

National Aeronautics and Space Administration

NASA

NASA Earth

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Transforming the Speed of Science with a new model for Earth Observation Cooperation:

International and Commercial Fleets with More Rapid Mission Development

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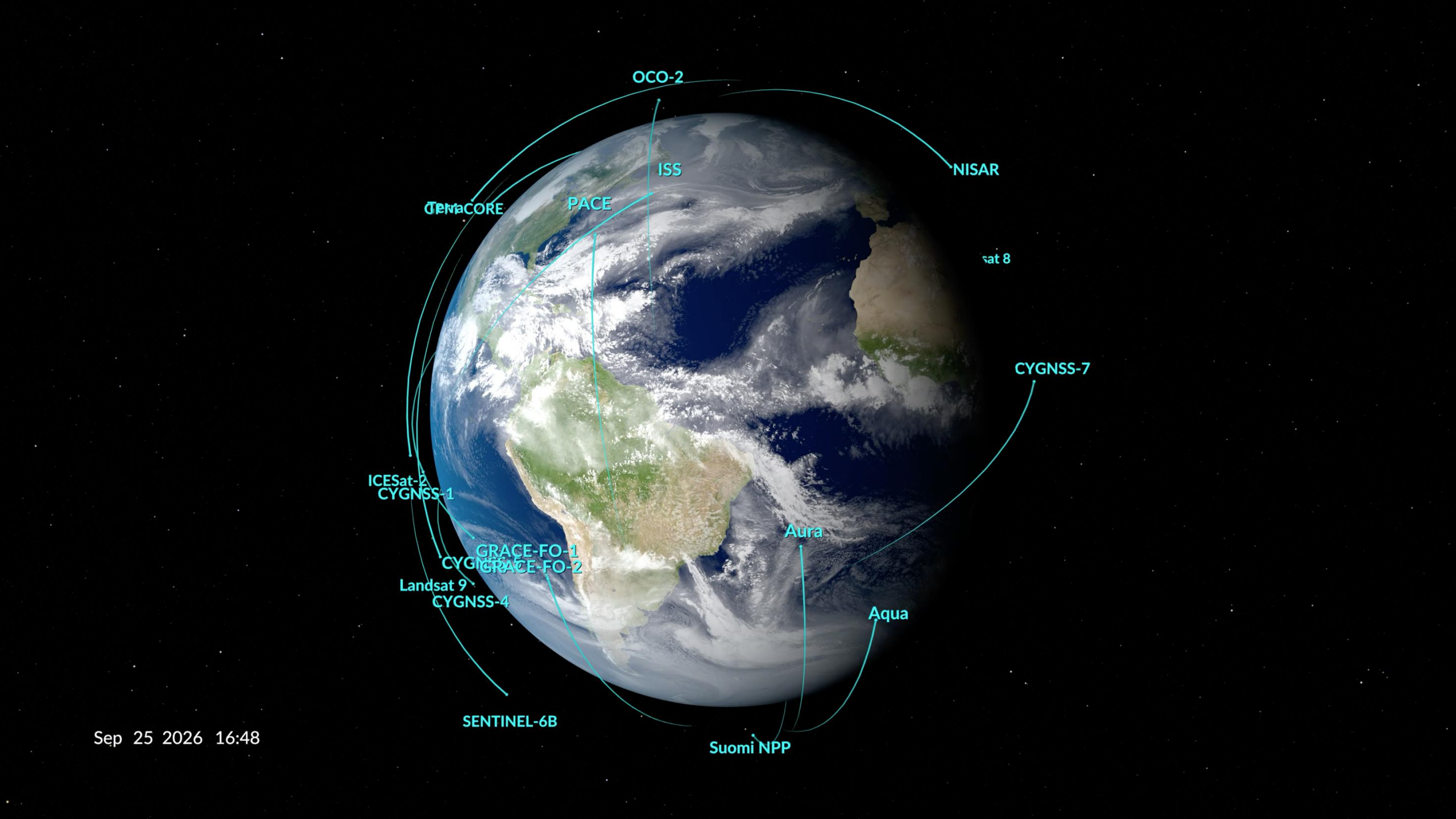
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The Upfront:

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

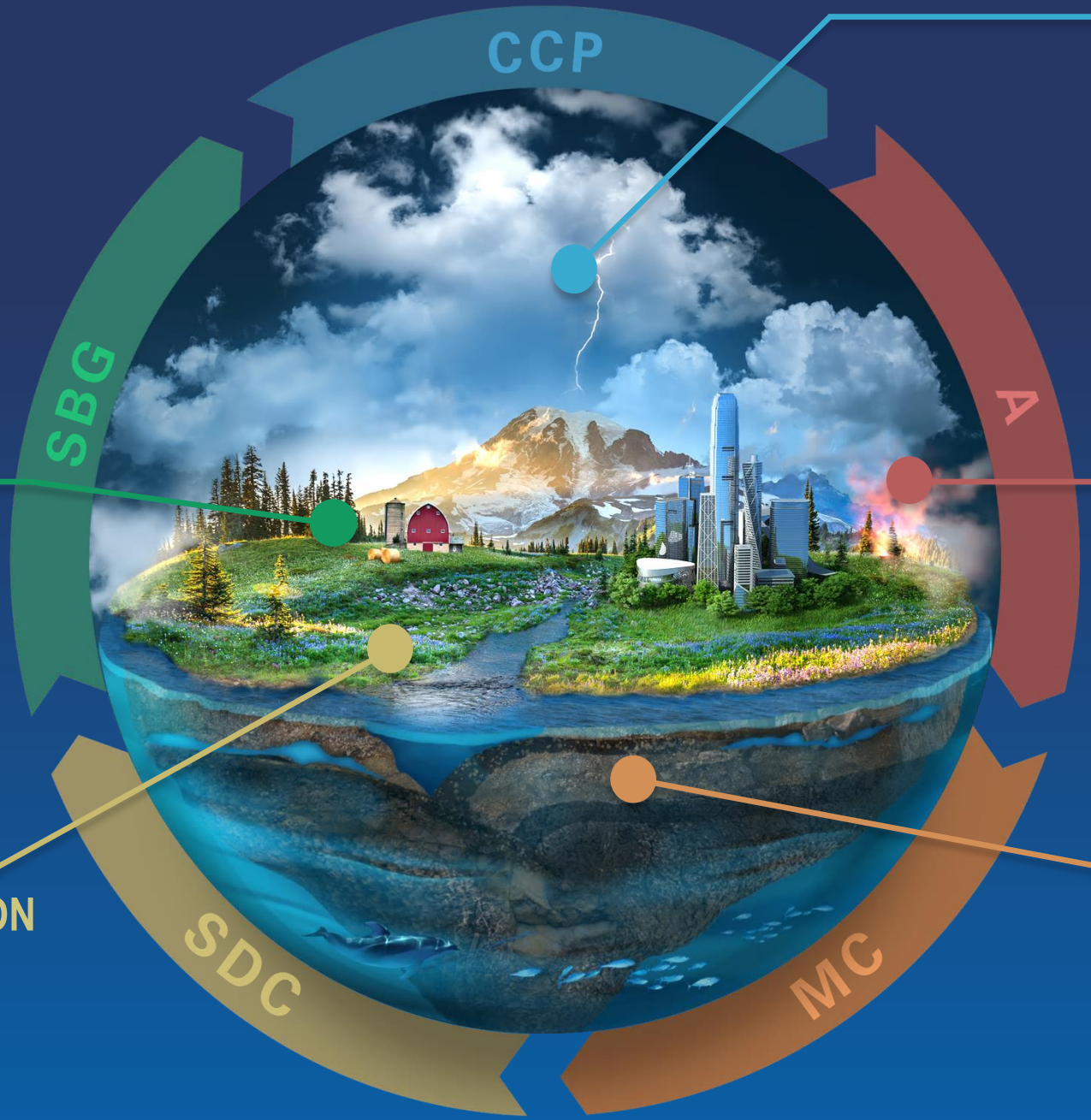


NISAR launch 7/30/2025
Credit: ISRO

As of FY2026 Enacted Budget

EARTH SYSTEM OBSERVATORY

INTERCONNECTED CORE MISSIONS



CLOUDS, CONVECTION AND PRECIPITATION

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

AEROSOLS

FALCON-Lidar Next Gen
STRIVE

MASS CHANGE

GRACE-C

SURFACE BIOLOGY AND GEOLOGY

EAGLE-VSWIR
EDGE
EAGLE-TIR

SURFACE DEFORMATION AND CHANGE

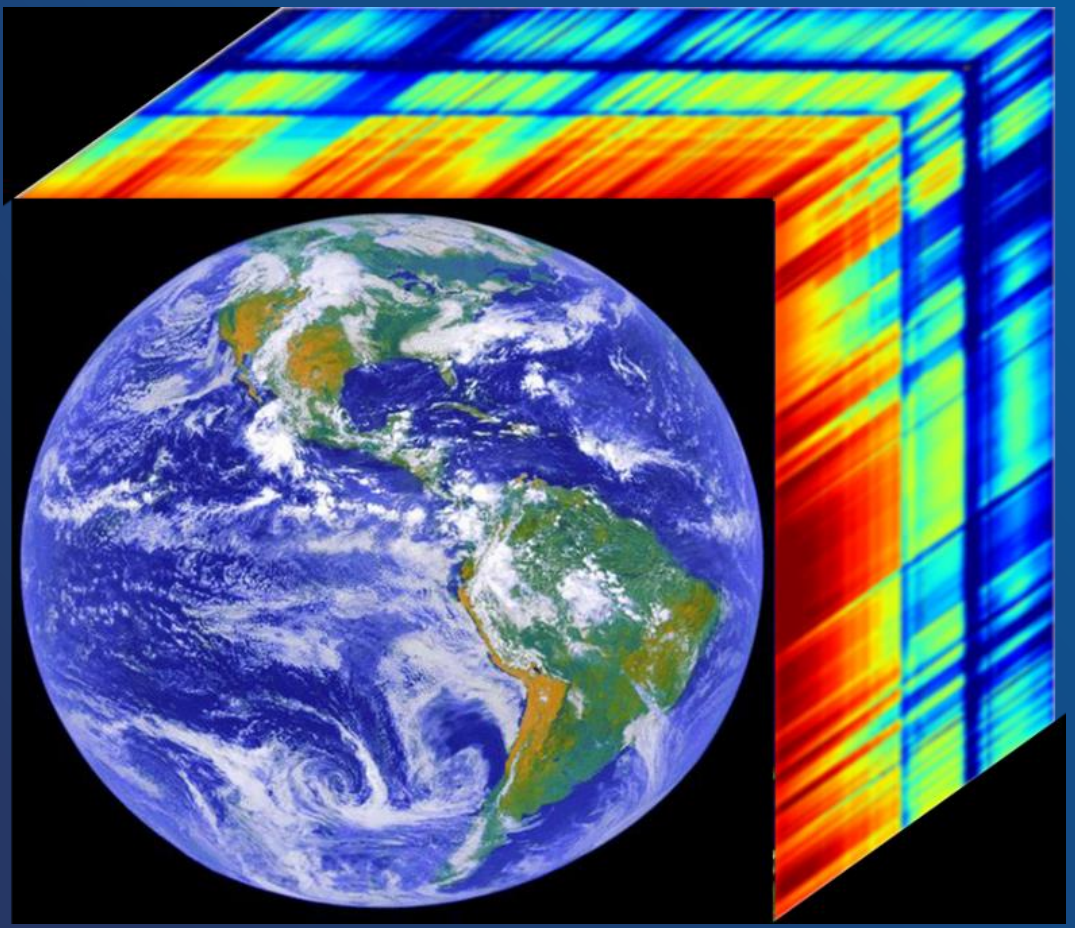
NISAR

EAGLE: Driving Advancements in Understanding Earth's Changing Surface

EAGLE-VSWIR

Directed Explorer Class Mission (JPL)

- Best-in-class imaging spectrometer
- Versatile technology that also supports lunar and Mars missions
- Science and Applications ranging from critical minerals to changing ecosystems, agriculture, wildfires, water quality, and disaster response
- Status: CDR-level instrument in development at JPL, commercial spacecraft on contract
- Target launch: 2029

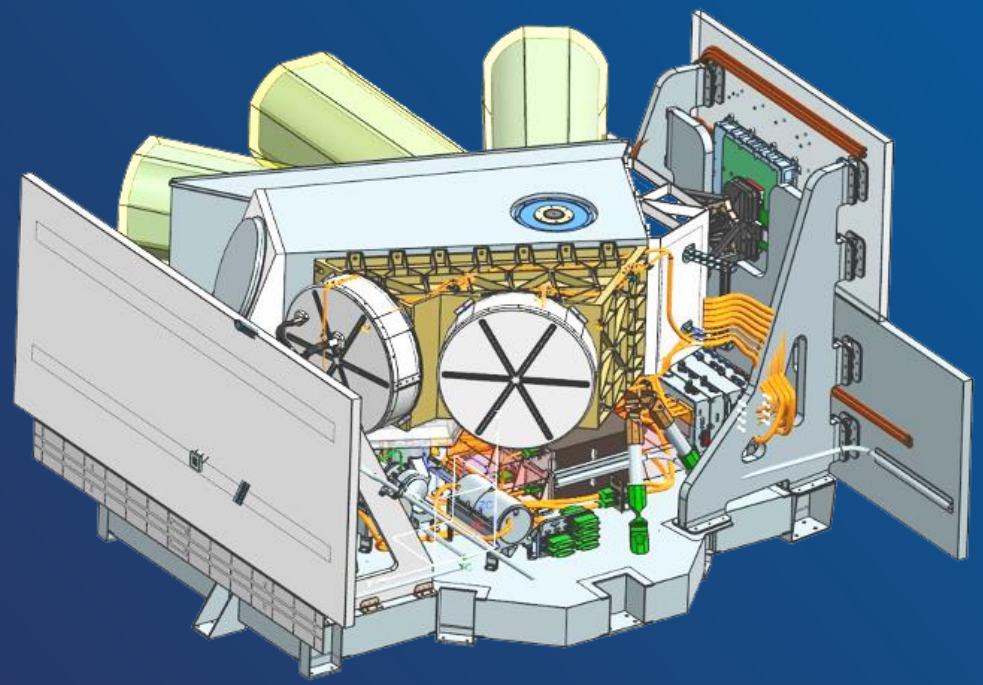


EAGLE: Driving Advancements in Understanding Earth's Changing Surface

EAGLE-TIR

Directed Explorer Class Mission (JPL)

- High sensitivity thermal imagery with 3-day refresh and unmatched mid infrared bands with early afternoon overpass
- Unsaturated fire and volcano temperature sensing to detect and predict change
- Applications ranging from agriculture to fire risk, urban heat and human health
- Status: Finalizing instrument component designs and building instrument component engineering units; will reuse EAGLE-VSWR instrument architecture
- Target launch: 2031



