

National Aeronautics and  
Space Administration



# EXPLORE EARTH

## Earth Science Division Community Forum

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Science Mission Directorate, NASA

April 24, 2023



**Click “CC” in the bottom left corner for Closed Captions**



**Enter your questions into the Q&A section**



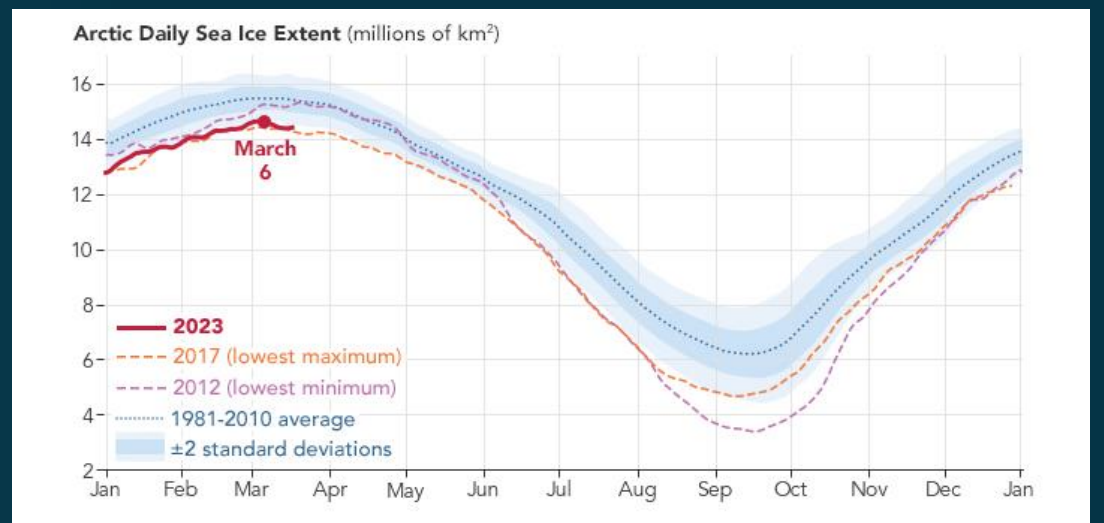
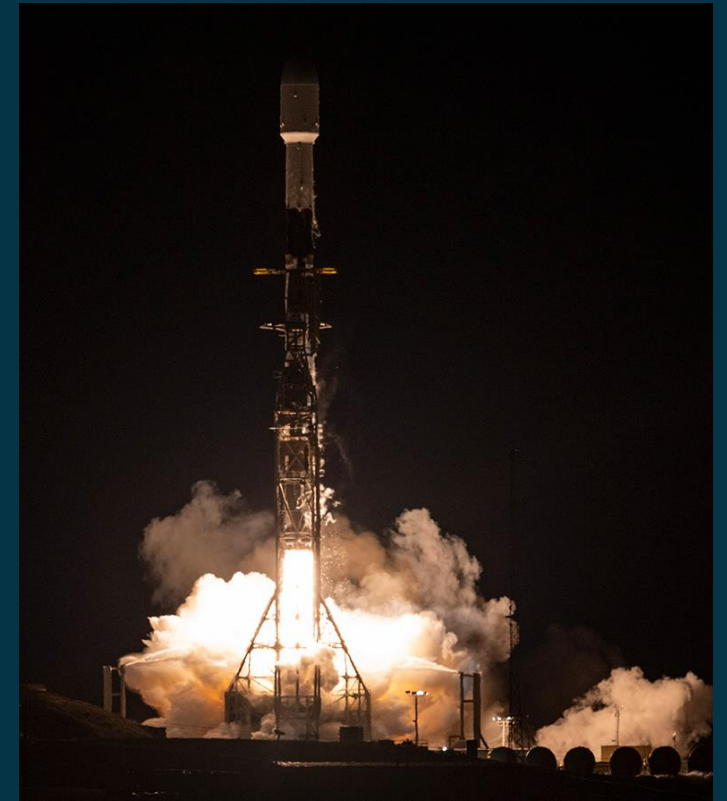
**This webinar will be recorded**

# Accelerating Discovery and Understanding of Earth Science

- Budget Challenges & Priorities
- Mission Milestones
- NASA's Role in Climate Science
- Bridging to the Earth System Observatory
- Delivering Actionable Science

*Decades of observational data inform our measurement of the changing ice pack, helping predict future ice changes.*

*SWOT launched Dec. 17, 2022 from Vandenberg Space Force Base.*





# BUDGET CHALLENGES & PRIORITIES: Stewarding Public Investment into Earth Science



The background of the slide is a dark blue space scene. On the left side, there is a vertical strip showing a bright yellow sun at the bottom, the blue and white horizon of Earth, and several other celestial bodies: a grey moon, a reddish planet (Mars), and a yellow planet with rings (Saturn). The rest of the background is a deep blue with scattered white stars.

# FY24 NASA ESD Budget Priorities

- Promote U.S. leadership in Earth system science
- Advance Open-Source Science
- Build an innovative and balanced program driven by the highest national priorities

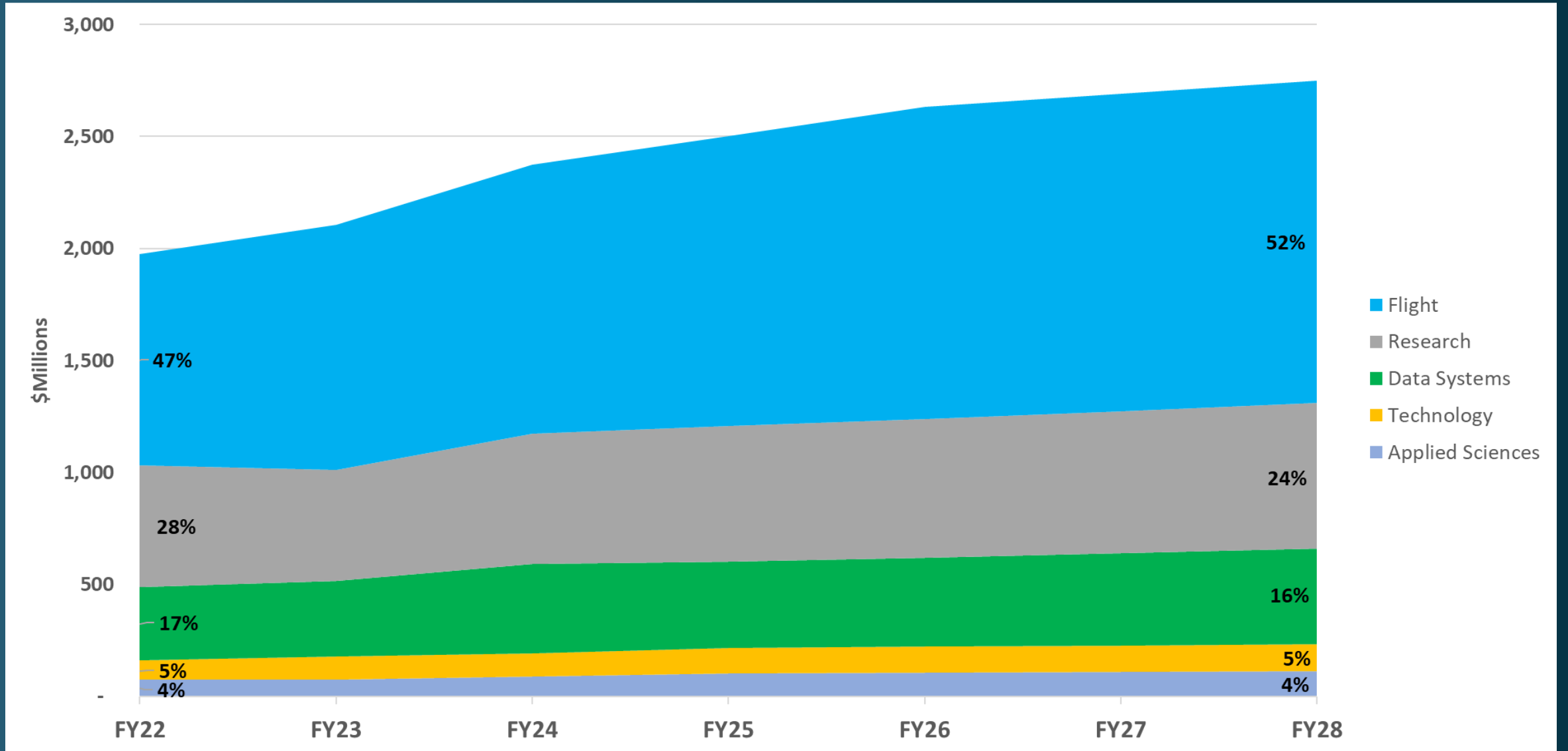
# FY24 NASA ESD Budget Request by Program

	Actual	Enacted	Request	Outyears			
(\$K)	FY22	FY23	FY24	FY25	FY26	FY27	FY28
<b>Total Earth Science</b>	<b>2,061,200</b>	<b>2,195,000</b>	<b>2,472,794</b>	<b>2,597,458</b>	<b>2,729,988</b>	<b>2,791,241</b>	<b>2,849,031</b>
<b>Earth Systematic Missions</b>	706,422	913,803	1,027,093	1,073,555	1,162,677	1,130,288	1,090,964
<b>Earth System Science Pathfinder</b>	312,686	232,116	235,629	298,565	290,534	282,460	290,274
<b>Earth System Explorers</b>	2,020	3,612	27,789	20,679	43,112	108,970	166,380
<b>Earth Science Data Systems</b>	339,357	366,087	411,681	398,919	408,140	423,762	439,583
<b>Earth Science Technology</b>	86,131	102,181	105,349	113,460	117,111	118,420	120,787
<b>Applied Sciences</b>	73,540	75,205	87,330	102,299	106,179	109,341	111,526
<b>Earth Science Research</b>	541,044	501,996	577,923	589,981	602,235	618,000	629,517

