of technological innovation
- Driving interdisciplinary science to go after most complex questions



NASA HQ Earth Science Division Leadership



Karen St. Germain
Division Director



Julie Robinson
Deputy Director

ELEMENTS

Earth Science Technology Office



Michael Seablom
Associate Director



Elizabeth Forsbacka
Deputy Associate
Director

Flight Programs



Scott Schwinger
Associate Director



Antonios Seas
Deputy Associate
Director



Beth Weinstein
Deputy Associate
Director

Earth Science Data Systems



Katie Baynes
Earth Data Officer



Jim O'Sullivan
Deputy Earth
Data Officer

Earth System Science Research Program



Barry Lefer
Associate
Director



Michelle Hawkins
Deputy Associate
Director

Earth Action



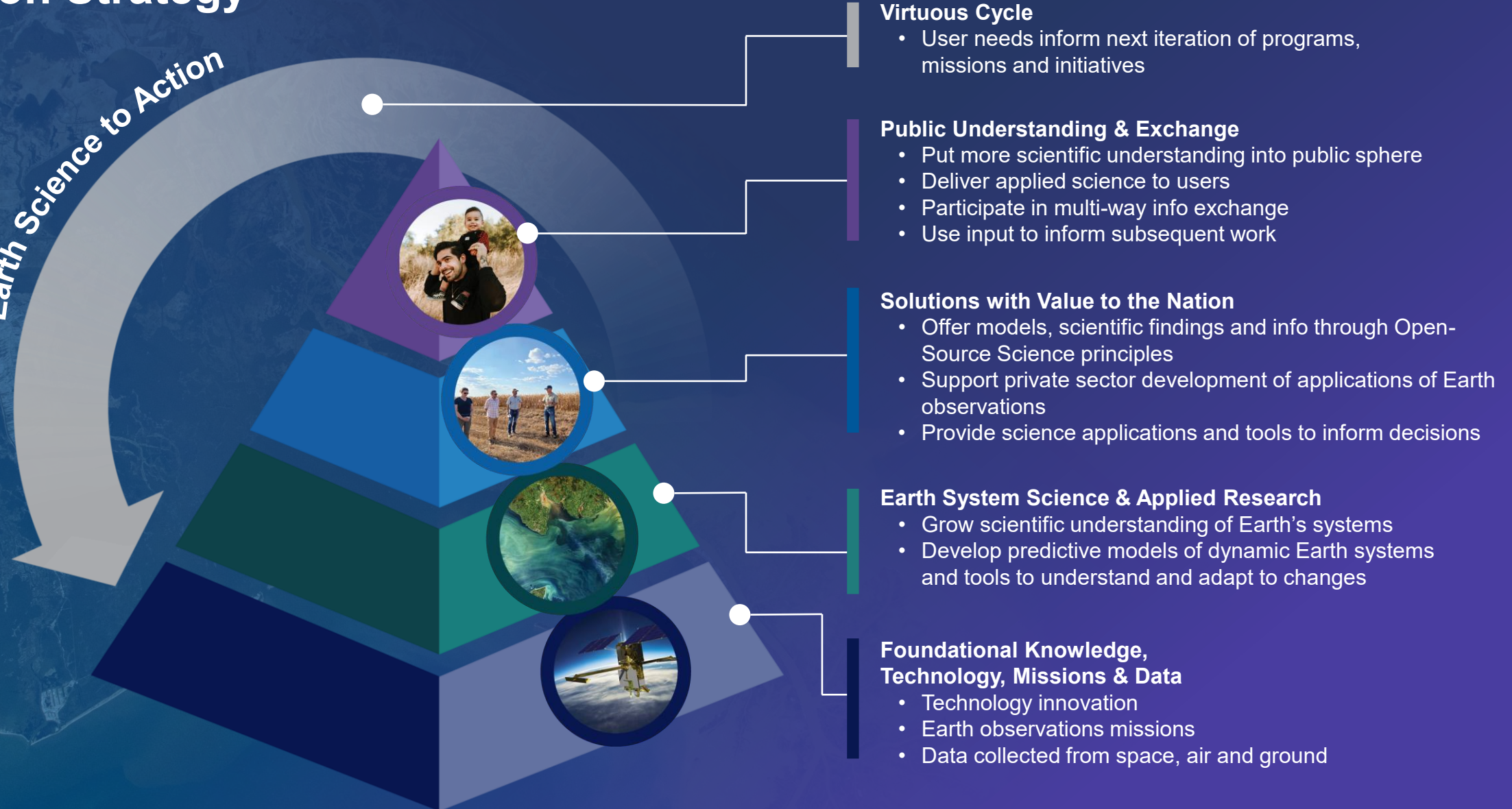
Thomas Wagner
Associate Director



**Emily Sylak-
Glassman**
Deputy Associate
Director

Earth Science to Action Strategy

Earth Science to Action



NASA's End-to-End Earth System Science Capability

Technology



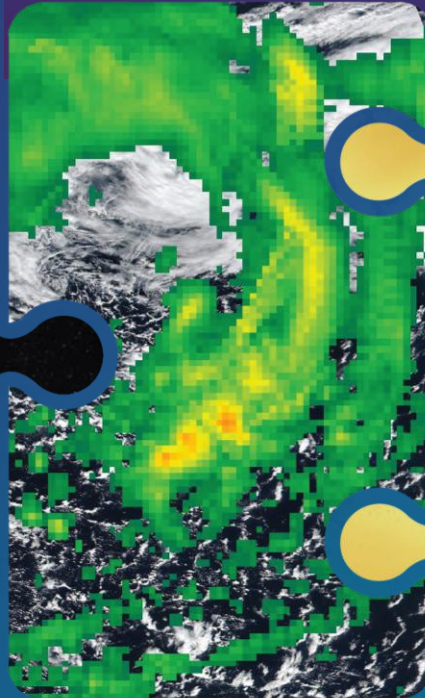
10 new technology infusions/year

Flight



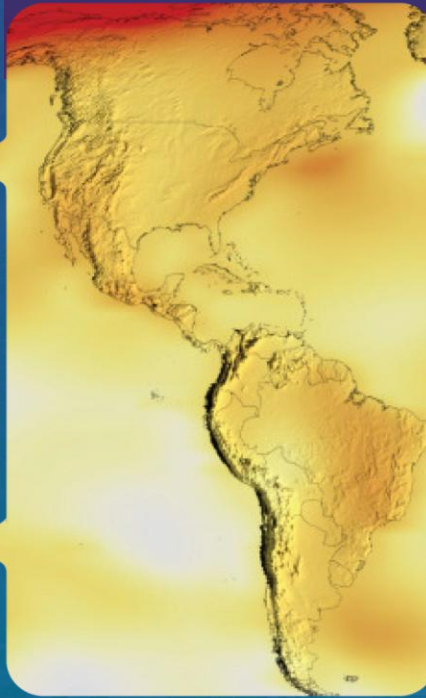
4 launches in the next 3 years;
3 new private partnerships

Data



Ingest 180 TB/Day,
Serve ~800 TB/Day,
>28M users

Research



Transforming mission data to discoveries that advance American competitiveness

Earth Action



Addressing national needs in Agriculture, Energy, Disasters, Wildfires, Water & more



Delivering Satellite Missions