EAGLE-TIR Instrument

EAGLE: Driving Advancements in Understanding Earth's Changing Surface

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

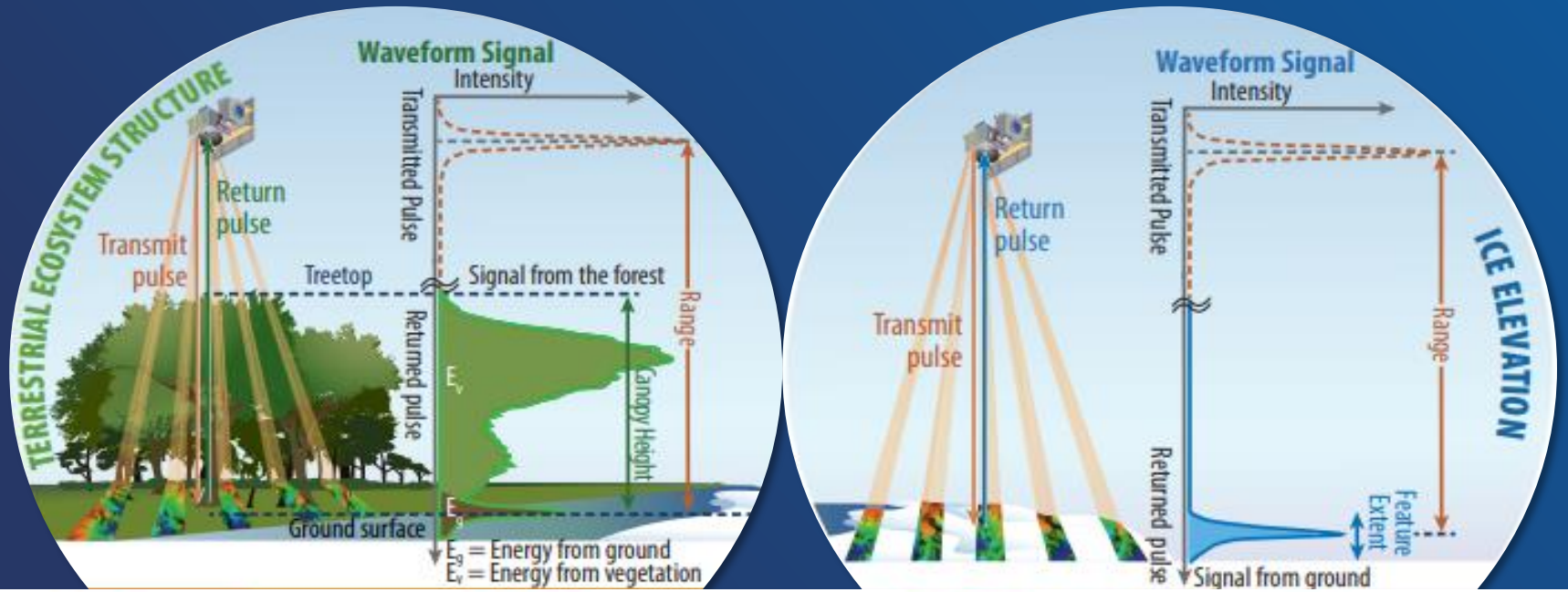
Competed Explorer Class Mission (UCSD/GSFC)

EDGE (Earth Dynamics Geodetic Explorer) will track dynamic Earth processes and produce the nation's next-generation global baseline elevation map, delivering global three-dimensional structure of terrestrial ecosystems and surface topography

10X improvement in spatial coverage

Status: Contract awarded to UCSD, System Requirements Review (SRR) held late September 2026

Target launch: No earlier than 2030



Safer communities

Water security

Navigable seas & access to essential resources

Full accounting of forests & rangeland ecosystems

Disaster mitigation

Technological advantage

FALCON: Driving Advancements in Understanding Changing Weather

PMM (JAXA/GSFC)
Global precipitation measurements

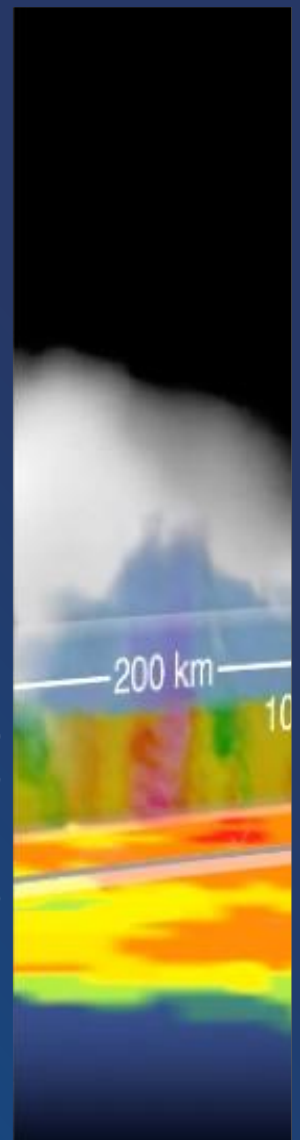
FALCON-Radar (JPL)
Cloud profiles and doppler motion to improve understanding of severe weather drivers

FALCON-Lidar Next Gen (GSFC/LaRC)
Atmospheric structure and composition profiles; cutting-edge detectors and laser for first spaceborne lidar water vapor profiles

FALCON-Radiometry (Commercial)
Water vapor and temperature fields

Competed Missions

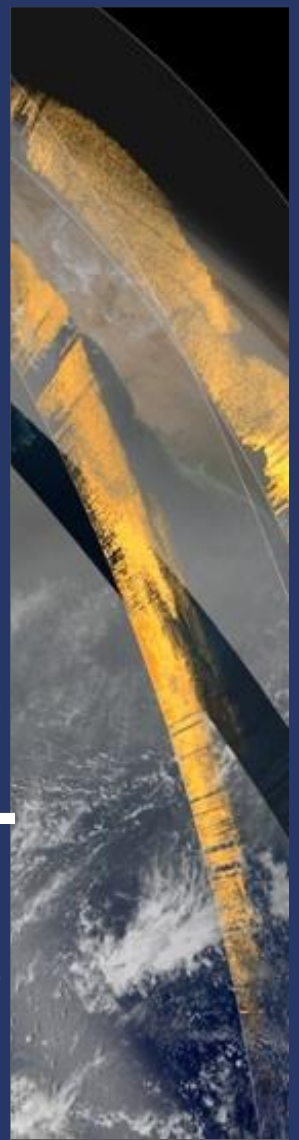
- INCUS: convective mass lift
- PolSIR: ice cloud cycles
- STRIVE: upper atmosphere limb profiles



Profiles



Structure



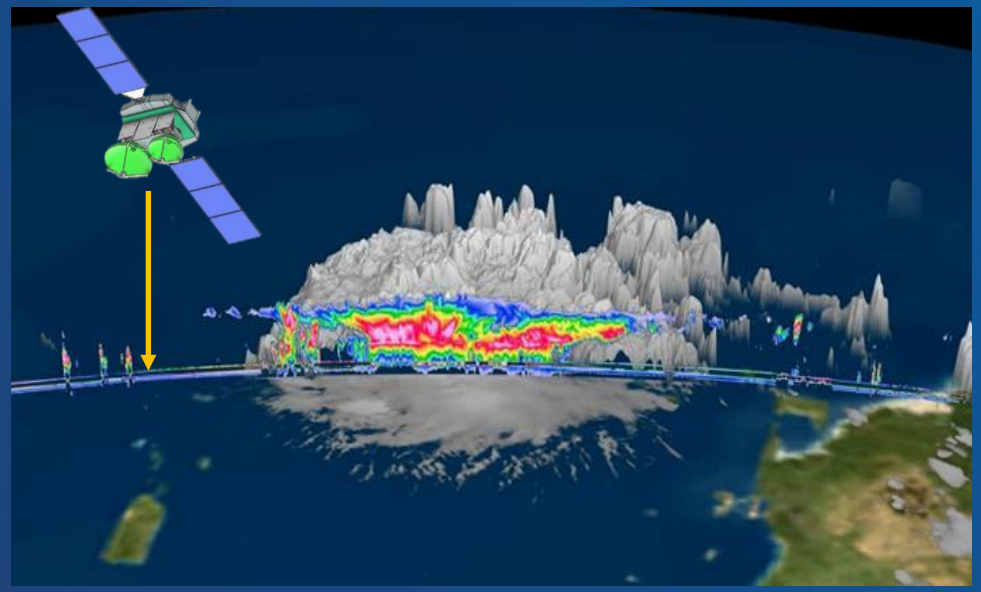
Composition

FALCON: Driving Advancements in Understanding Changing Weather

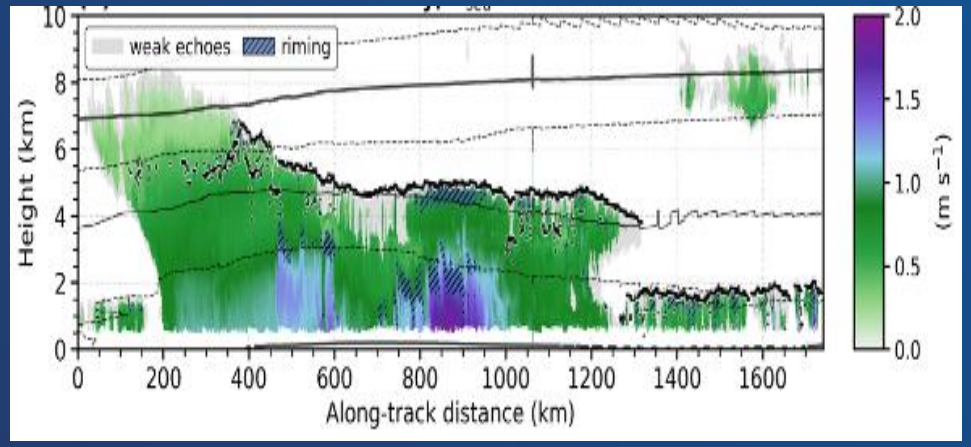
FALCON-RADAR

Directed Explorer Class Mission (JPL)