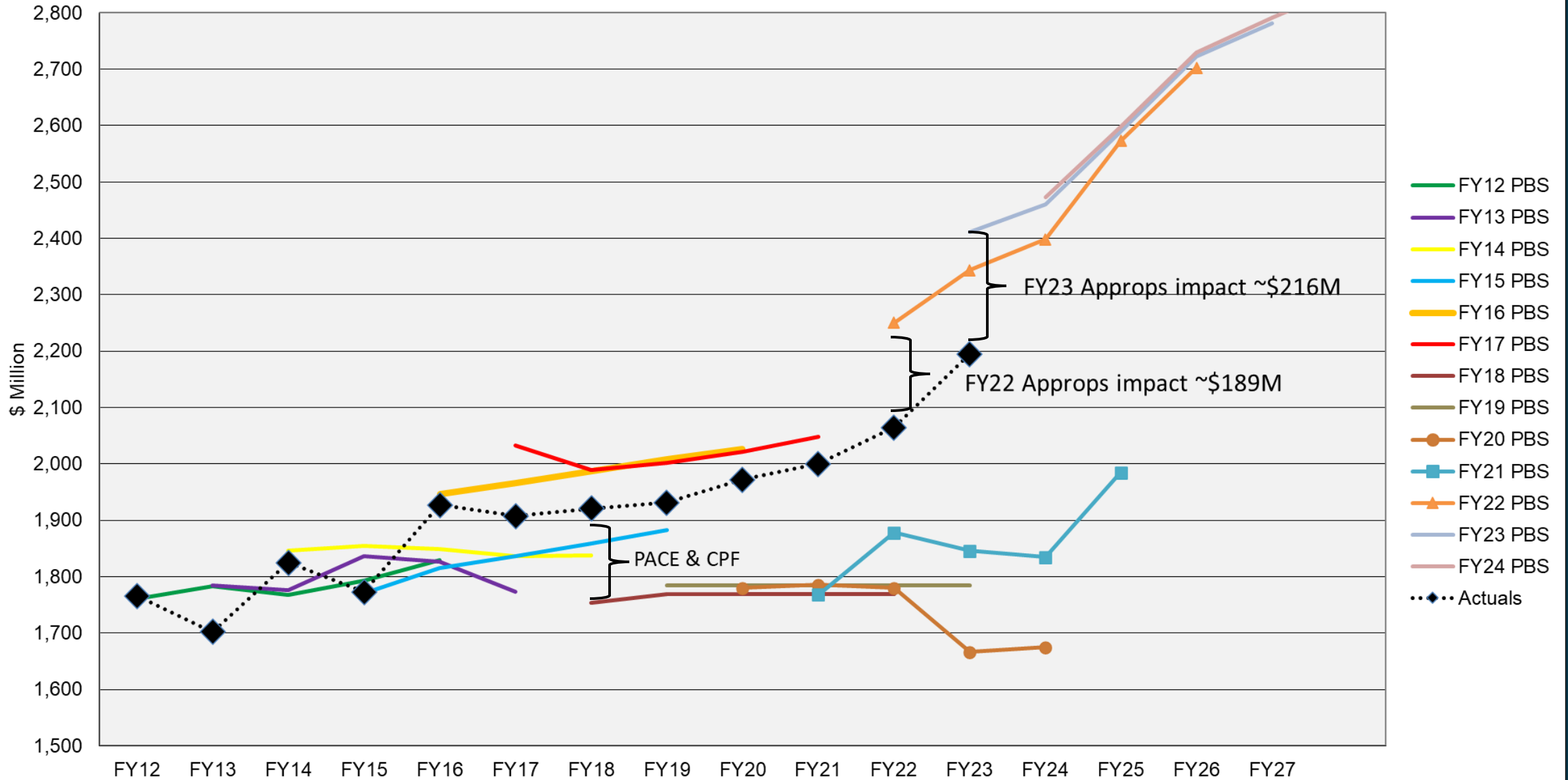
\* FY23 pending Op Plan approval

- FY23 appropriation of \$2.2B (increase of \$134M) was the largest in ESD history
- President's FY24 Budget Request seeks \$278M increase in Earth to fund Landsat Next and ESO

# NASA Earth Science Program Balance



# ESD President's Budget and Appropriations History





# Accumulating Budget Challenges

- Landsat Next (**\$1.5B**) was not accounted for in 2018 Decadal Survey mission targets against the ESD top line
- COVID-19 shut down multiple flight programs & Center instrument programs at peak staffing, amounting to **~\$300M cost growth**
- Technical challenges for NISAR, PACE, and SWOT, exacerbated by COVID-19, led to **~250M cost growth**
- Record inflation for materials, shipping, and labor costs, and longer lead times are driving total costs AND the need to phase resources earlier in project life
- Cumulative challenge for the 2020s approaches \$2B



# MISSION MILESTONES

Advancing Earth Science Program of Record

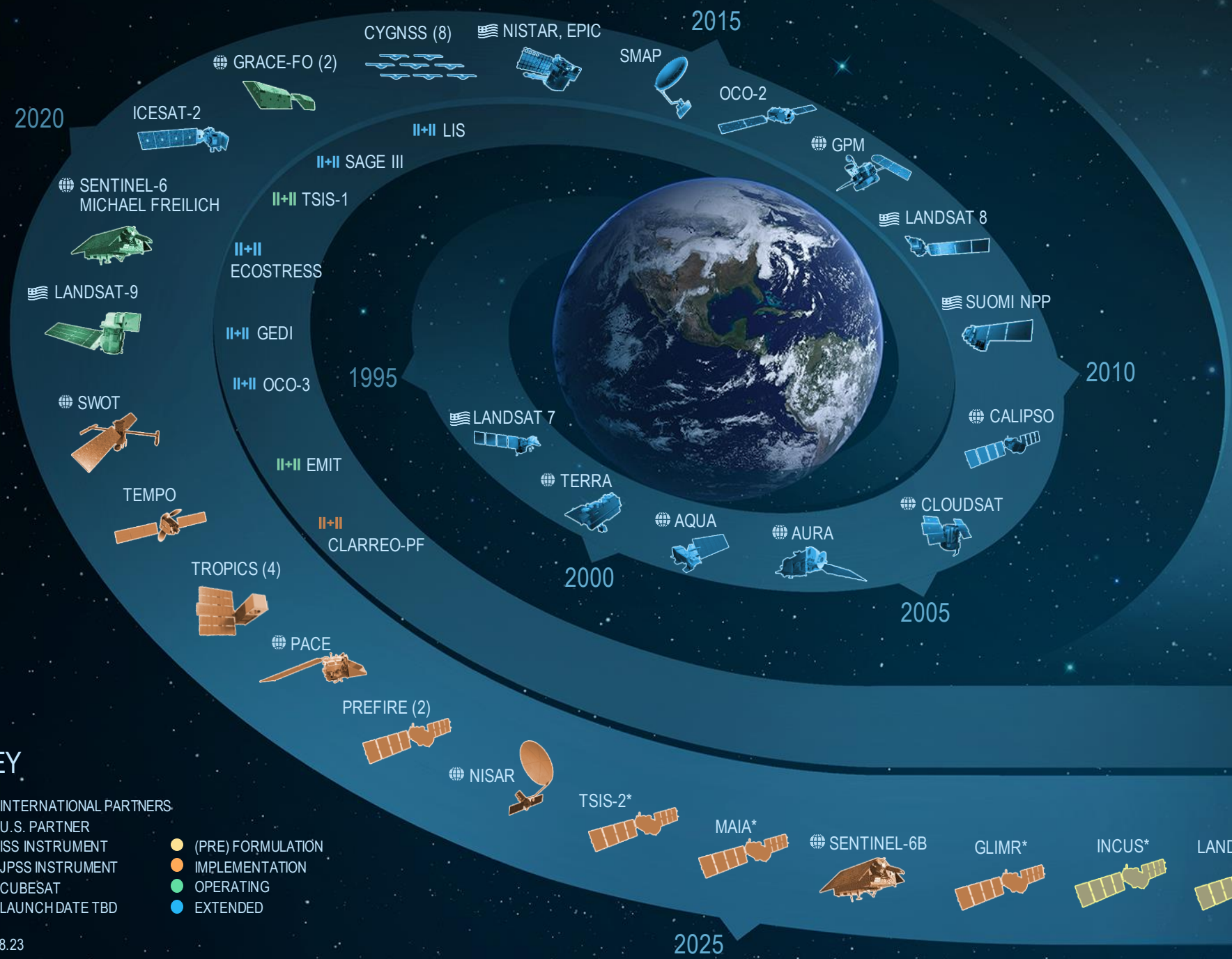


# Planned Milestones in FY23-24

- Continue Earth Venture Suborbital-3 (EVS-3) campaigns throughout FY23
- Launch two technology demonstration InVEST CubeSats: HyTI (6U) and SNOOPI (6U) in FY23/24
- Advance the adoption of open science through a Year of Open Science in 2023
- Select Earth Venture Instrument-6 (EVI-6) in Q3 FY23
- Release inaugural Earth System Explorer (ESE) AO in Q3 FY23
- Launch TROPICS constellation via two commercial launches no earlier than May 1, 2023 within a 60-day window
- Open the Earth Information Center (EIC) first physical location on June 6, 2023
- Initiate Decadal Survey Midterm Assessment in Q3 FY23
- Deliver PREFIRE CubeSats by July 2023
- Launch new SERVIR Hub in Central America in August 2023
- Release prototype version of Greenhouse Gas Information and Monitoring Center with interagency partners in August 2023
- Deliver CLARREO-Pathfinder by December 2023
- Launch PACE by May 2024
- Make Earth System Explorers (ESE) Step-1 selections in FY24



# EARTH FLEET



## INVEST/CUBESATS

- CIRIS 2023
- NACHOS 2022
- CTIM 2022
- NACHOS-2 2022
- MURI-FD 2022
- SNOOPI\* 2023
- HYTI\* 2023

## JPSS INSTRUMENTS

- OMPS-LIMB 2022
- LIBERA 2027
- OMPS-LIMB 2027
- OMPS-LIMB 2032

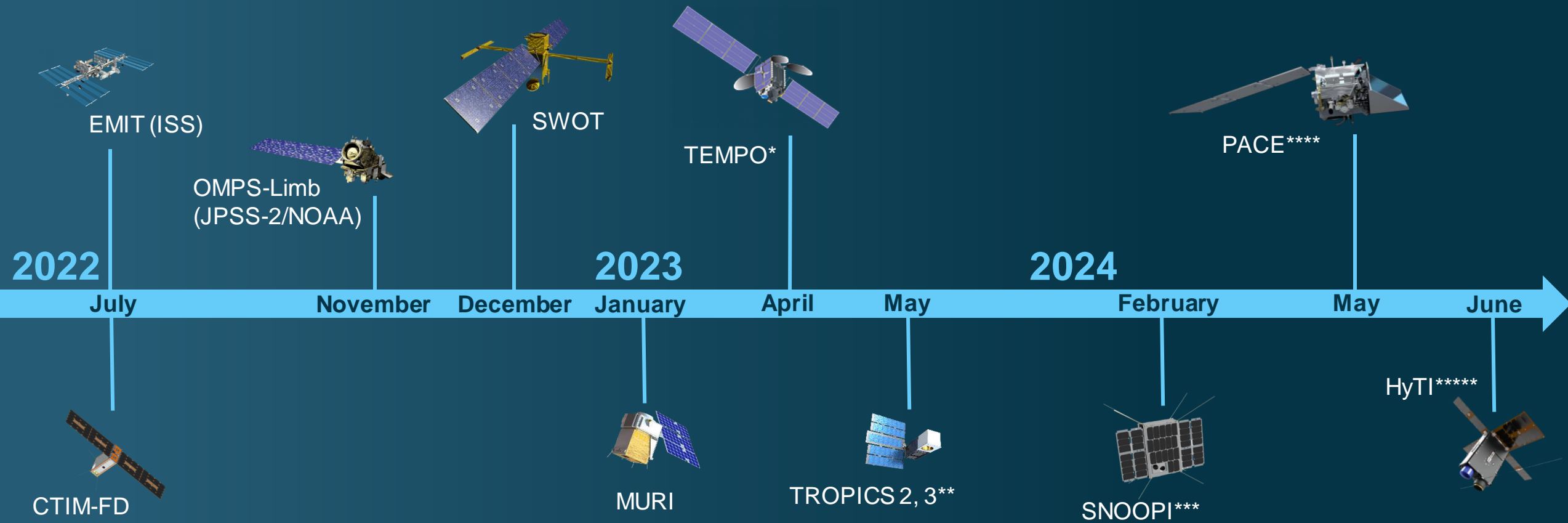
## ISS INSTRUMENTS

## MISSIONS

### KEY

- INTERNATIONAL PARTNERS
- U.S. PARTNER
- II+II** ISS INSTRUMENT
- JPSS INSTRUMENT
- CUBESAT
- LAUNCH DATE TBD
- (PRE) FORMULATION
- IMPLEMENTATION
- OPERATING
- EXTENDED