Earth Science Flight Program

Flight Mission Strategy

Reformulate ESO missions aligned with 2026 appropriation and Presidential priorities

- Directed, streamlined, cost-capped Explorer class missions developed in 36 months
- Linkages to Moon to Mars objectives

Greater efficiencies and cost management

- Technology maturation
- Rapid on-orbit testing
- Cost and schedule caps

Demonstrate rapid development across the portfolio

- Reducing time to science
- Using commercial products and services

THRIVING ON OUR CHANGING PLANET

A Decadal Strategy for Earth Observation from Space



As of FY2026 Enacted Budget

EARTH SYSTEM OBSERVATORY

INTERCONNECTED
CORE MISSIONS

SURFACE BIOLOGY AND GEOLOGY

EAGLE-VSWIR
EDGE
EAGLE-TIR

SURFACE DEFORMATION AND CHANGE

NISAR



CLOUDS, CONVECTION AND PRECIPITATION

INCUS
PoSIR
PMM
FALCON-Radar
Commercial Radiometry
FALCON-Lidar Next Gen

AEROSOLS

FALCON-Lidar Next Gen
STRIVE

MASS CHANGE

GRACE-C

Fleet for the Atmosphere Linking Commercial Observations with NASA **FALCON**

PMM (JAXA/GSFC)

Precipitation profiles

FALCON-Lidar Next Gen (GSFC/LaRC)

Atmospheric structure and composition measurements

FALCON-Radar (JPL)

Cloud profiles to improve understanding of severe weather drivers.

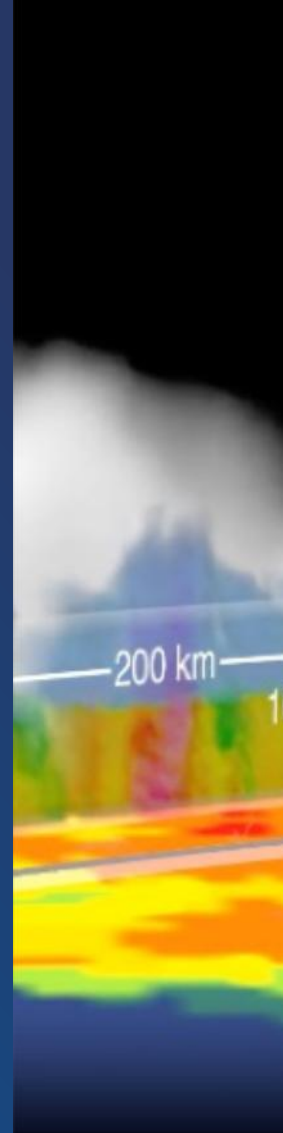
FALCON-Radiometry (Commercial)

RFI Released 3/24/2026 for contribution options

Joining the FALCON fleet

- INCUS (CSU/JPL)
- PoSIR (Vanderbilt/GSFC)
- STRIVE (UW/GSFC)