- Provides highly detailed and accurate information on critical cloud and precipitation processes and weather intelligence national need, especially in the Arctic and Antarctic, as expressed by NGA
- Measures aviation risk factors including icing conditions and turbulence
- Advances technology for millimeter wave radar for Earth, with Moon and Mars applications
- Embraces “Faster to Science” and commercial practices
- Status: PDR-level instrument in development at JPL, commercial spacecraft selected
- Target launch: 2029



Credit: CloudSat

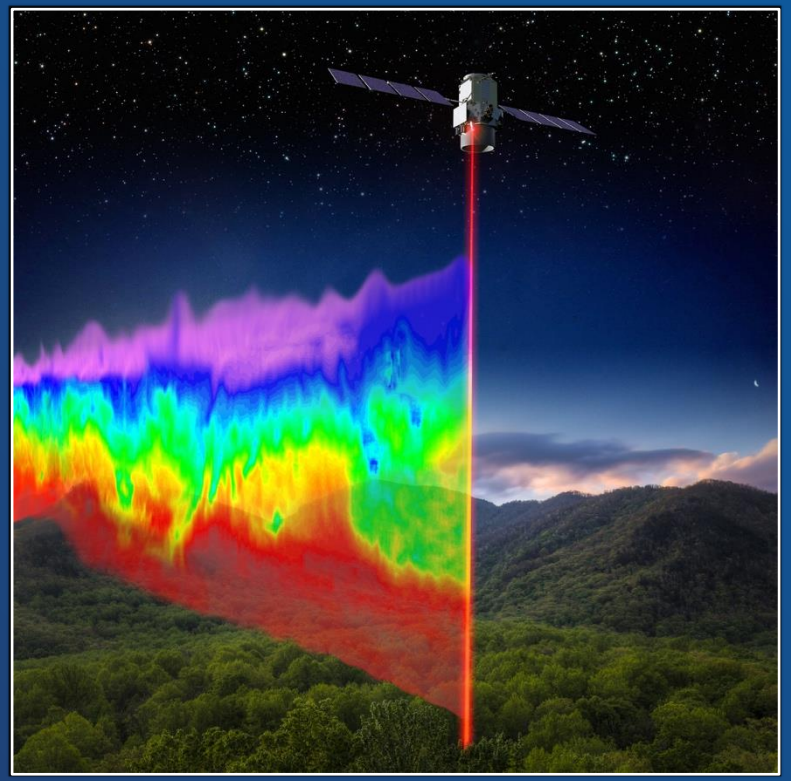


FALCON: Driving Advancements in Understanding Changing Weather

FALCON-Lidar Next Gen: First Coincident Aerosol, Cloud, and Water Vapor Lidar profiles

Directed Explorer Class Mission (GSFC)

- Atmospheric observations at multiple wavelengths to see clouds, aerosols, and first ever water vapor profiles in the troposphere (where we live)
- Combination will dramatically advance understanding of coupled behavior, such as how aerosols serve as nuclei for clouds
- Instrument design has direct technology transfer from Earth to Exploration
  - Characterization of atmospheric water vapor and dust content
  - Critical hazard avoidance for entry/ decent maneuvers
- Status: Completing long-lead item development (telescope, detectors, and water vapor laser) in advance of instrument development
- Target launch: 2031



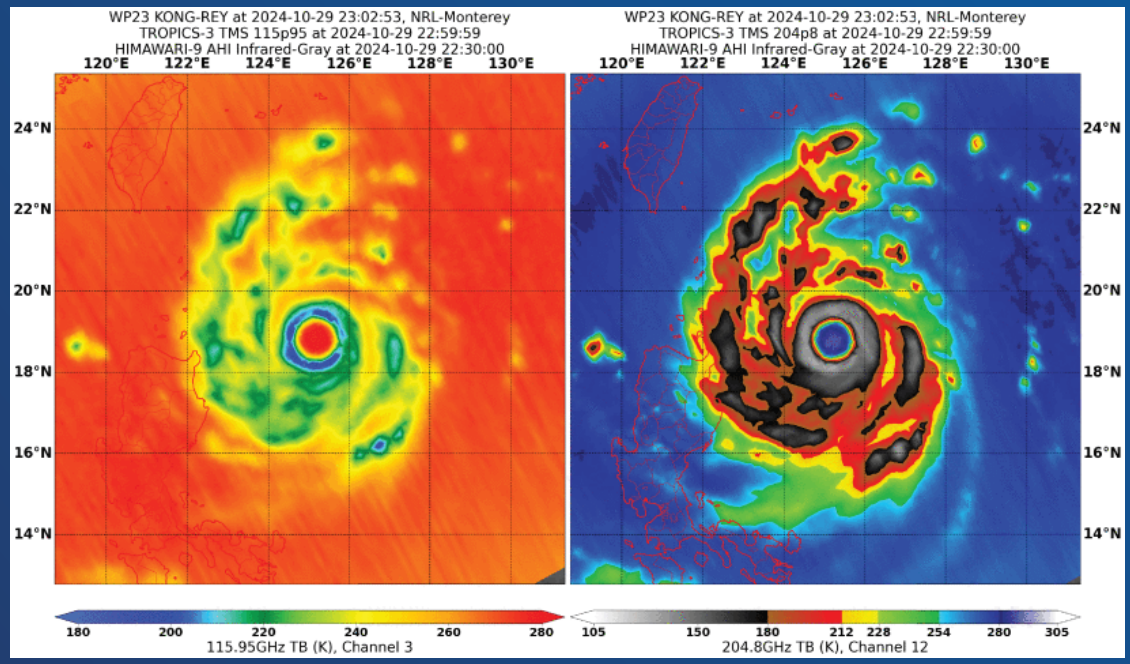
Water Vapor and Aerosol/Cloud Profiling together in ABLE tech maturation, Amin Nehrir, NASA GSFC

FALCON: Driving Advancements in Understanding Changing Weather

FALCON-Radiometry

Competed Commercial Capability

- Radiometry provides critical background temperature and water vapor fields that enable all other FALCON capabilities
- FALCON Radiometry RFI sought innovative mission concepts for commercially-owned and operated microwave radiometry observations to fly in formation with the FALCON missions
- RFI yielded a variety of mission concepts with varying capabilities under evaluation
- Status: Radiometer synergy study completed and solicitation planned for FY27
- Target launch: 2029, 2030



Imagery from the NASA TROPICS mission of Typhooon Kong-rev. The TROPICS microwave radiometer has been transitioned to industry and is now flown and operated by Tomorrow.io (Figure from Blackwell et al. 2025).