# Recent and Upcoming Earth Science Launches



\*Agency LRD March 2023

\*\*Agency LRD November 2023

\*\*\*Launch Date NET February 2024

\*\*\*\*Agency LRD May 2024

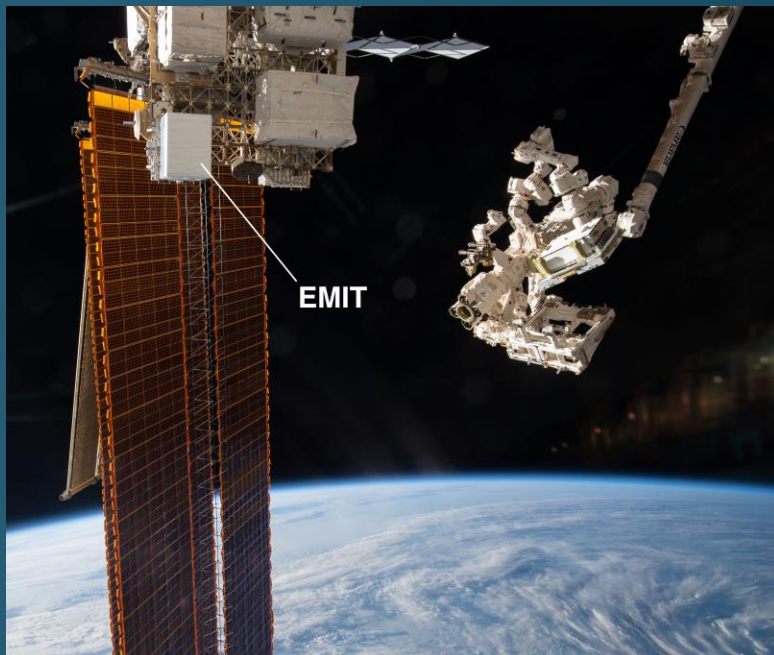
\*\*\*\*\*Launch Date NET June 2024

# EMIT (EVI-4)

- Launched aboard SpaceX CRS-25 on July 14, 2022
- Earth Surface Mineral Dust Source Investigation (EMIT) is analyzing airborne dust impact on climate

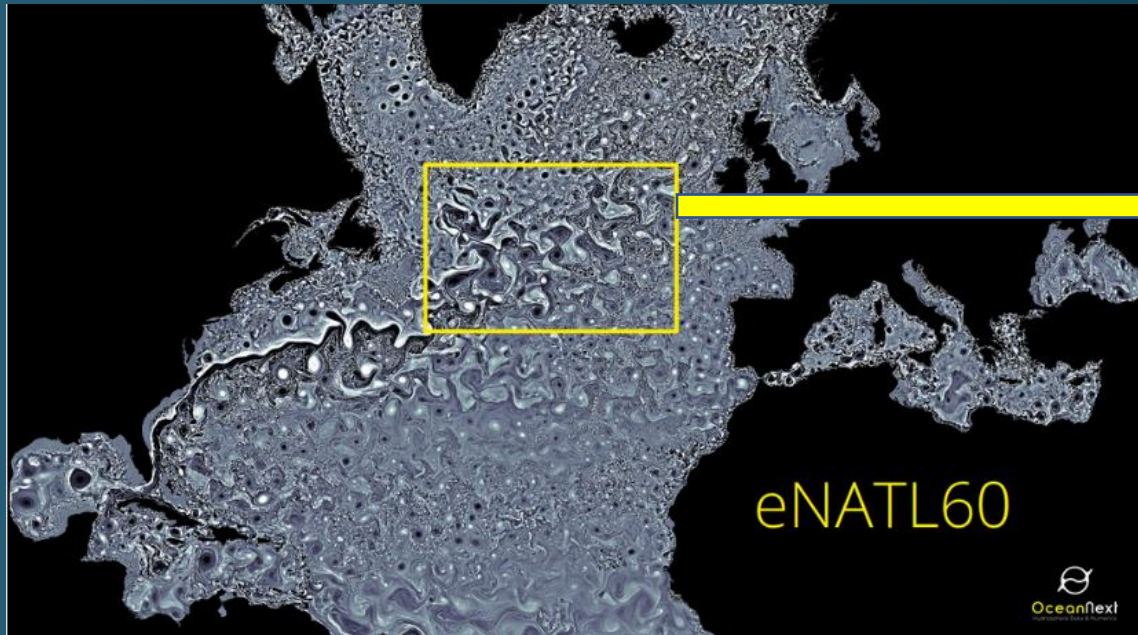


*Turkmenistan methane plumes, detected Aug. 2022*

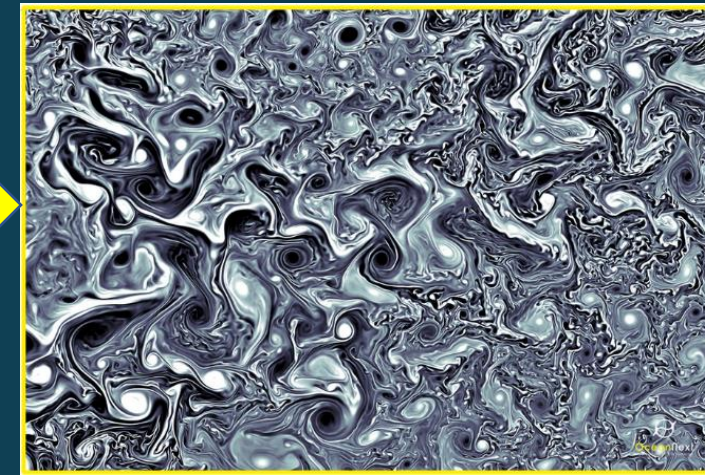


*Global mapping of 100's of methane and carbon dioxide plumes*

# SWOT: New Vision of Ocean Circulation at Fine Scales

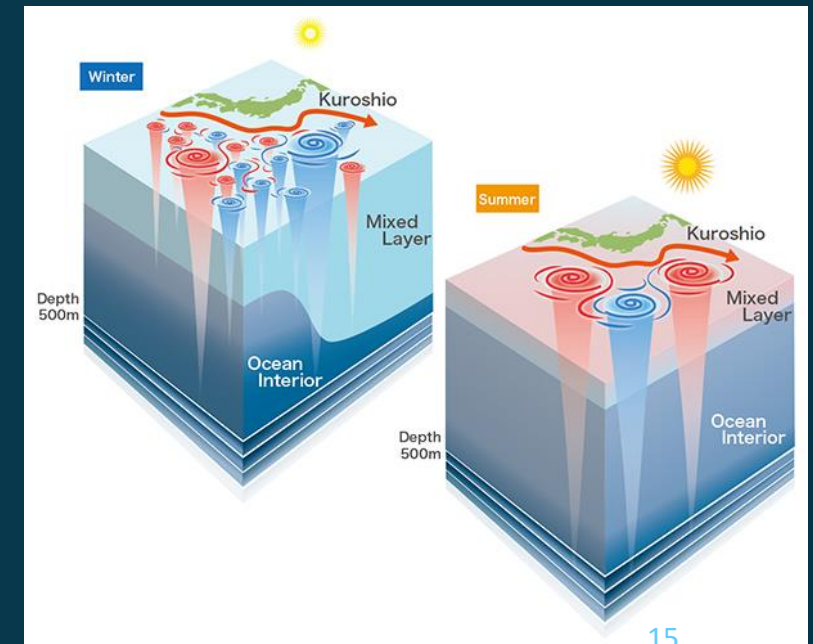


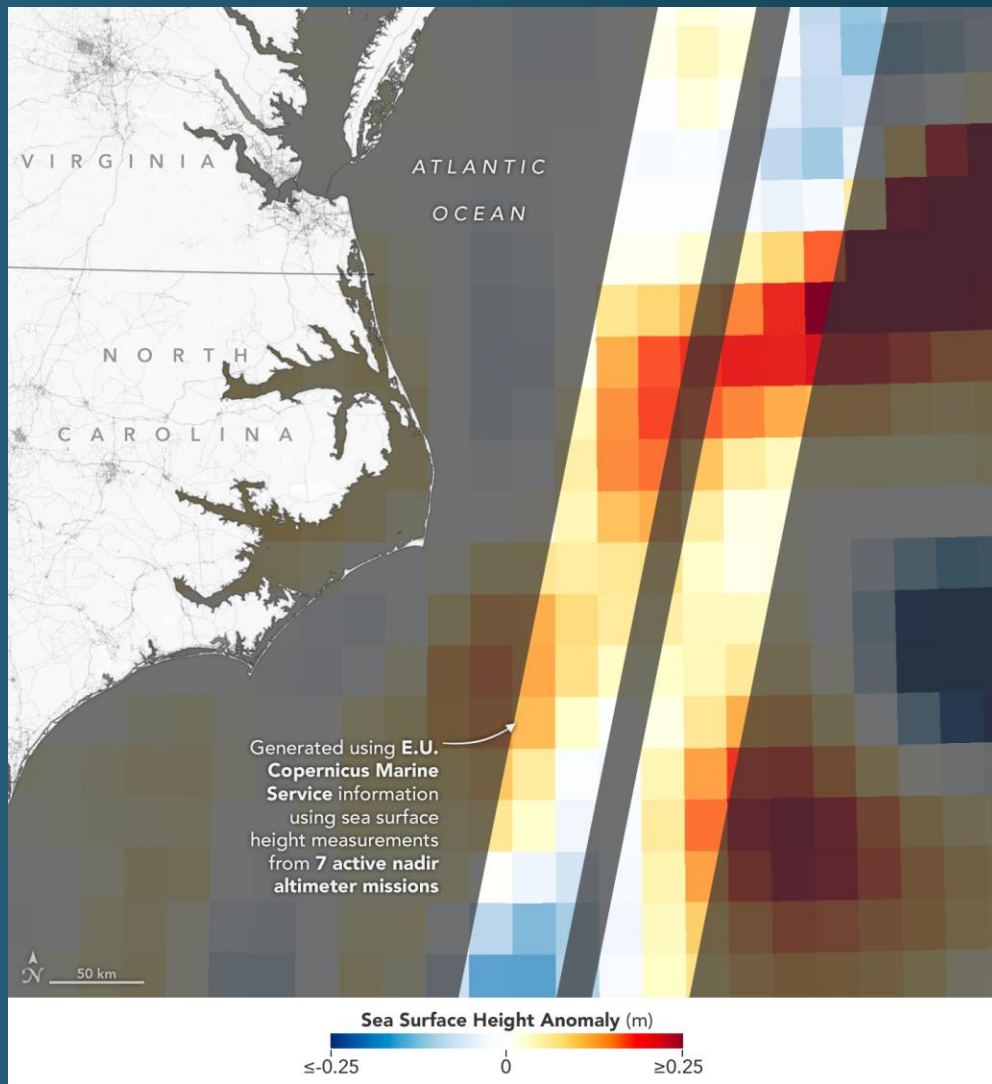
Ultra-high resolution ocean flow simulations (~1 km horizontal grid resolution)