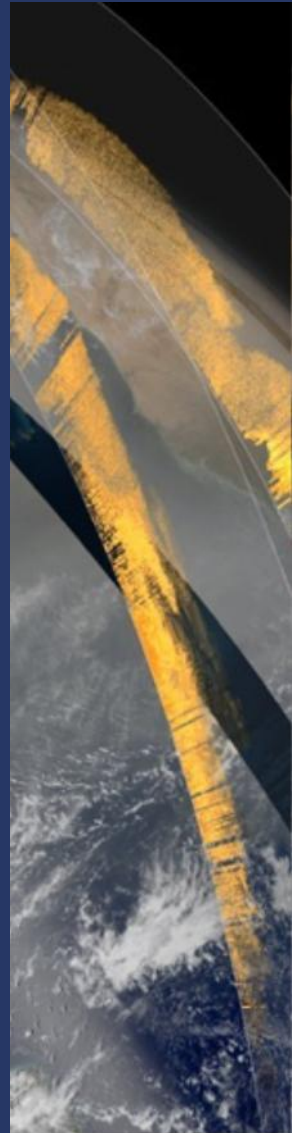
Profiles



Structure



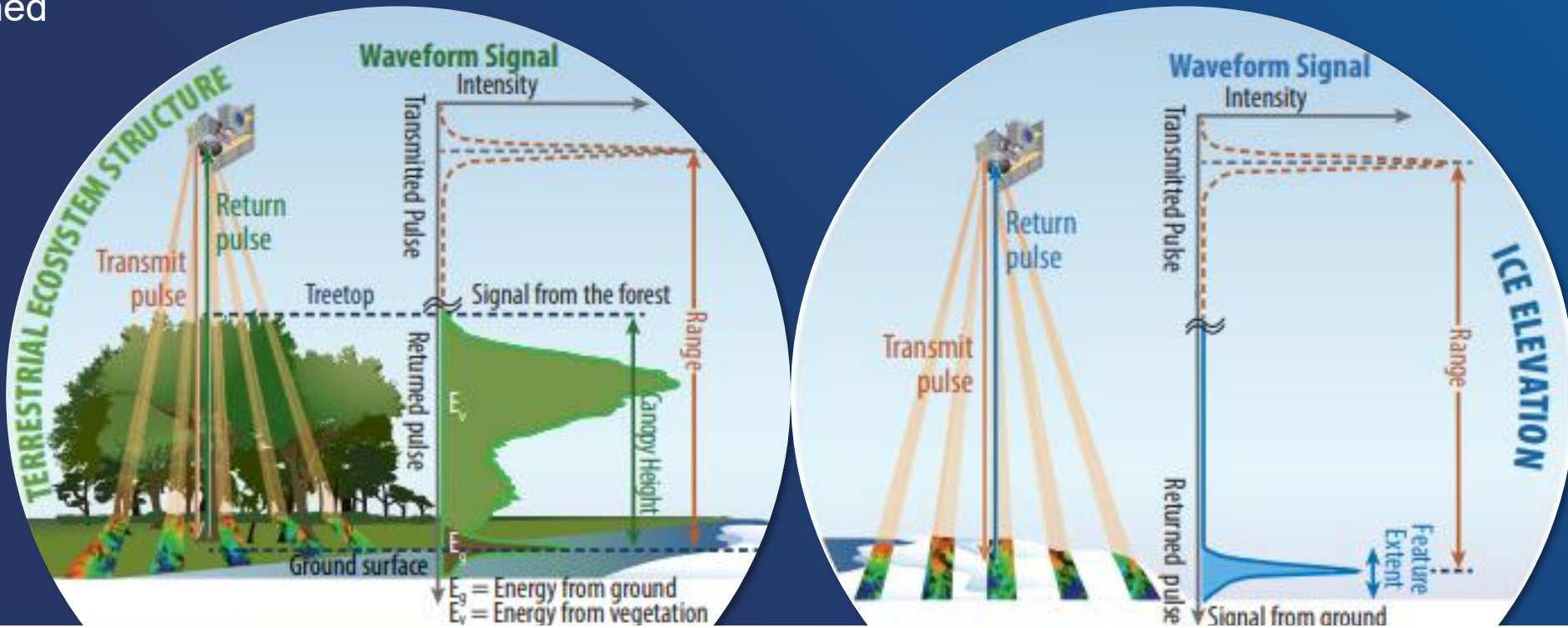
Composition



EDGE: Advancing Global Monitoring Land, Ice, and Coastal Regions

Completed Explorer Class Mission (UCSD/GSFC)

EDGE (Earth Dynamics Geodetic Explorer) will track dynamic Earth processes and produce the nation's next-generation global baseline elevation map, delivering greater global coverage than all prior missions combined