FALCON: Driving Advancements in Understanding Changing Weather

Precipitation Measuring Mission (PMM)

Partnership Mission with JAXA

- Reveals the 3D structure of precipitation systems across a wide range of weather regimes
- Advances understanding of processes governing precipitation systems and storm evolution
- Enhances the ability to identify storms with the potential to develop into high-impact weather events
- Status: Refining interfaces and developing launch vehicle solicitation paperwork
- Target launch: 2030

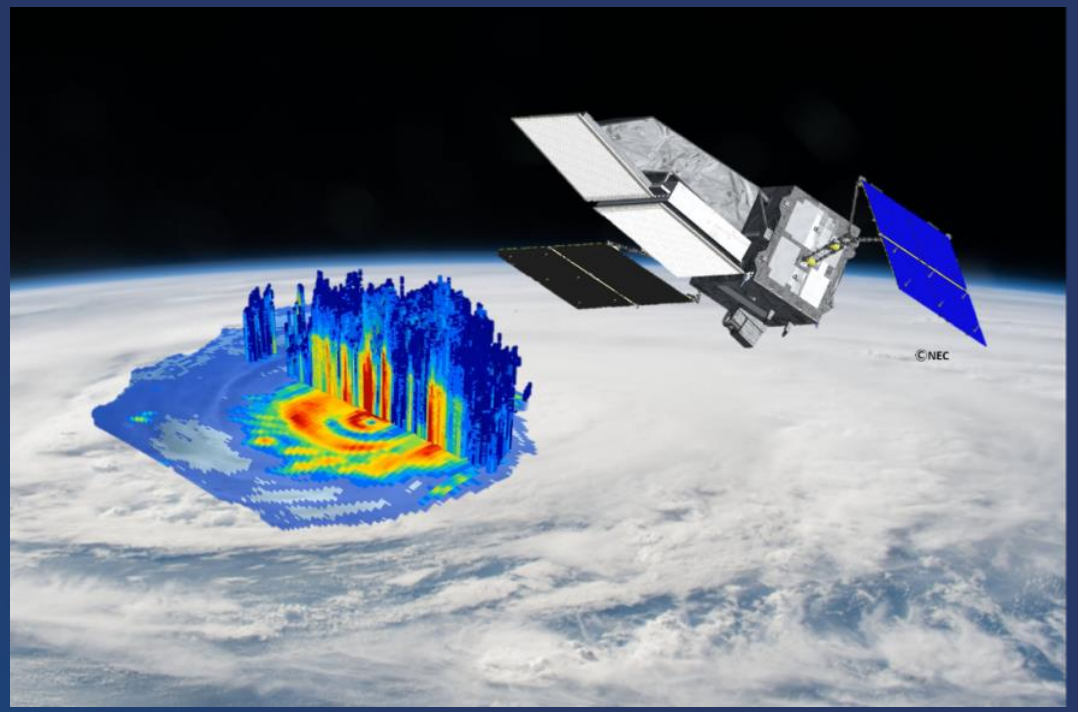


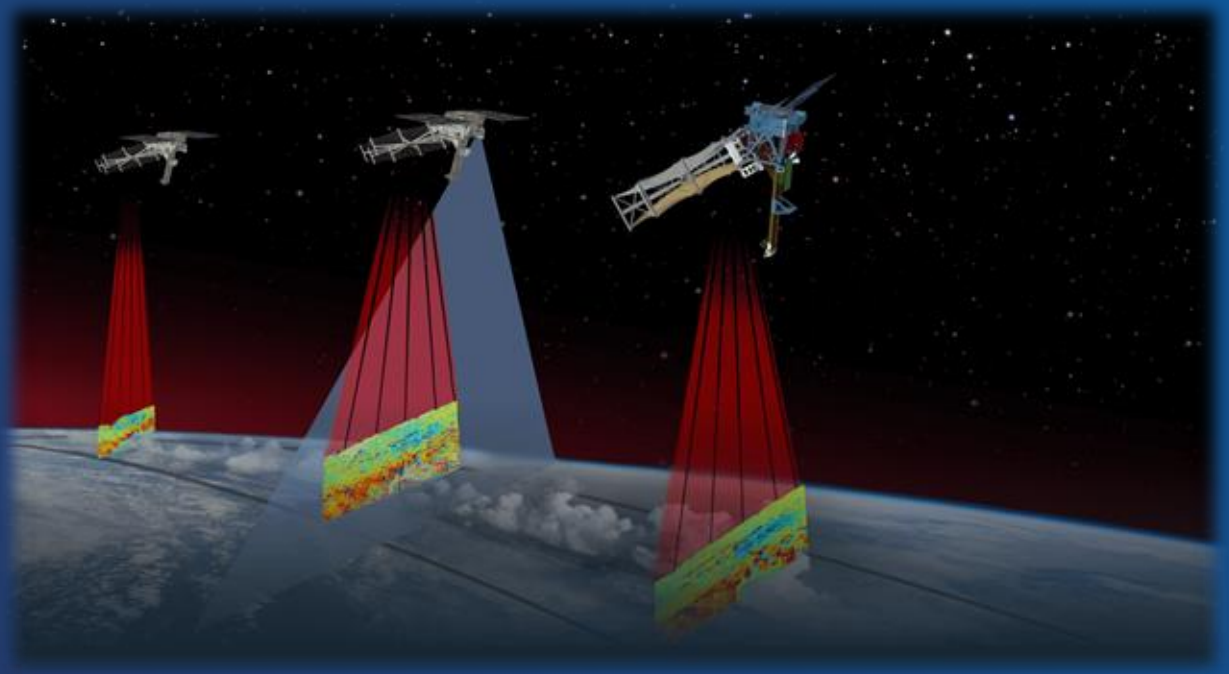
Image of a three-dimensional reflectivity retrieval and PMM satellite. Graphic © NEC.

FALCON: Driving Advancements in Understanding Changing Weather

INvestigation of Convective UpdraftS INCUS

Competed Venture Class Mission (CSU/JPL)

- Understand why, when and where tropical convective storms form, and why only some storms produce severe weather
- 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
- Three smallsats flying in formation
- Status: Three integrated spacecraft will be delivered to storage in 2026
- Target launch: 2027



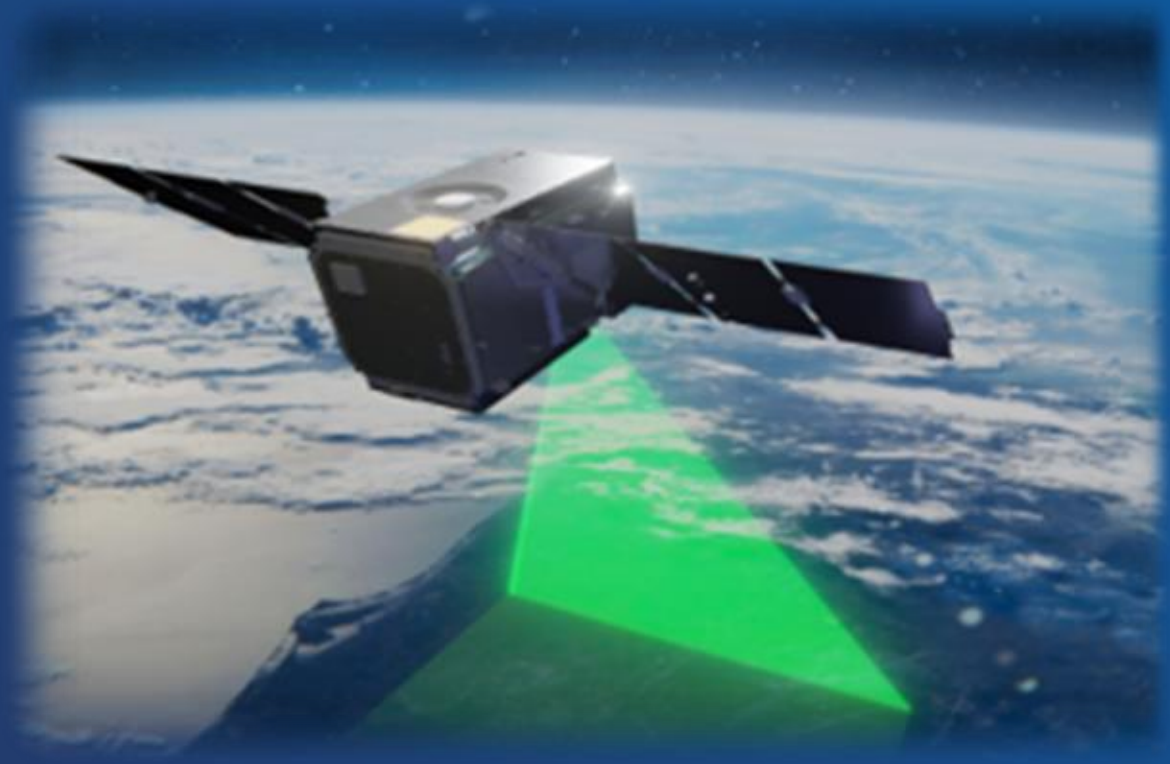
Credit: NASA/JPL

FALCON: Driving Advancements in Understanding Changing Weather

Polarized Submillimeter Ice-cloud Radiometer PolSIR

Competed Venture Class Mission (Vanderbilt/GSFC)