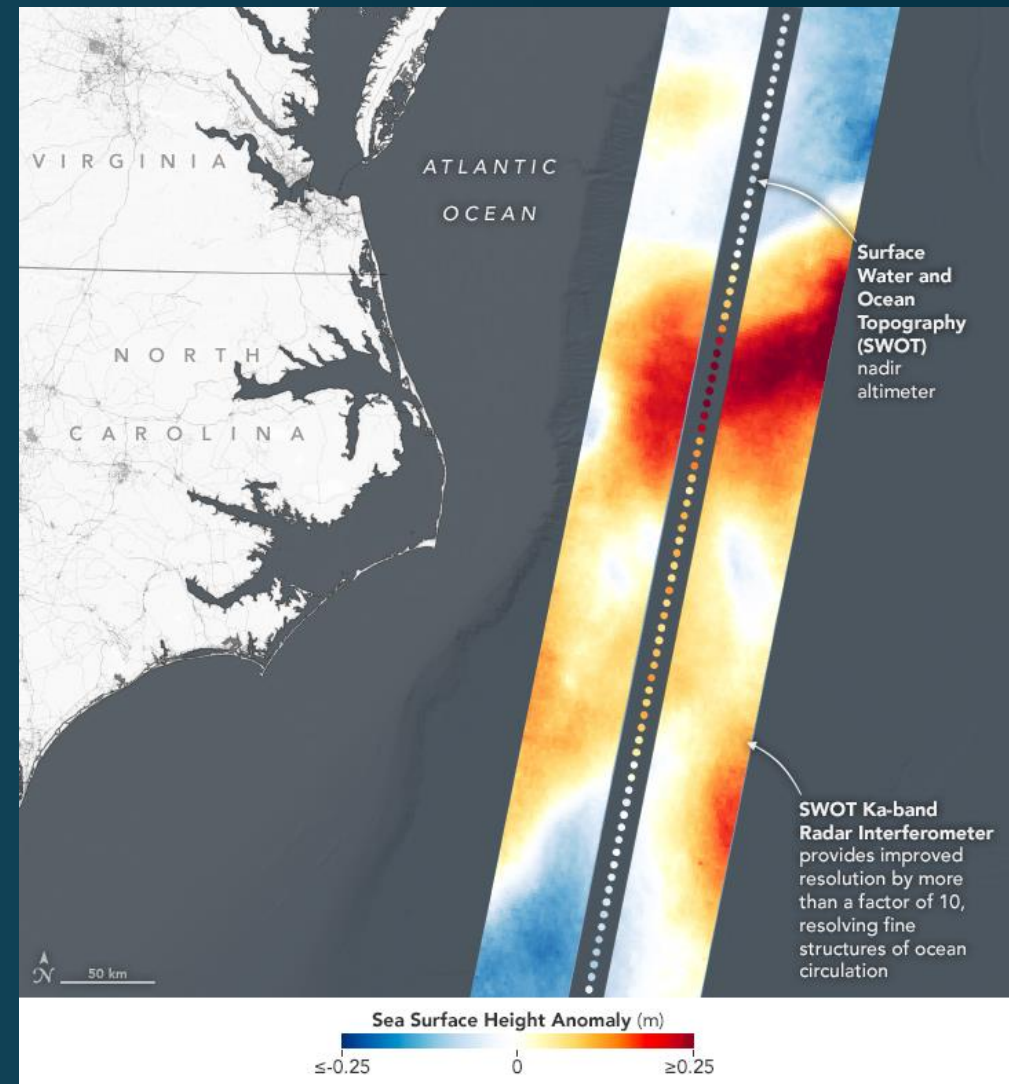
Understanding of the roles played by fine-scale ocean turbulence (and tidal motions) in influencing the large-scale ocean circulation, and thereby, the climate system

Small-scale currents and eddies affect global climate through modulation of sea surface **temperature and heat flux**, as well as the oceanic uptake of **carbon dioxide** from the atmosphere.





**Comparison image:** The spatial resolution of SWOT ocean measurements is 10 times greater than the composite of sea surface height data gathered over the same area by seven other satellites: Sentinel-6 Michael Freilich, Jason-3, Sentinel-3A and 3B, Cryosat-2, Altika, and Hai Yang 2B.

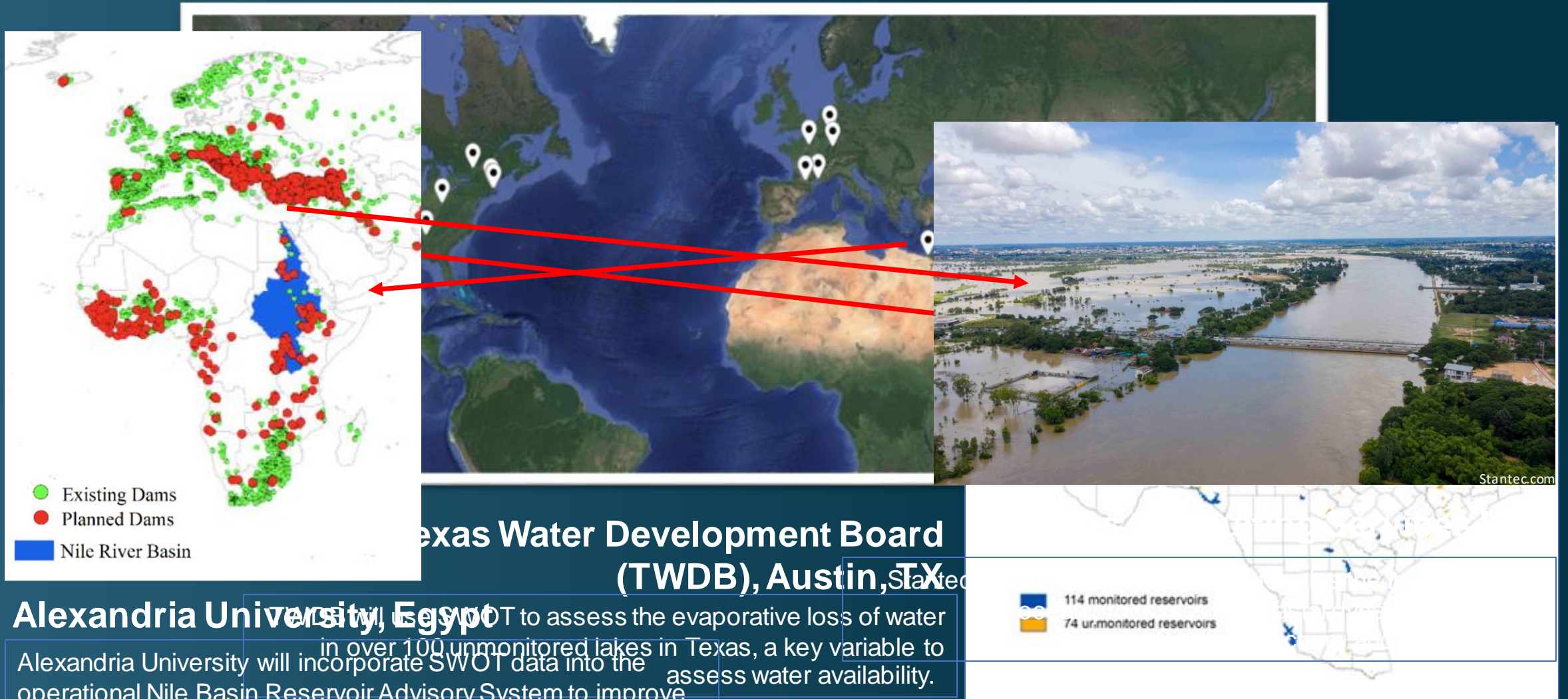


**SWOT first light image:** On Jan. 21, 2023, SWOT measured sea surface height in the Gulf Stream off the coastal North Carolina and Virginia. The two KaRIn antennas acquired data that was mapped as two wide, colored strips spanning a total of 75 miles (120 kilometers) across.



# SWOT Applications

25 Early Adopters across the globe are preparing to incorporate SWOT data for multiple applications from coastal resilience to stream flow



Texas Water Development Board (TWDB), Austin, TX

Alexandria University, Egypt

Alexandria University will incorporate SWOT data into the operational Nile Basin Reservoir Advisory System to improve dam operations in the Nile Basin. Alexandria University will incorporate SWOT data into the operational Nile Basin Reservoir Advisory System to improve dam operations in the Nile Basin.

114 monitored reservoirs  
74 unmonitored reservoirs

# Recent Launch: TEMPO



First space-based instrument for hourly monitoring of daytime air pollutants across the North American continent, launched April 7, 2023

Will fly as part of global constellation including Sentinel-4 over Europe and GEMS over Asia

Science to be provided to NOAA, EPA

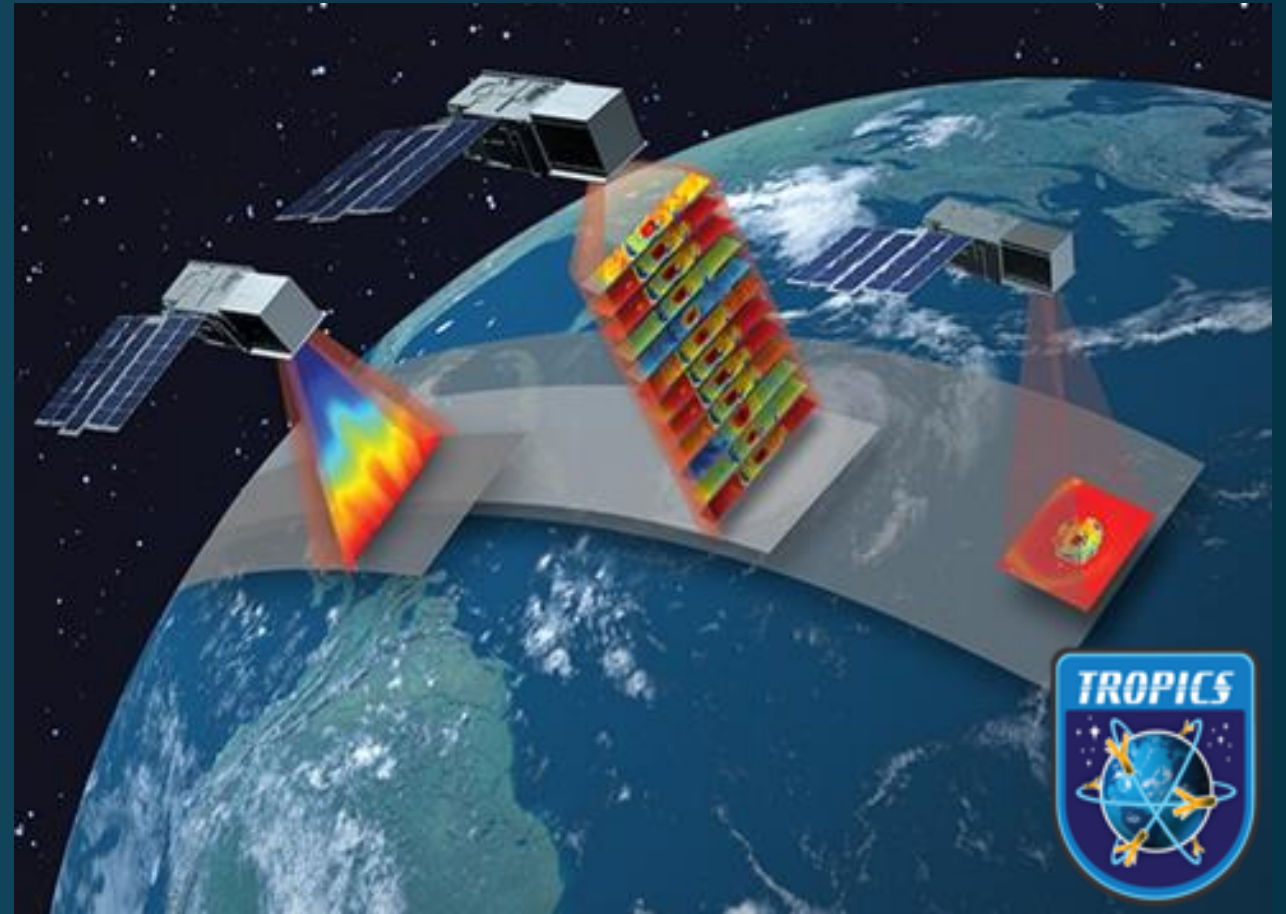
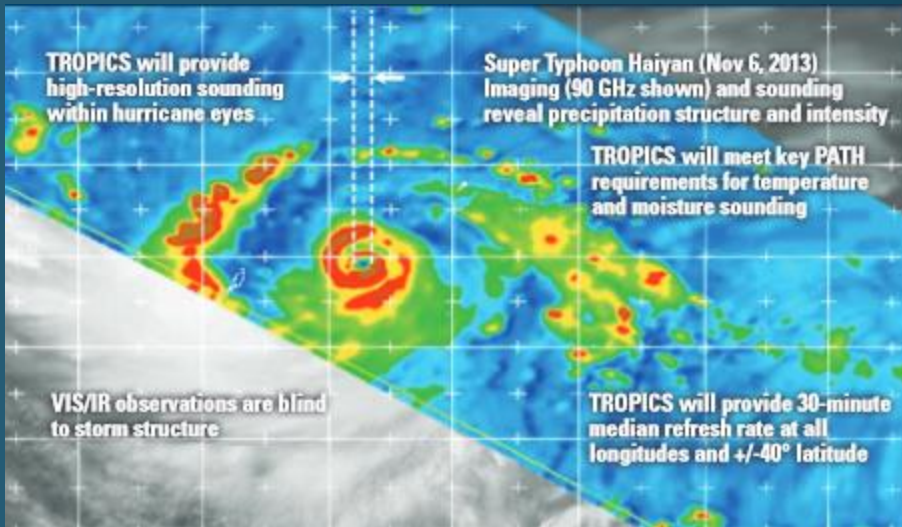