Safer
communities



Water
security



Navigable seas
& access to
essential resources



Full accounting of
forests & rangeland
ecosystems



Disaster
mitigation

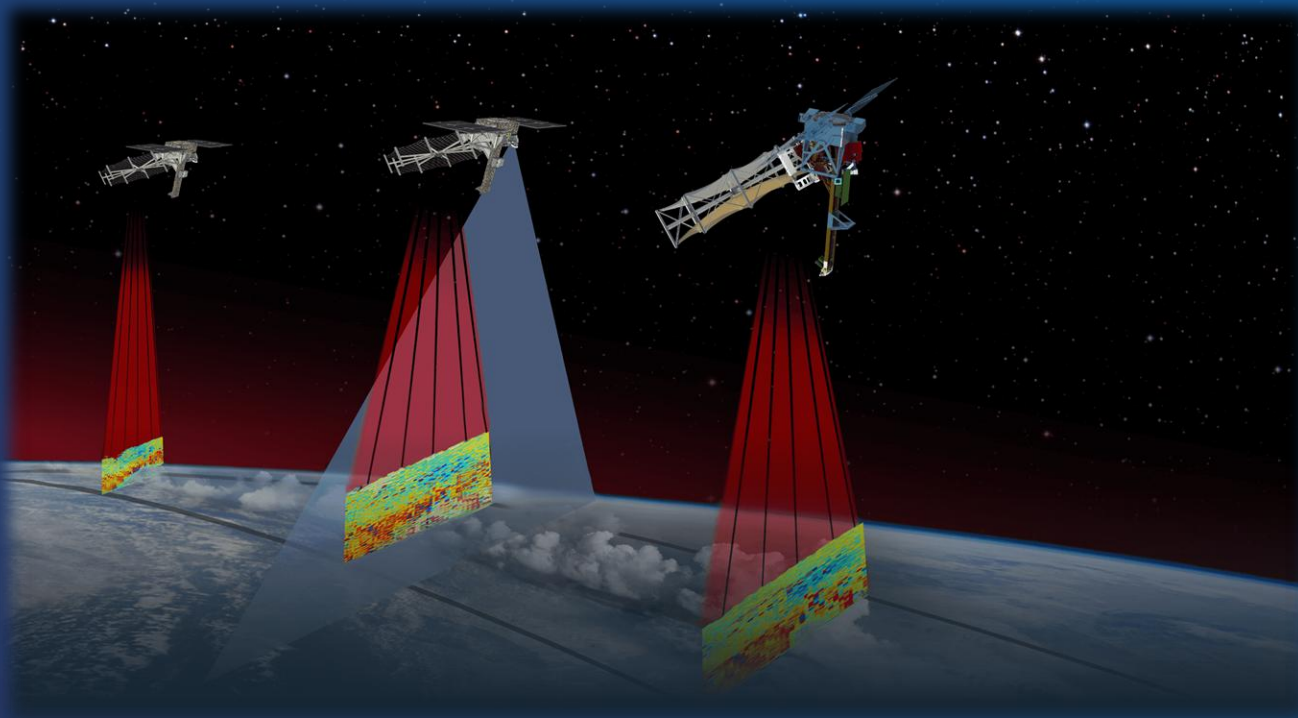


Technological
advantage

INvestigation of Convective UpdraftS INCUS

Competed Venture Class Mission
(CSU/JPL)

- Why convective storms, heavy precipitation and clouds occur exactly when and where they do
- First ever measurements of how much water and air is lifted (convective mass flux) into the atmosphere to understand and improve prediction of severe weather



Polarized Submillimeter Ice-cloud Radiometer **PoISIR**

Competed Venture Class Mission (Vanderbilt/GSFC)

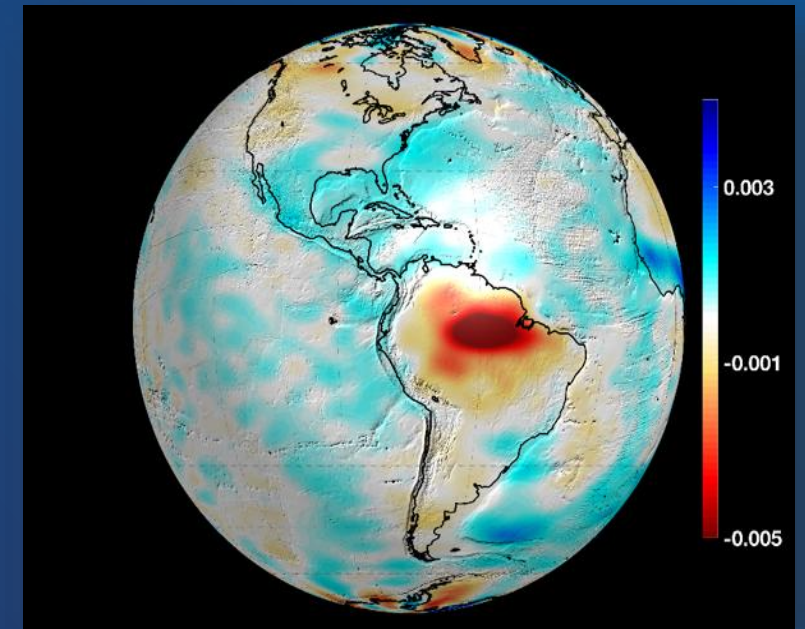
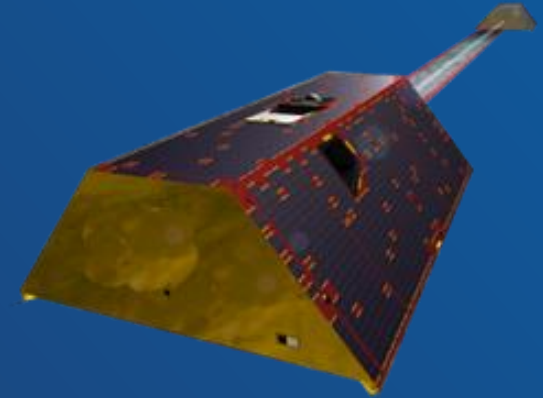
- Diurnal variability of tropical and sub-tropical ice clouds to reduce a fundamental uncertainty in Earth system understanding of how and why ice clouds change throughout the day
- Deep convection re-distributes energy around the Earth, and its evolution in a changing climate is an incredibly complicated process
- Observations from PoISIR's two CubeSats will increase understanding of the diurnal cycle of deep convection