- Measure high-altitude ice clouds in tropical and sub-tropical regions to understand how they change over the daily cycle
- Deep convection re-distributes energy around the Earth; a complex process that is changing with warming temperatures
- Two CubeSats
- Status: Instruments delivered and awaiting integration to both completed spacecraft
- Target launch: 2027



Credit: Blue Canyon Technology

FALCON: Driving Advancements in Understanding Changing Weather

STRIVE: New Window on Stratosphere-Troposphere Interactions

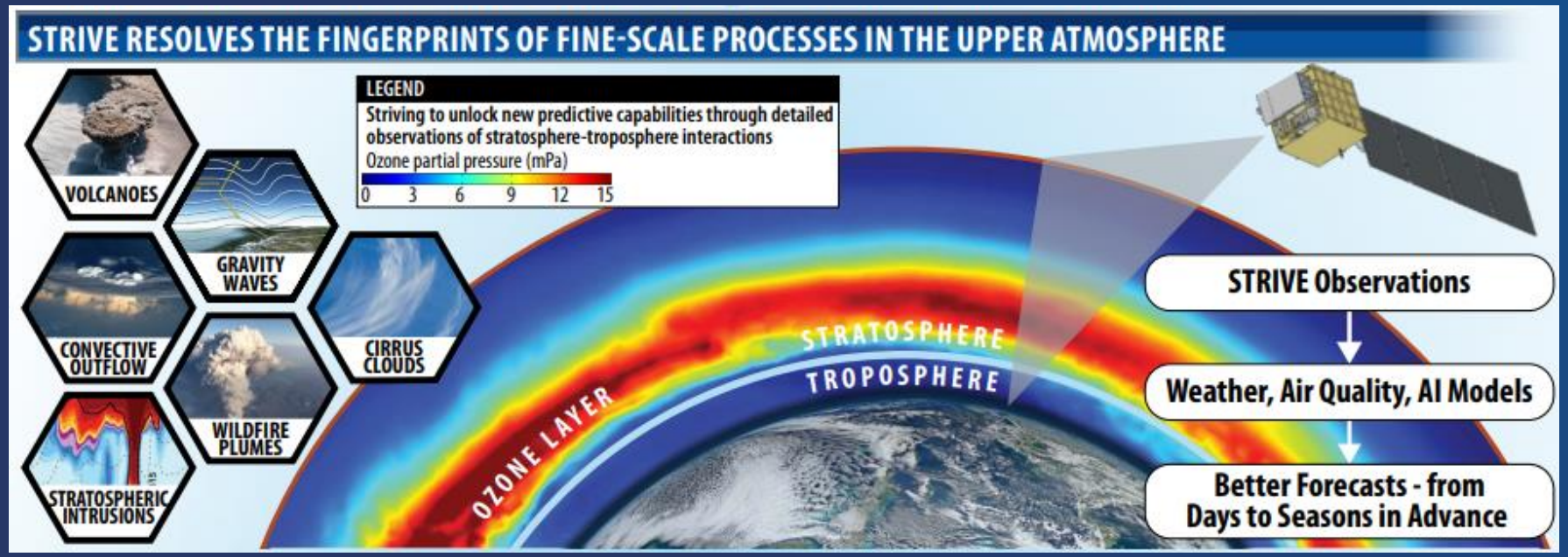
Competed Explorer Class Mission (UW/GSFC)

STRIVE (Stratosphere Troposphere Response using Infrared Vertically-resolved light Explorer) is an infrared limb sounder that will deliver an unprecedented view of the atmosphere, with a transformational leap in the accuracy of atmospheric predictions including weather patterns, extreme events, air quality, and the ozone layer

STRIVE will deliver in two months the same number of profiles that MLS/Aura did over 20 years

Status: Contract awarded to UW, System Requirements Review (SRR) held in July 2026

Target launch: No earlier than 2030



FALCON: Driving Advancements in Understanding Changing Weather

High-altitude Aerosols, Water vapour and Clouds (HAWC)

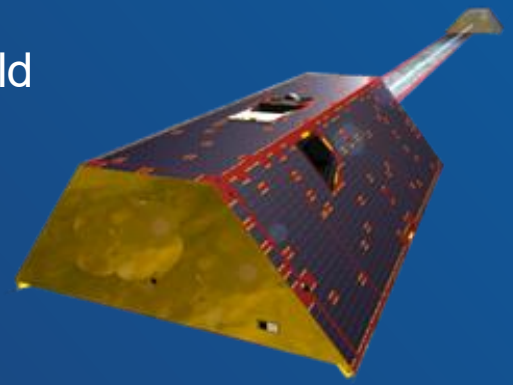
CSA Mission Concept for a Potential Addition to the FALCON Fleet

- **Being formulated to provide observations of clouds, water vapor, aerosols, and Earth's atmospheric energy balance, with relevance to processes in the rapidly changing Arctic**
- **Instruments:**
  - **Aerosol Limb Imager (ALI):** characterize aerosols in the middle and upper atmosphere
  - **Spatial Heterodyne Observations of Water (SHOW):** measure water vapor in the upper troposphere and lower stratosphere
  - **Thin Ice Clouds and Far InfraRed Emissions (TICFIRE):** complementary measurements of water vapor, ice-cloud properties, and far-infrared radiation emitted by the atmosphere.
- **Status:** Discussions ongoing related to potential scientific harmonization between FALCON and HAWC concept and potential collaboration on commercial access to space
- **Target Launch:** No earlier than 2033

Gravimetry Measurements and Subsurface Water GRACE-Continuity

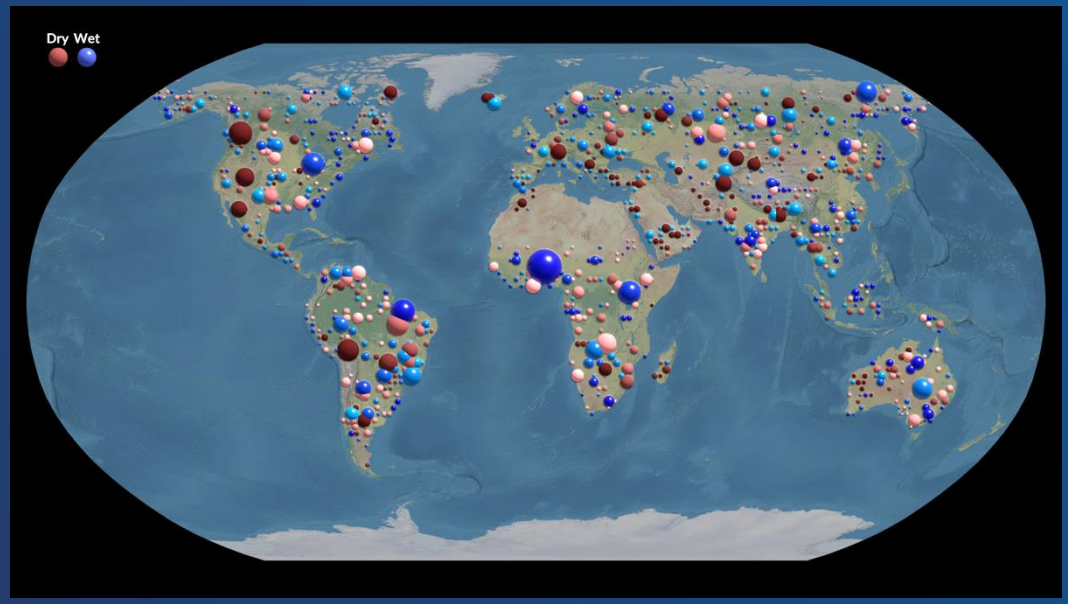
Directed Explorer Class Mission (JPL) / Partnership with DLR