# Upcoming Launch: TROPICS

## Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of SmallSats

Four CubeSats provide unprecedented information on the inner-core conditions of tropical cyclones to understand intensification

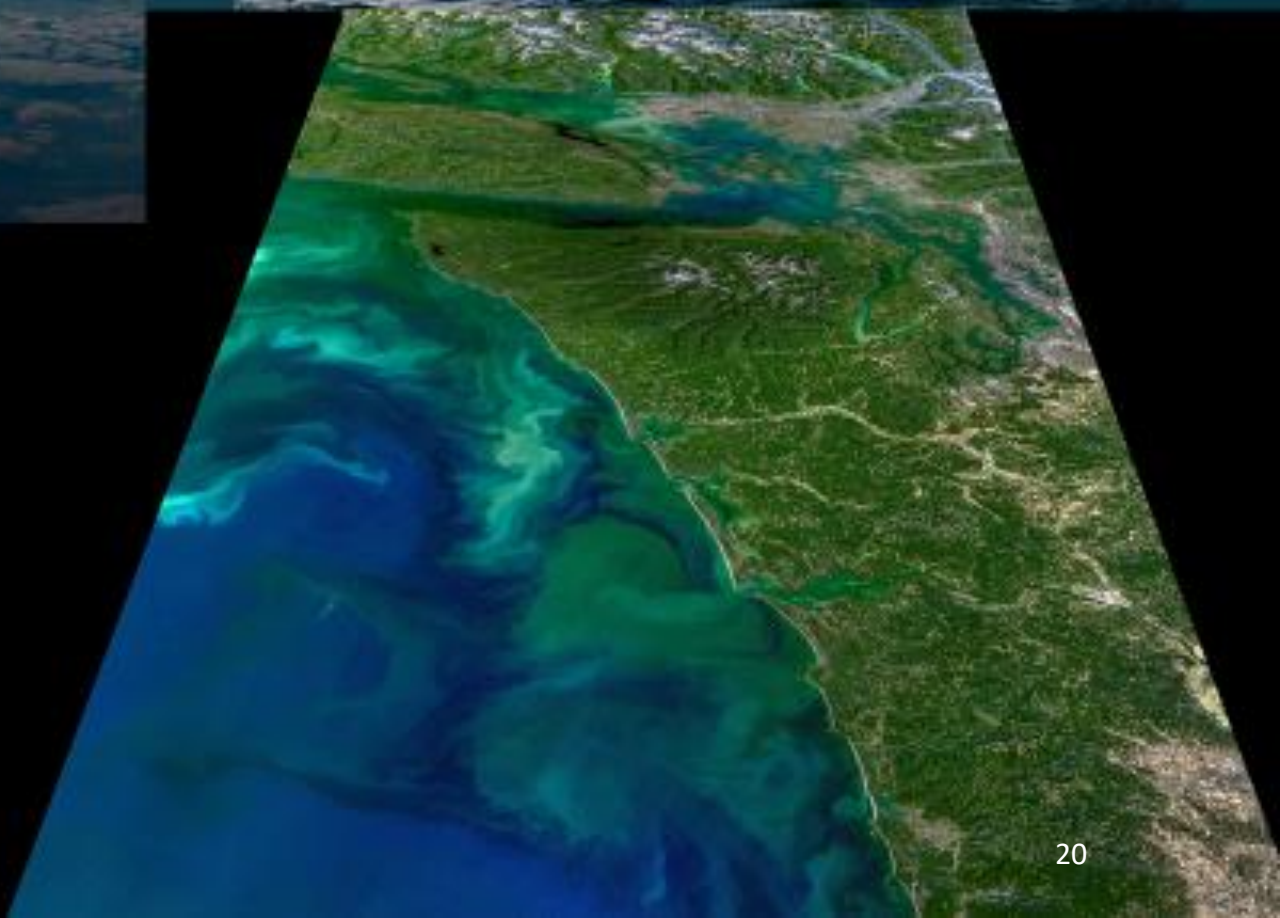
- First high-revisit microwave nearly-global observations of precipitation, temperature, and humidity
- May 2023 launch date for TROPICS 2, 3





## PACE Advances Ocean Science

- Monitor fisheries
- Respond to toxic algae blooms
- Key ocean and atmosphere data for forecasting air quality and weather that will improve our understanding of Earth's climate





# NASA'S ROLE IN CLIMATE SCIENCE

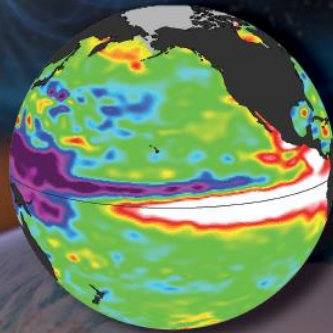
## Informing Operational Services





# Earth System Science

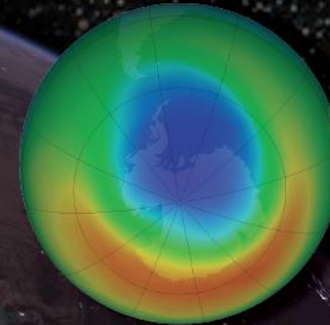
**Climate Variability  
and Change**



**Carbon Cycle  
and Ecosystems**



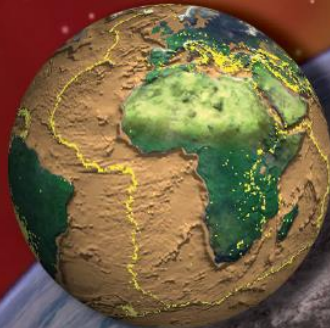
**Atmospheric  
Composition**



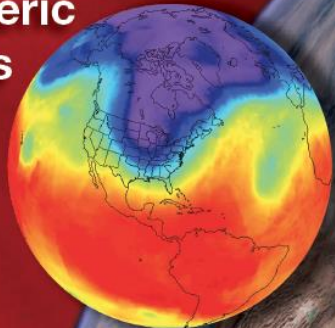
**Water and  
Energy  
Cycle**



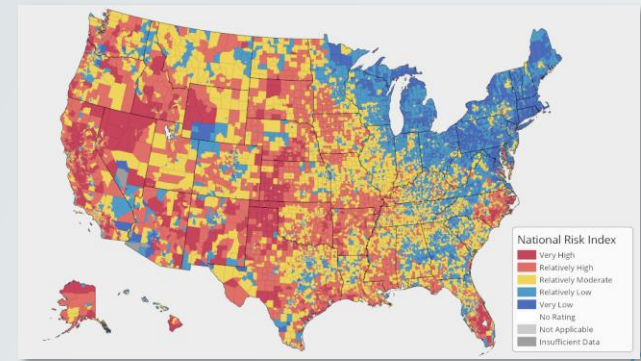
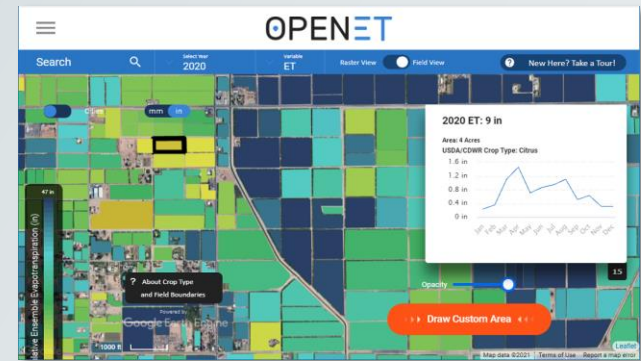
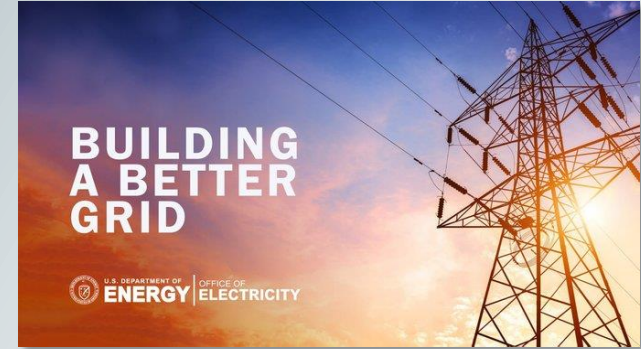
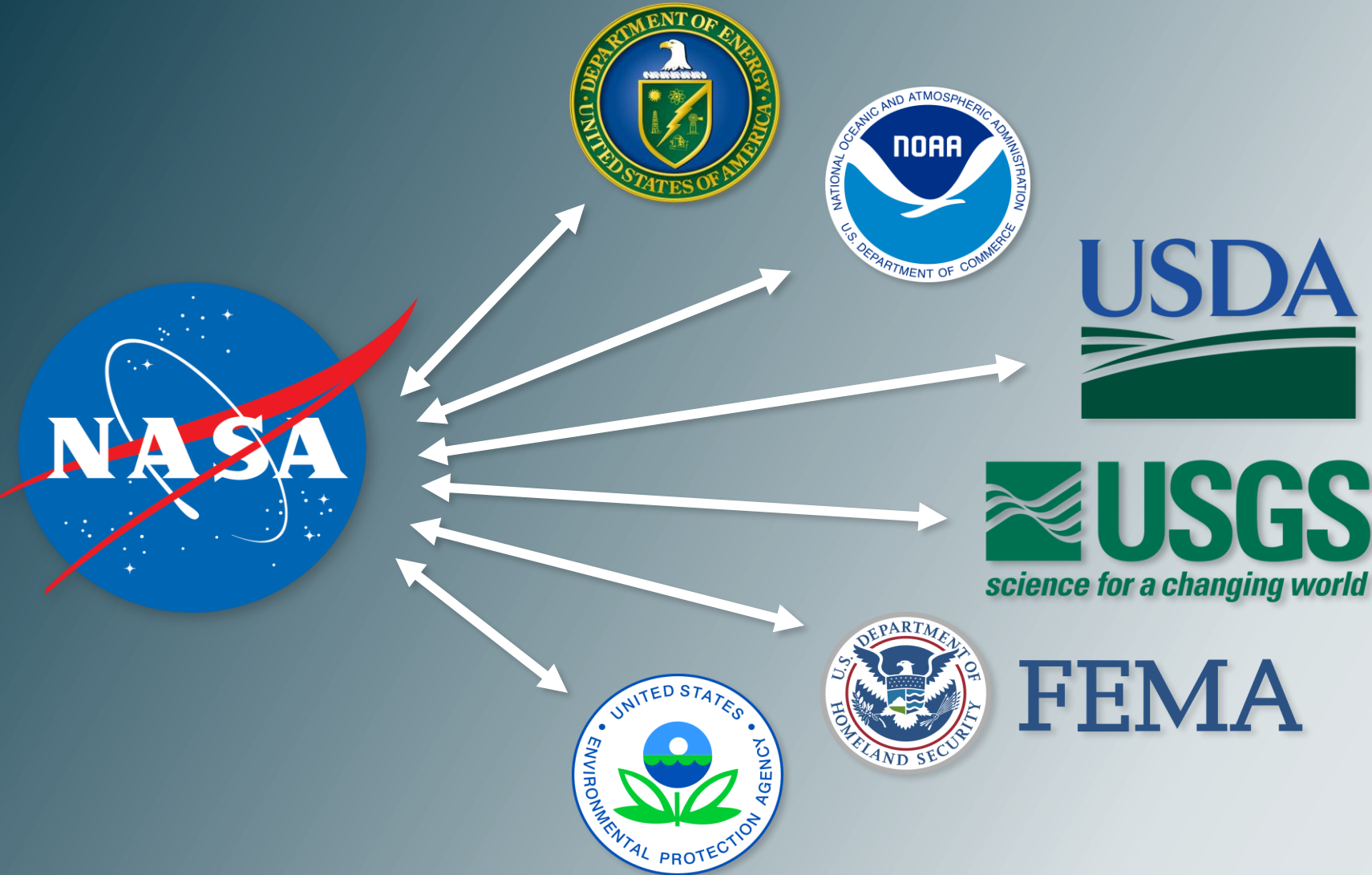
**Earth Surface  
and Interior**