Gravimetry Measurements and Subsurface Water GRACE-Continuity

Directed Explorer Class Mission (JPL)

- The GRACE-C mission will advance more than two decades of large-scale mass change observations by measure changes in Earth's gravitational field
- Advanced accuracy through laser ranging versus previous microwave ranging
- This valuable data is currently used for:
 - Ground water estimates for Agriculture
 - Drought assessment and forecasting
 - Water management
 - Glacier and ice sheet change
 - Energy balance
- Status: In observatory integration and test
- Target Launch: No later than 2029



Adopting a Mission-Class Framework

Shifting focus toward organizing high-priority science objectives into cost-capped, competitive or directed mission classes rather than tying recommendations to rigid, assumed budget profiles



Venture

- \$35M-\$250M
- < 36 months to orbit
- Higher-risk (tailored Class D and commercial best practices)
- EVO competition (PI-led) or Directed
- Fully commercial missions possible

Emphasizes rapid development, commercial partnerships, and innovative, high-risk/high-reward science



Explorer

- \$251M-\$500M
- 36-48 months to orbit
- Medium-risk (tailored Class C and commercial best practices)
- ESE Competition (PI-led) or Directed

Enables priority science and decadal objectives not met by Venture or commercial missions



Large

- > \$500M
- Directed
- Lower-risk (typically Class C and commercial best practices)

Transformational science not achievable through smaller or disaggregated approaches



Maximizing our science
through integration

Multisource Integrated Observatory (MIO)

Multisource Integrated Observatory Goal and Objectives

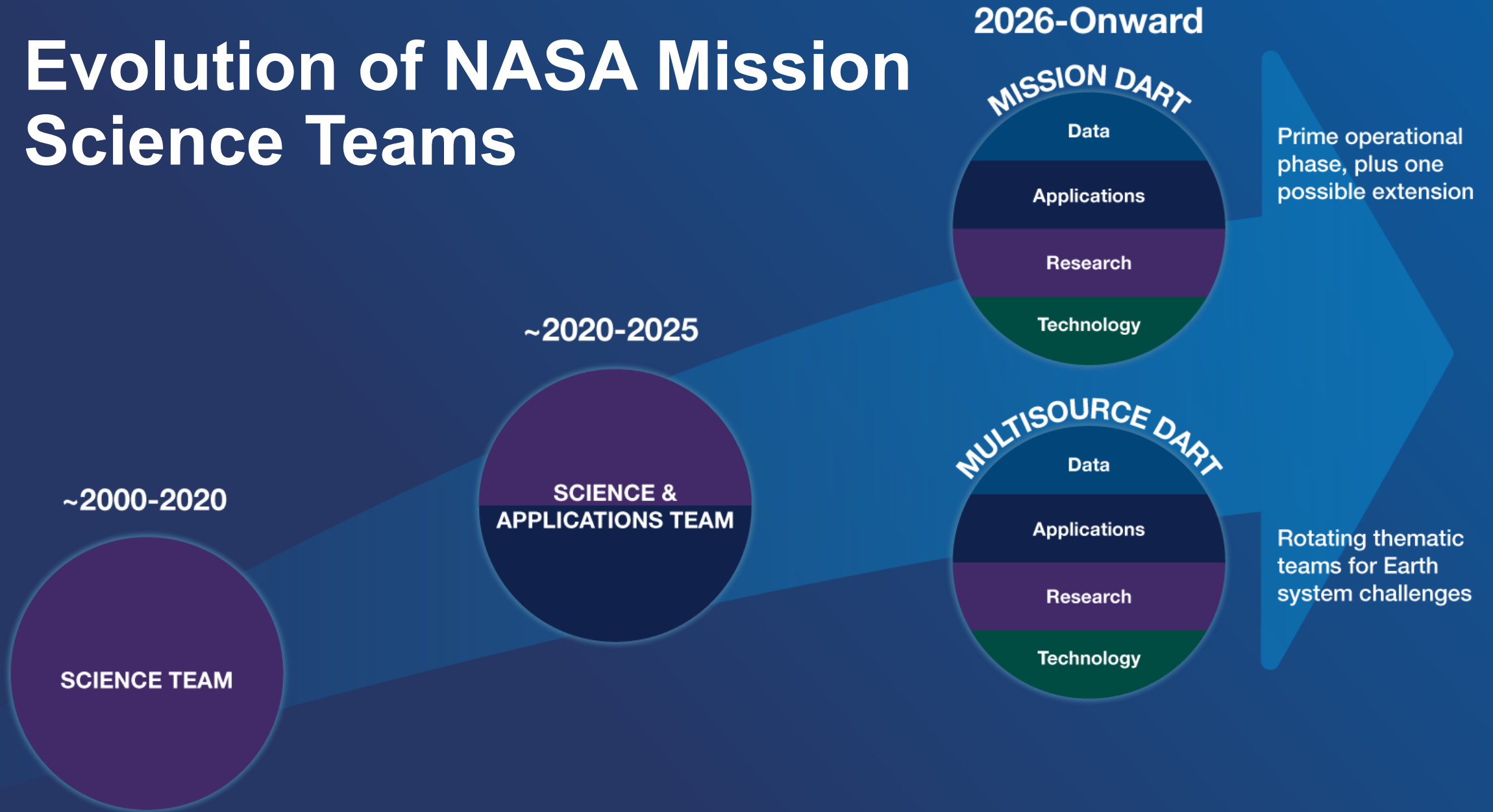
ESD sees growing opportunity in integrated Earth-observing to answer complex Earth system science questions