- 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 from laser ranging vs 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



Credit: NASA GSFC/SVS

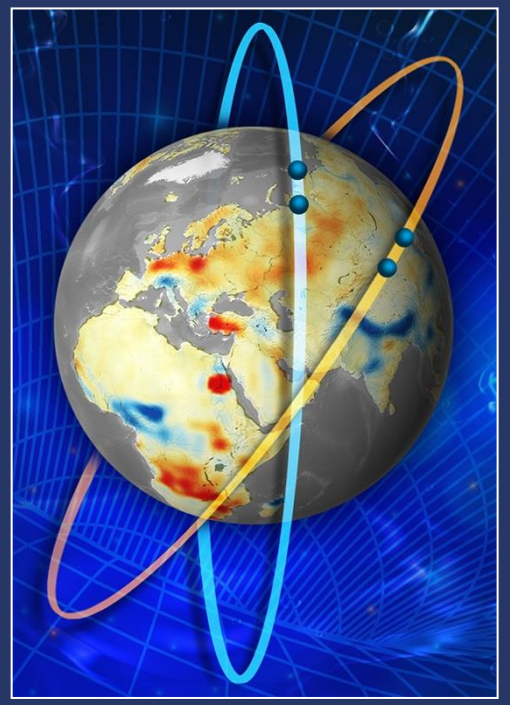
- Status: In observatory integration and test

- Target Launch: December 2028, NLT Summer 2029

Mass Change and Geosciences International Constellation (MAGIC)

NASA / ESA / DLR Science Cooperation

- MAGIC: NASA-DLR GRACE-C satellite pair with a second pair provided through ESA's Next Generation Gravity Mission (NGGM)
  - Two pairs will provide complementary observations increasing the scientific and applications value of the individual missions
  - Full constellation planned for deployment by 2032
- NASA/ESA MAGIC Working Group to coordinate science and applications planning and to exchange studies, results, simulated data, and data products in preparation for the combined constellation
- Early coordination ensures consistent products, improves understanding of each satellite pair characteristics and systematic errors, and optimizes combined observations.
- This model allows independently developed missions to contribute to a larger observing system while partners retain responsibility, maximizing the scientific and applications value of each partner's investment.

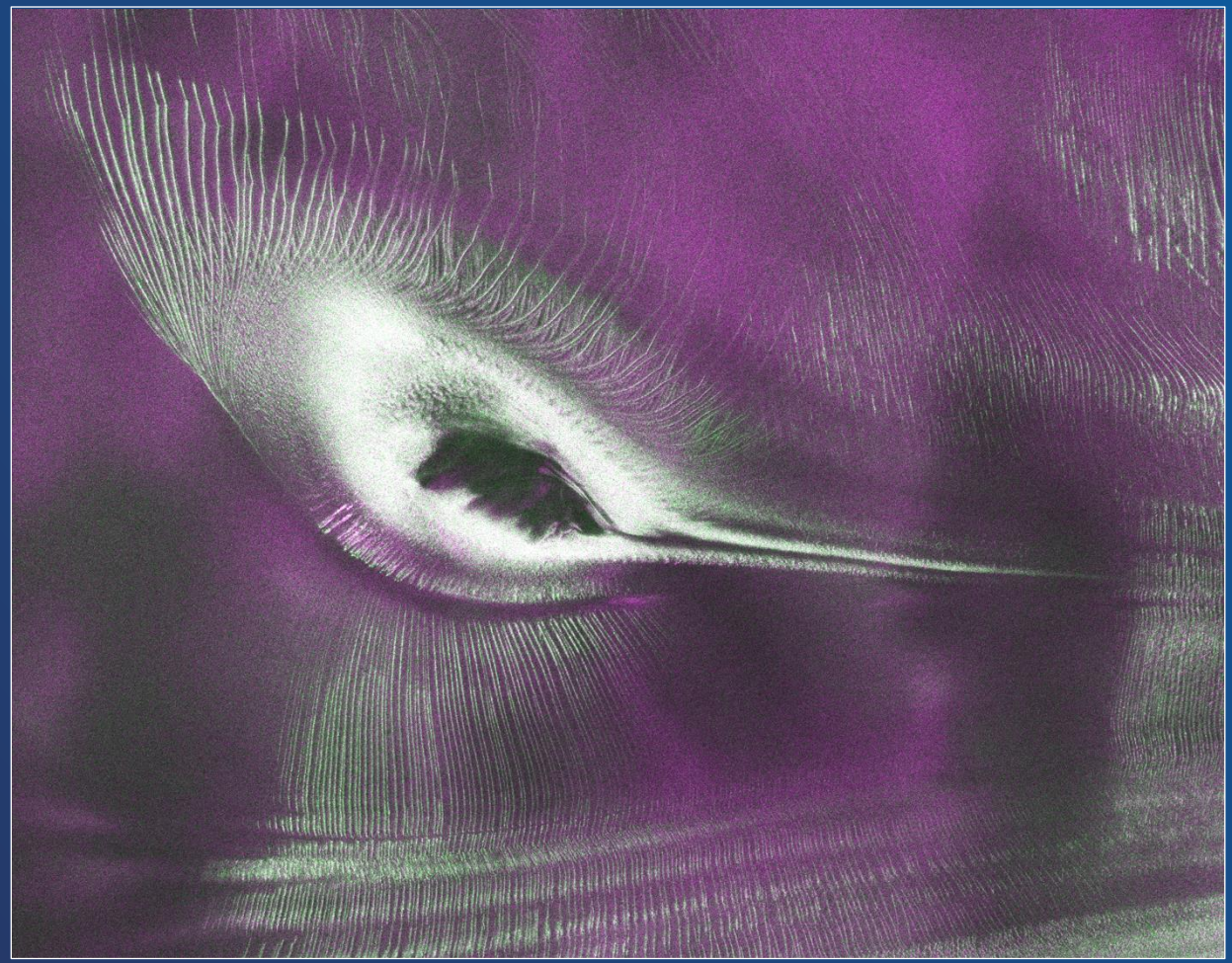


Rendering of MAGIC constellation. Credit: ESA

NISAR Mission Status: Prime Operations

Partnership with ISRO

- Transitioned to Science Operations Dec. 29, 2025
  - More than 1.6 million images produced
- L-SAR and S-SAR hardware are healthy; key spacecraft resources nominal
- Processing of L-SAR data in the cloud is nominal
  - Released 107,000 products to the science community in February 2026 – precalibrated with known issues
  - Began release of “forward processed” data July 2026; plan to reprocess data acquired prior to July 2026
- Joint L-band and S-band data acquired over India, Antarctica, Greenland and selected global sites



Ice flow around Antarctic peak Nunatak Zaterjavshijsja captured by NISAR’s L-band radar in August 2025. Credit: NASA/JPL-Caltech

NISAR

L-Band Image Washington, DC

Acquired 21 July 2026

RGB composite is formed from HH backscatter (red), HV (green), and the HH/HV ratio (blue)

Water bodies appear dark because of low radar backscatter

Variations in color highlight differences in land cover, vegetation structure, and urban development