**Weather and  
Atmospheric  
Dynamics**



# NASA Enables Climate-Informed Services Across the USG



# White House Fast Track Action Committee on Climate Services: Whole-of-Government Approach

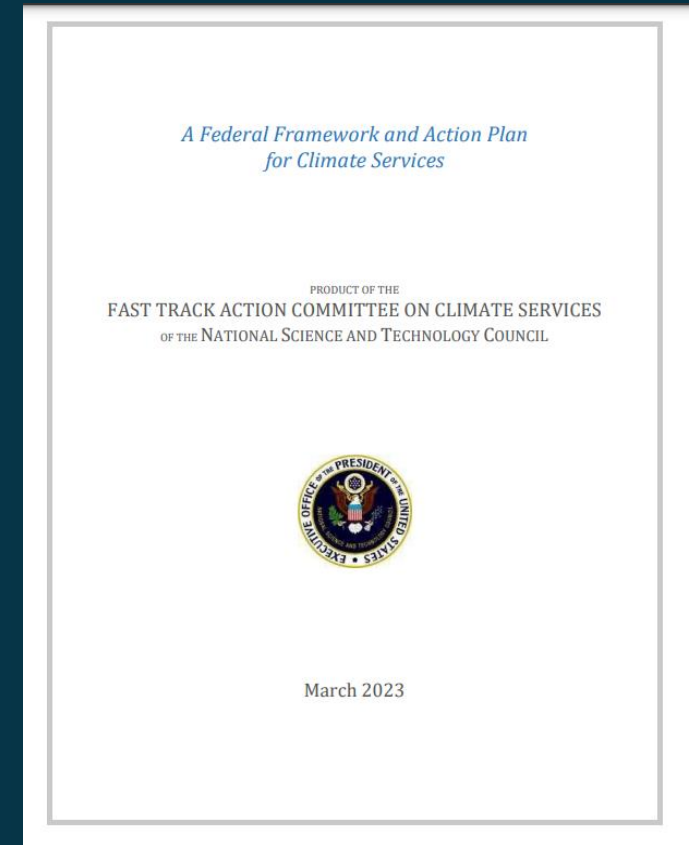
FTAC was composed of 17 federal government departments and agencies

Principles for federal coordination from final report:

- Recognizing the development, delivery, and use of climate services is a shared, whole-of-government responsibility
- Aligning climate services investments to the existing authorities, expertise, technical capabilities, and stakeholder relationships within each agency
- Prioritizing the user experience in terms of discoverability, design, and usability of data, products, and tools
- Maintaining internal consistency across the Federal Government with respect to climate data, products, and tools, while maintaining flexibility to meet the diverse needs of agencies and their stakeholders

Identified USGCRP as mechanism for **whole-of-government** solution

- Consistent with 2022 USGCRP Decadal Strategic Plan



[https://www.whitehouse.gov/wp-content/uploads/2023/03/FTAC\\_Report\\_03222023\\_508.pdf](https://www.whitehouse.gov/wp-content/uploads/2023/03/FTAC_Report_03222023_508.pdf)



# Core Links in USG Climate Services Knowledge Value Chain

## **Generate** climate information:

- Observations
- Modeling and simulation
- Indigenous and traditional knowledge
- Lived experience

## **Deliver** climate services:

- Mapping and visualization
- Extension services
- Training and capacity building
- Storytelling

## **Evaluate** climate services:

- Peer review
- User surveys
- Benefit/cost analysis
- Randomized control trials



## **Develop** climate services:

- Science translation
- User engagement
- Design co-production
- Application development

## **Use** climate services:

- Risk assessment
- Hazard mitigation
- Project design and planning
- Investing and asset management



# BRIDGING TO THE NEXT-GENERATION

## Developments in the Earth System Observatory



# Earth Science Flight Opportunities

Open solicitation/In review

Completed solicitation

Mission	Mission Type	Release	Selection	Major Milestone
<b>EVS-1</b> (EV-1) (AirMoss, ATTREX, CARVE, DISCOVER-AQ, HS3)	5 Suborbital Airborne Campaigns	2009	2010	Completed KDP-F
<b>EVM-1</b> (CYGNSS)	Class D SmallSat Constellation	2011	2012	Launched Dec. 2016
<b>EVI-1</b> (TEMPO)	Class C Geostationary Hosted Instrument	2012	2012	Launched Apr. 2023
<b>EVI-2</b> (ECOSTRESS & GEDI)	Class C & Class D ISS-hosted Instruments	2013	2014	Launched June & Dec. 2018
<b>EVS-2</b> (ACT-America, ATOM, NAAMES, ORACLES, OMG, CORAL)	6 Suborbital Airborne Campaigns	2013	2014	Completed KDP-F
<b>EVI-3</b> (MAIA & TROPICS)	Class C LEO Hosted Instrument & Class D CubeSat Constellation	2015	2016	MAIA Delivery 2022; TROPICS Launch TBD
<b>EVM-2</b> (GeoCarb)	Class D Geostationary Hosted Instrument	2015	2016	Launch TBD
<b>EVI-4</b> (EMIT & PREFIRE)	Class C ISS-hosted Instrument & Class D Twin CubeSats	2016	2018	EMIT launched to ISS July 2022; PREFIRE delivery NLT 2023
<b>EVS-3</b> (ACTIVATE, DCOTSS, IMPACTS, Delta-X, SMODE)	5 Suborbital Airborne Campaigns	2017	2018	S-MODE in final deployment. 4 in post-deployment phase.
<b>EVI-5</b> (GLIMR)	Class C Geostationary Hosted Instrument	2018	2019	Delivery NLT 2024
<b>EVC-1</b> (Libera)	Class C JPSS-Hosted Radiation Budget Instrument	2018	2020	Delivery NLT 2025
<b>EVM-3</b> (INCUS)	Full Orbital	2020	2021	Launch ~2026
<b>EVI-6</b>	Instruments and SmallSats	2022	2023	Delivery NLT 2027
<b>ESE</b>	Explorer Mission	2023	2025	Launch ~2031 & ~2033
<b>EVS-4</b>	Suborbital Airborne Campaigns	2023	2024	N/A
<b>EVC-2</b>	Continuity Measurements	2024	2025	Delivery NLT 2029
<b>EVI-7</b>	Instrument Only	2025	2026	Delivery NLT 2030
<b>EVM-4</b>	Full Orbital	2025	2026	Launch ~2031
<b>ESE</b>	Explorer Mission	2025	2027	Launch ~2034 & 2036
<b>EVC-3</b>	Continuity Measurements	2027	2028	Delivery NLT 2032
<b>EVS-5</b>	Suborbital Airborne Campaigns	2027	2028	N/A

**EVS**  
Sustained sub-orbital investigations (~4 years)

**EVM**  
Complete, self-contained, small missions (~4 years)

**EVI**  
Full function, facility-class instruments Missions of Opportunity (MoO) (~3 years)

**EVC**  
Complete missions or hosted instruments targeting “continuity” measurements (~3 years)

**ESE (NEW)**  
Medium-size instruments and missions (~2 years)

# ROSES-23 ESD Highlights

- ROSES-23 came out in February and offers numerous opportunities for Earth Science community to propose (And review - Thanks to those who support the peer review process!)
- 15 Elements have defined due dates; 17 are listed as TBD – watch ROSES as they are "definitized"
- 5 elements use Dual Anonymous Peer Review
  - A.15 Cryospheric Science
  - A.22 SMAP Science Team
  - A.28 GNSS Research
  - A.30 SAGE III/ISS Science Team
  - A.59 Technology Development for Support of Wildland Fire Science, Management, and Disaster Mitigation (Step 2)
- 1 element calls for Inclusion Plan – A.24 Earth Surface and Interior
- 2 no-due date elements – A.25 Rapid Response and Novel Research in Earth Science; A.59 (Step 1)
- ESD continues to participate in SMD-wide FINESST solicitation (F.5)

# ROSES Selection Highlights

- ROSES-22 - 26 active solicitations covering all elements of ESD. Selections are complete for most but not all; proposal due dates have passed for all but one. See NSPIRES web site for details.
- Big change in ROSES-22 – Earth Venture Suborbital (EVS-4) (step 1 proposals due 2/28/23; step 2 proposals due 4/27/23) – step 2 proposals focus on mission concepts; selected proposals will form basis for separate solicitations for team members.
- Awards were implemented for proposals selected last year (ROSES-21) in response to Increasing Participation of Minority Serving Institutions in Earth Science Division Surface-Based Measurement Networks solicitation; instruments are in the process of being deployed!