Goal: Maximize science and applications from individual missions and observations combined across NASA, partner and commercial fleets

Objectives

- Integrate the broad spectrum of activities required to accelerate the pace of scientific discovery and innovation
- Deliver high-impact, actionable applications based on multisource data, technology, and science
- Advance science-to-application pipelines across public and private sectors

Evolution of NASA Mission Science Teams





Advancing Technology
Earth Science Technology Office

Earth Science Technology Office (ESTO)

Driving Innovation

>1,172 technology investments made since 1999

>2,000 collaborators from >400 organizations

>269 infusion into science missions, operational and commercial services

>23 patents issued for ESTO technology

~90% projects advanced one or more Technology Readiness Levels during ESTO funding since inception

FY25 Program Metrics



184 projects active in FY25 (58 added / 60 completed)



71 unique PI organizations, in 28 states



162 unique Co-I organizations, in 34 states



More than 50% of ESTO projects led by industry PIs or had contributions from industry partners / Co-Is



3 technology demonstrations on orbit



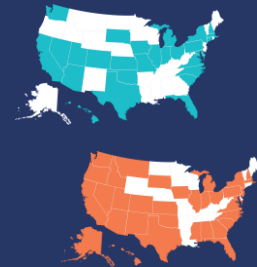
11 projects airborne tested



11 journal articles published, with more than 370 conference proceedings publications



1 patent granted



Faster to Science Venture Technology Accelerator

New ESTO initiative to accelerate transition of next-generation Earth observation technologies to science missions, operational agencies and commercial providers:

- Maturing high-potential Earth-observing technologies
- Identifying transition pathways early
- Engaging potential end users in targeted flight demonstrations and on-orbit validation planning
- Serving as a bridge to commercialization, infusion, and operations





Advancing Scientific
Understanding of Earth
Earth Science Research

Research Strategy

Advance scientific breakthroughs to better understand Earth and advance models that capture the intricacies of the Earth system

- Focus on things that only NASA can do
- Sustain our community as a premier knowledge incubator
- Understand Earth's complex and interconnected systems
- Strengthen the linkage between discovery and impact of science



ESD Research Strategy Provides Flexibility

- Simplify Research organization structure (transition to Spheres)
- Use directed funds to maintain community-serving capabilities
- Provide steady cadence of ROSES opportunities for all
- Streamline and accelerate the ROSES application, evaluation, and award processes
- Enhance communication to our science community



Integrated Earth System Modeling Strategy

Models underpin state-of-the-art prediction and global analyses that support economic growth, national priorities and security:

- **Streamline:** Engage leading experts in the field nationwide to identify streamlined modeling approaches and consolidated workflows for greater effectiveness
- **Prioritize:** Align investments around advanced technologies, mission needs, and new modeling techniques, including AI/ML
- **Flexible and scalable:** Define modular and connected modeling approaches that maximize scientific computing systems



Earth Modeling Nexus: From Independent to Integrated

INDEPENDENT MODELS TODAY

Land

LIS (Land Information System)

Atmosphere

Ex.: Chemistry, turbulence, cloud processes

Ocean

ECCO (Estimating the Circulation and Climate of Oceans)

Ice

ISSM (Ice Sheet and Sea-Level System Model)