Sustained Land Imaging **Commercialization Plan**

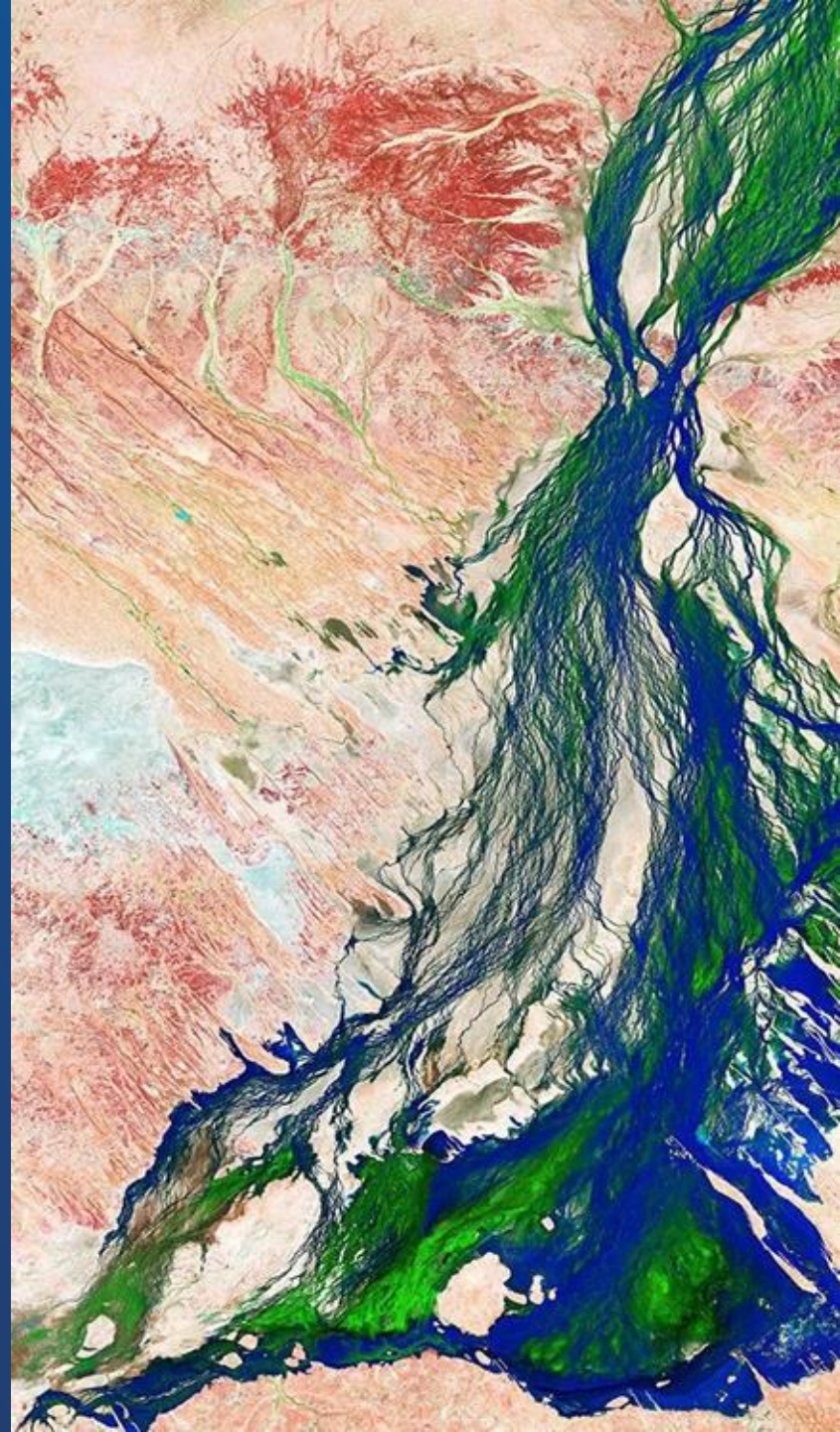
Approach for product-based strategy

As soon as feasible and no later than 2035, all or the majority of USGS Landsat data products are produced using commercially-provided data, which is harmonizable with the historical archive, from a robust and competitive marketplace supported by a rolling federal procurement process that maintains the value of the Landsat data record.

Phases

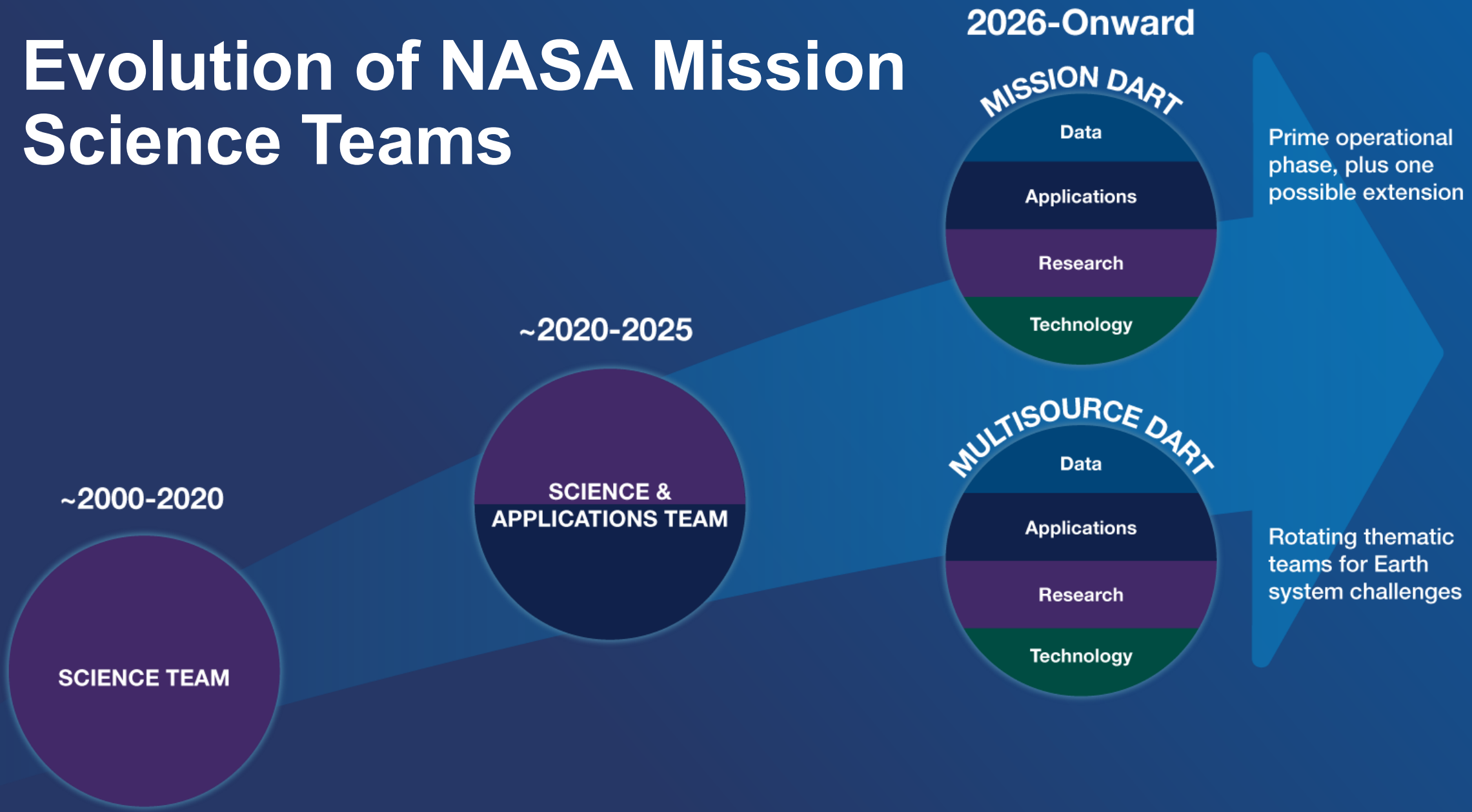
- Demonstration (FY27-28)
- Initial capability and comprehensive assessment (FY29-31)
- Operational capability (by FY35)

A phased, product-based approach to support integrating commercial data into the Landsat record.



Australia's Diamantina River captured by Landsat 8's Operational Land Imager (OLI) on April 7, 2023. NASA

Evolution of NASA Mission Science Teams



Faster to Science
Acceleration through Collaboration

- NASA's Earth observation missions are more flexible and collaborative.
- Approaches are matched to science needs, technology maturity and partner capabilities.
- Directed, competed, international and commercial missions are integrated for greater impact.
- Commercial sector growth expands opportunities and models for observation.
- NASA preserves integrated science benefits while enabling flexible development.
- Faster mission development and stronger partnerships accelerate science from concept to impact.





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