# EVI-6 Announcement of Opportunity (AO)

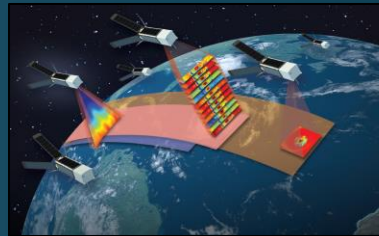
- Final AO released April 19, 2022
- AO closed September 1, 2022
- Selection anticipated in Q3 FY23
- PI-Managed Mission Cost Cap of \$37M (FY24)
- NASA will determine platform and launch vehicle
- Solicits Class D instruments and CubeSats



**EVI-1**  
TEMPO



**EVI-2**  
GEDI & ECOSTRESS



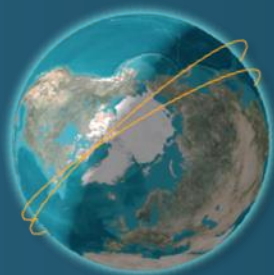
**EVI-3**  
TROPICS



**EVI-3**  
MAIA



**EVI-6**  
TBD



**EVI-4**  
PREFIRE



**EVI-4**  
EMIT



**EVI-5**  
GLIMR

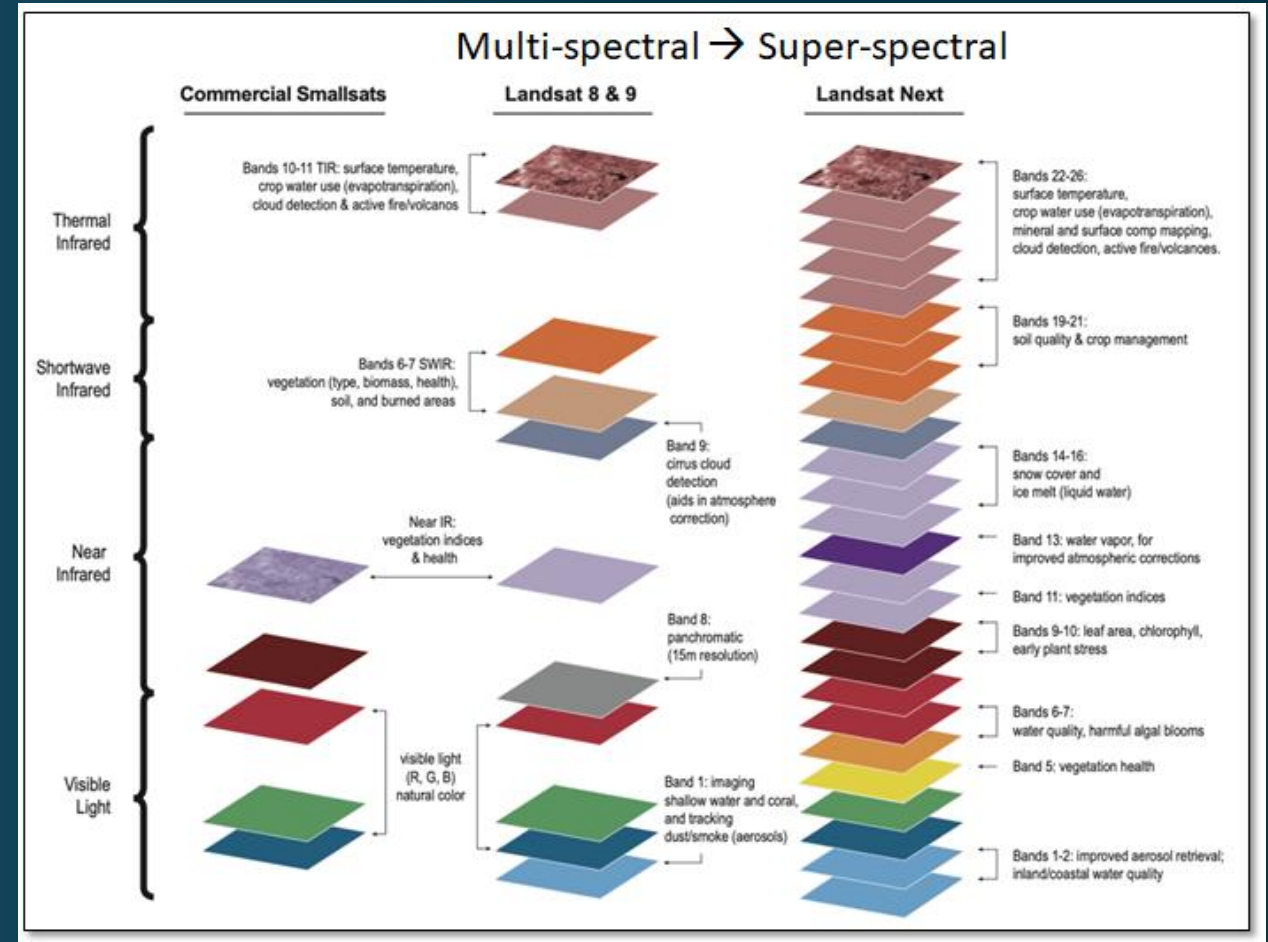
# Landsat Next

Landsat Next mission is a constellation of three identical satellites, approximately equally distributed in orbit

- 9-day global land revisit frequency
- 26 spectral bands (21 VSWIR; 5 TIR)
- Target Launch Readiness Date: November 2030

Status and next steps:

- Held KDP-A Program Management Council on Nov. 2
- RFPs for instruments anticipated Spring 2023



**Landsat Next will provide more than twice as many spectral bands, with resolution improved by a factor of 2, and with the repeat coverage of Landsats 8 and 9, combined**



# EARTH SYSTEM OBSERVATORY

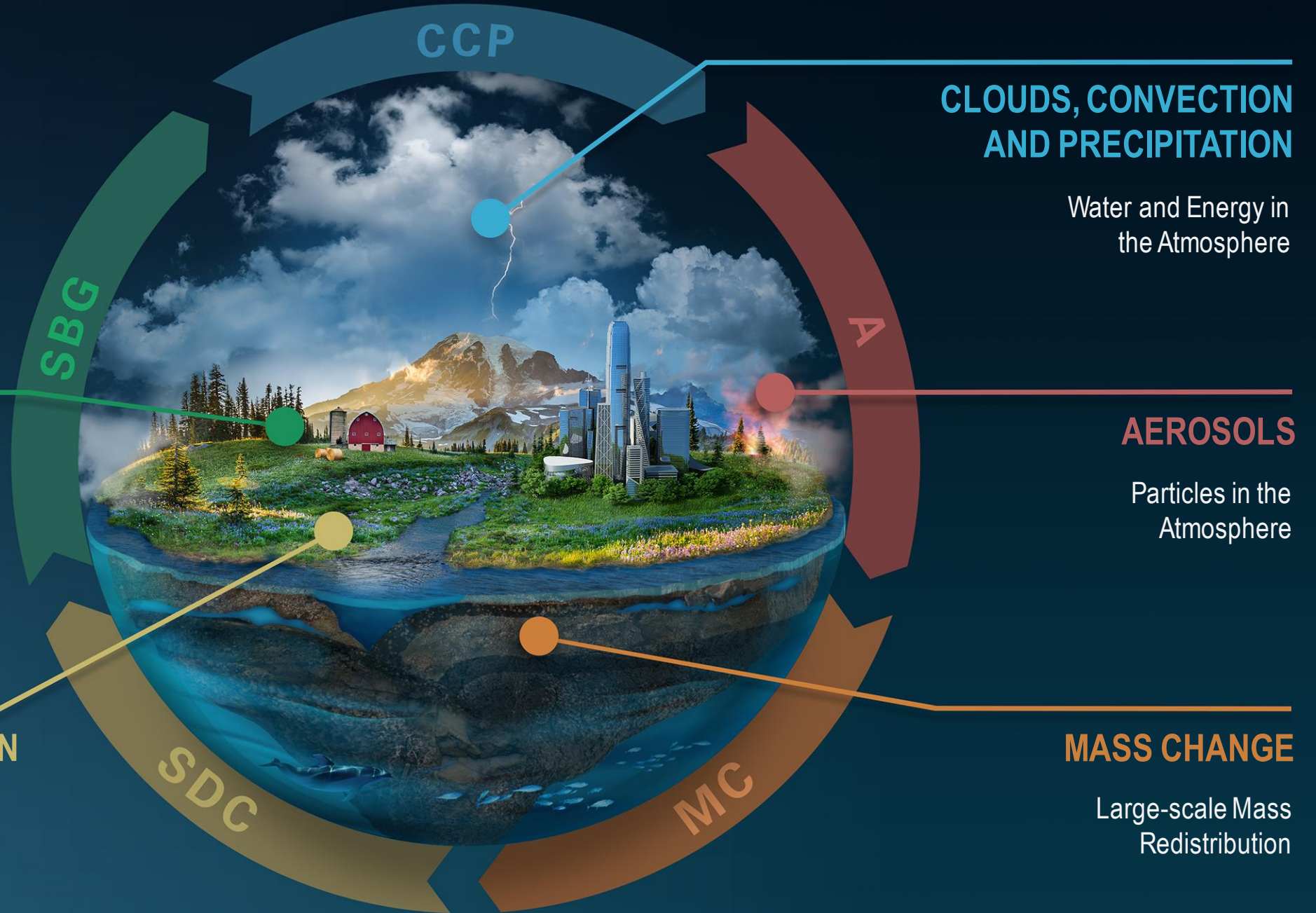
INTERCONNECTED CORE MISSIONS

## SURFACE BIOLOGY AND GEOLOGY

Earth Surface & Ecosystems

## SURFACE DEFORMATION AND CHANGE

Earth Surface Dynamics





# ESO Core Missions

- Atmosphere Observing System (AOS-Storm and AOS-Sky), Surface Biology and Geology (SBG) and Mass Change (MC) passed KDP-A and now in Formulation
- SDC will remain in extended study phase to take advantage of NISAR mission lessons learned
- ESO Independent Review Board, July - October 2022
  - IRB report and NASA response posted at [nasa.gov/reports](https://nasa.gov/reports)