Earth System

Reanalysis and short-term and seasonal prediction

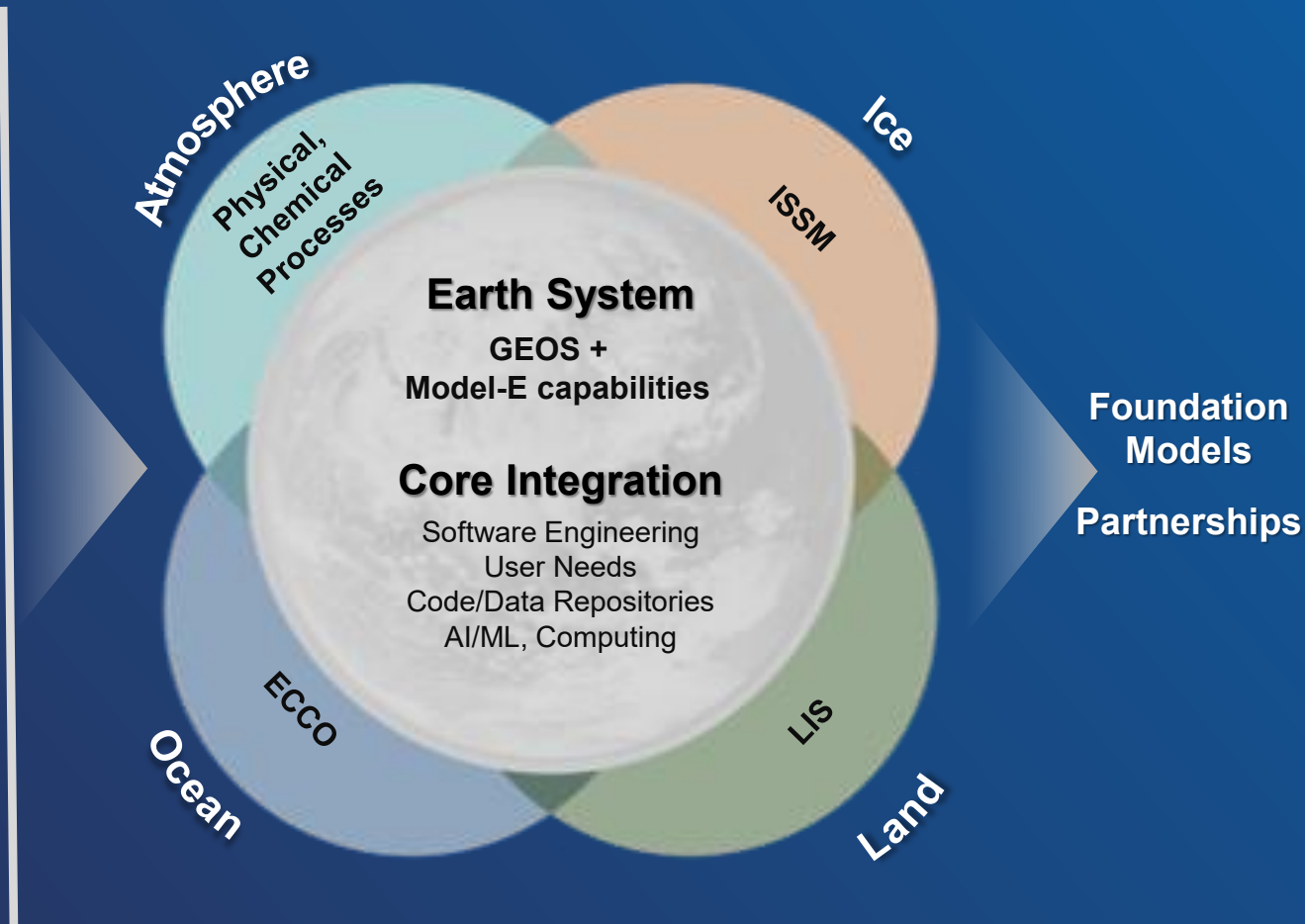
GEOS (Global Earth Observing System Model)

Earth System

Decadal and long-term prediction and planetary atmospheres

Model E (Global Earth Observing System Model)

INTEGRATION VIA EARTH MODELING NEXUS



NASA Earth Science Research Results Portal



BioSCape grows the biodiversity remote sensing user community by delivering hands-on training opportunities.



Meetings and Events

NURTURE '26 News Story on CBC Newfoundland & Labrador



Ashley Brauweiler shows how a NASA project in Labrador will help predict weather

Here & Now

CBC NEWS

JGR Atmospheres

RESEARCH ARTICLE
10.1029/2024JD042700

Key Points

- Shallow snowfall is the most pervasive regime, with more than half of the occurrences below the satellite radar blind zone.
- Collocated KAZR-CloudSat observations show comparable vertical structure for deep and shallow snowfall regimes.
- Detecting snowfall occurrence and accumulation depends on both the blind zone height and radar sensitivity.

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KAZR-CloudSat Analysis of Snowing Profiles at the North Slope of Alaska: Implications of the Satellite Radar Blind Zone

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Abstract Spaceborne radars provide near-global observations of clouds and precipitation, but ground clutter can result in a satellite radar blind zone as high as 2 km above the surface. As a result, satellite radars may underestimate snowfall from shallow clouds and incorrectly flag snow virga as snowfall at the surface. Ground-based radar observations provide invaluable tools to assess satellite

This study investigates snowfall regimes using observations from Atmospheric Radiation Measurement North Slope of Alaska (ARM) identified in the Ka-band ARM zenith radar (KAZR) are separated into three categories: deep snowfall, shallow snowfall, and snow virga for nearly half of the regime occurrence (48%) followed by snow. However, more than half (62%) of the shallow snowfall is likely a satellite radar blind zone. Snow virga is incorrectly flagged as snow increases to 12% in October. The KAZR regimes and vertical strat CloudSat observations with snow certainly possible flags, the deep at between the ground-based and spaceborne radar observations. An occurrence and accumulation at varying reflectivity thresholds in 1 detection characteristics for current and planned spaceborne radar.

Plain Language Summary In a warmer climate, more

Article

Wide-swath altimetry maps bank shapes and storage changes in global rivers

<https://doi.org/10.1038/s41586-026-10218-y>

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Research Results and Scientific Developments

America's View | February 2025 | 10

Best Practice

Addressing Challenges and Exploring Solutions to Enhance Earth Observation Applications for Emergency Management

Patrick Kerwin¹, Jordan Bell², John Cooney³, Timothy Lahmers⁴, Alexander Melascos⁵, Julia Milroy⁶, Krysten Okora⁷, Julie Rolfe⁸, Rachel Verbeke⁹, Joshua Barnes¹⁰, Lauren Childs-Gleason¹¹, Katie Picchione¹², and Patrick Res¹³

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Earth observation (EO) and remote sensing technology provide essential data for disaster response and recovery efforts. Emergency management agencies (EMAs) rely on EO data to assess damage, monitor recovery progress, and coordinate relief efforts. However, several challenges hinder the effective use of EO data in emergency management. These challenges include: data availability, data quality, data integration, data interpretation, and data dissemination. Addressing these challenges requires a multi-faceted approach involving government, academia, industry, and the private sector. This paper explores the challenges and opportunities associated with using EO data for emergency management and presents a framework for enhancing EO applications in this field.

Keywords: Earth observation, emergency management, disaster response

Earth observation (EO) and remote sensing data to monitor natural resource management and its consequences on the environment and society (Kirschbaum et al., 2020). EO technology has developed rapidly for scientific, civil, and commercial applications across fields, including emergency management (Dennis et al., 2019). Emergency management requires timely, relevant data to inform decisions to fill gaps in field reporting (Cova, 1999; Drobek and Hoesmer, 1991). But more applications, and an emergency management (EM) community eager to move forward to meet emergency managers' expectations.

Campaign Highlights



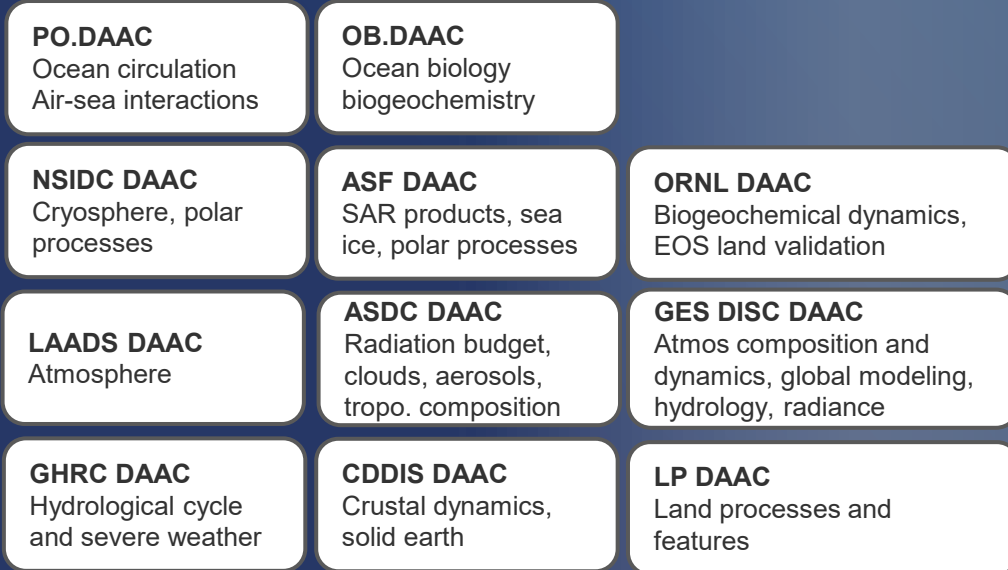
Driving
Earth Science Data

Data Systems Strategy

- **Focus on Core Data Systems mission**
 - Quality and Efficiency
 - Technological Evolution
 - Community Support and Open Science
- **Emphasis on:**
 - Ground-breaking science products
 - Foundational data products used by many different parts of the enterprise from research and modeling to applications
 - Near Real Time (NRT) products
- Structure data systems to support AI/ML and processing innovation
- Coordination with other agencies to sustain and enhance data discovery and utility



Evolving Earth Science User Support



From: 11 Geographically-Distributed Full Stack
Archives (DAACs)

To: Thematic Support Teams:
no anchoring physical team locations,
best support regardless of geography

Centralized services:
Cloud-based ingest, archive,
distribution, metrics, and cataloging



Driving Use of Actionable Science
**Applied Science and Responsive
Science Initiatives**

ESD's Private Sector Engagement Strategy

Harness the power of **Earth Observations** to bolster America's **national security, safety, and economic prosperity.**

Unlock economic potential of NASA's Earth science cutting-edge capabilities.





Questions?



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Our Mission.

science.nasa.gov/earth