## AOS

MCR: May 2022  
KDP-A: Jan 2023

## SBG

MCR: Jun 2022  
KDP-A: Nov 2022

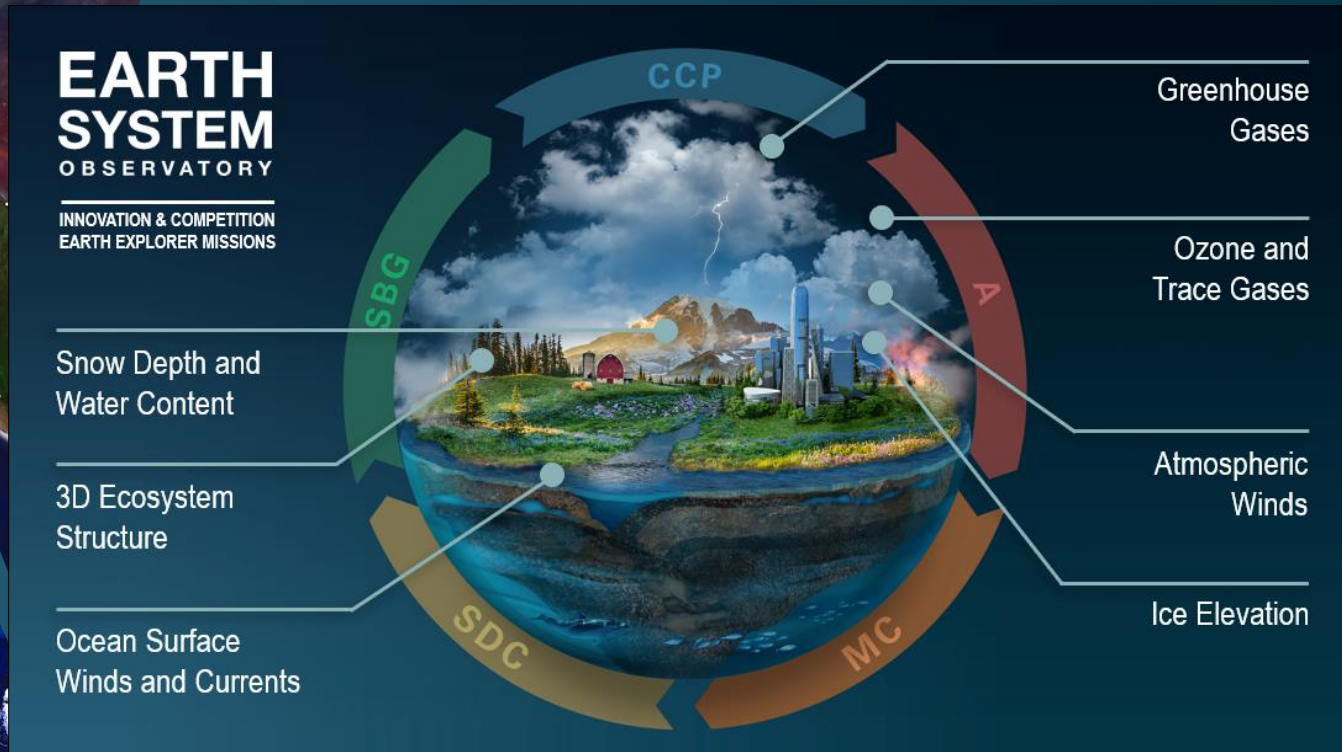
## MC

MCR: Jun 2022  
KDP-A: March 2023

## SDC

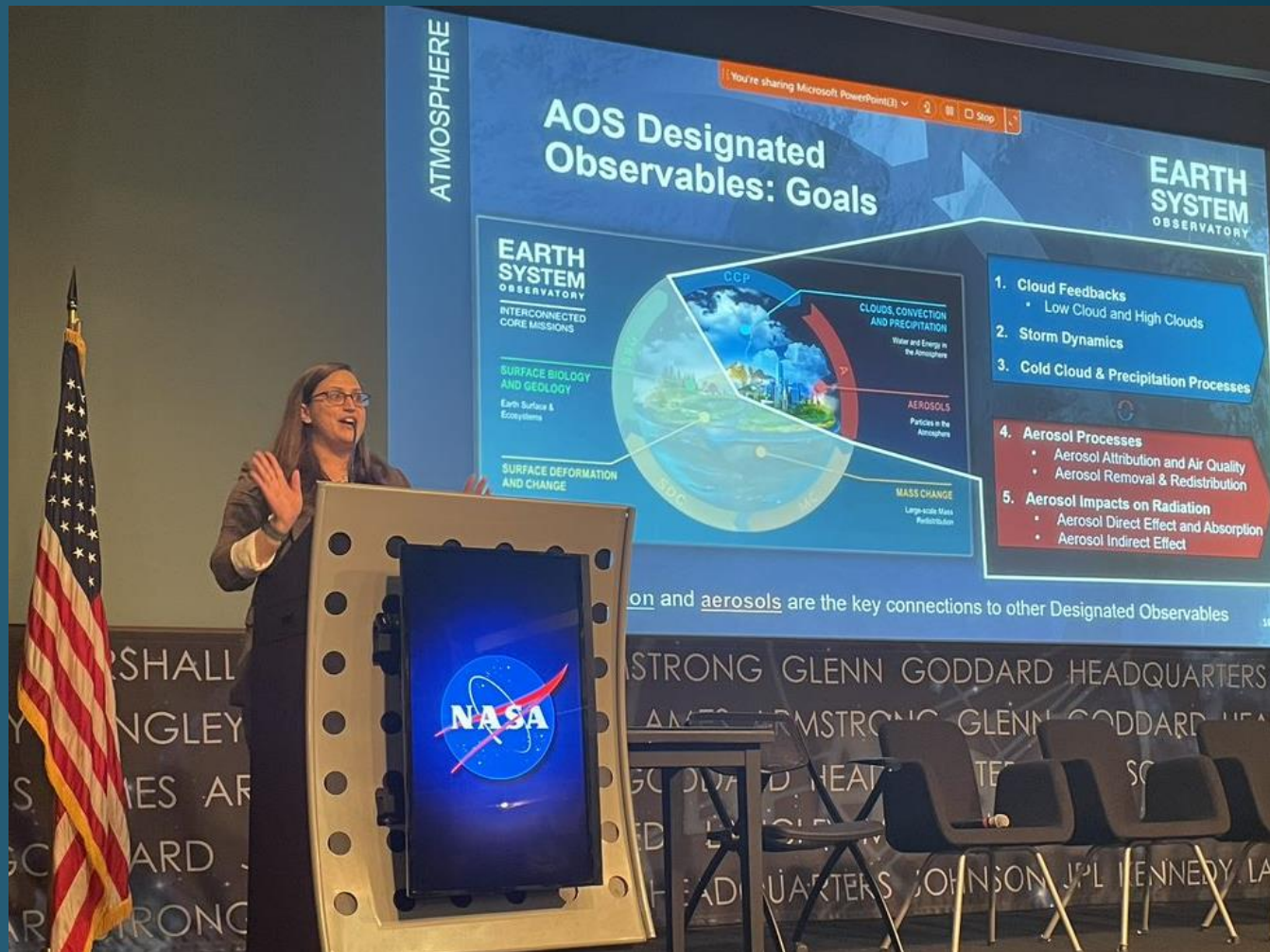
Remaining in extended  
Study Phase

# Earth System Explorers (ESE)



- Draft Announcement of Opportunity (AO) released on Dec 6, 2022
  - Final AO expected to be released Spring 2023
  - PI-Managed Mission Cost (PIMMC) cap of \$310M (FY24 \$)
  - NASA will provide launch vehicle services
  - Two-step selection process
- 
- New Earth System Explorers Program Office in process of being stood up at GSFC; undergoing SRR/SDR in March 2023

# ESO Industry Day: April 11, 2023

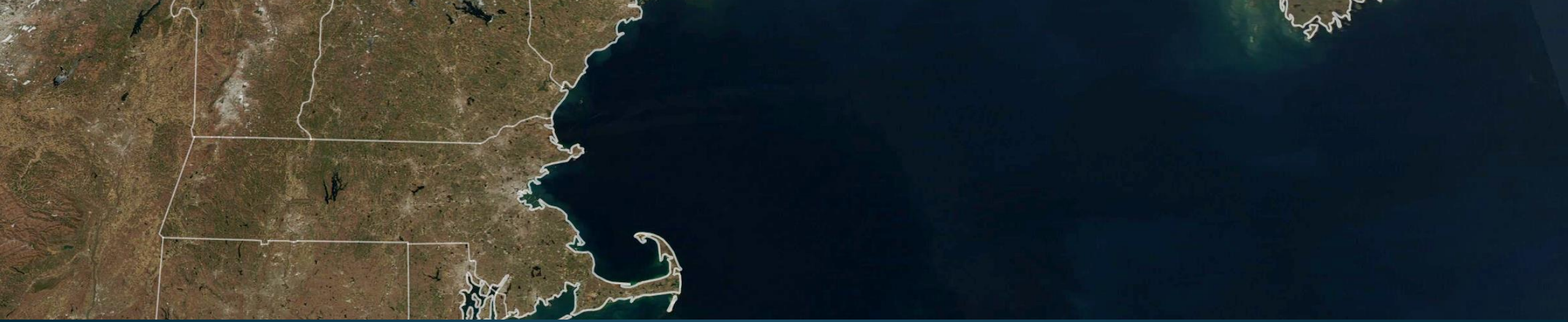


~60 industry representatives, in-person and online

Presentations on purpose, science objectives, architecture, acquisition and applications of each ESO mission

Q&A-driven panel discussion

More to come!

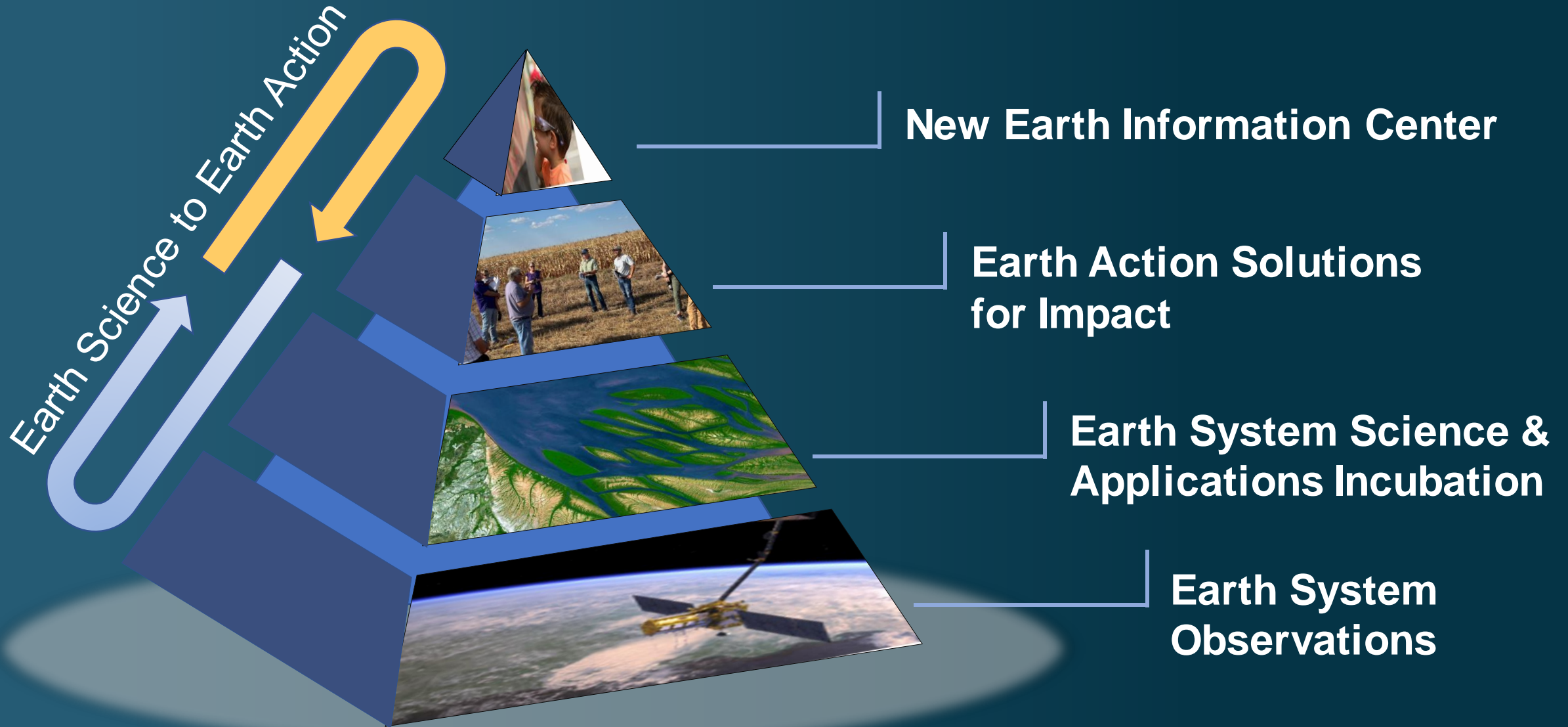


# DELIVERING ACTIONABLE SCIENCE

Showing People our Earth as NASA Sees It



# NASA Earth Action Strategy



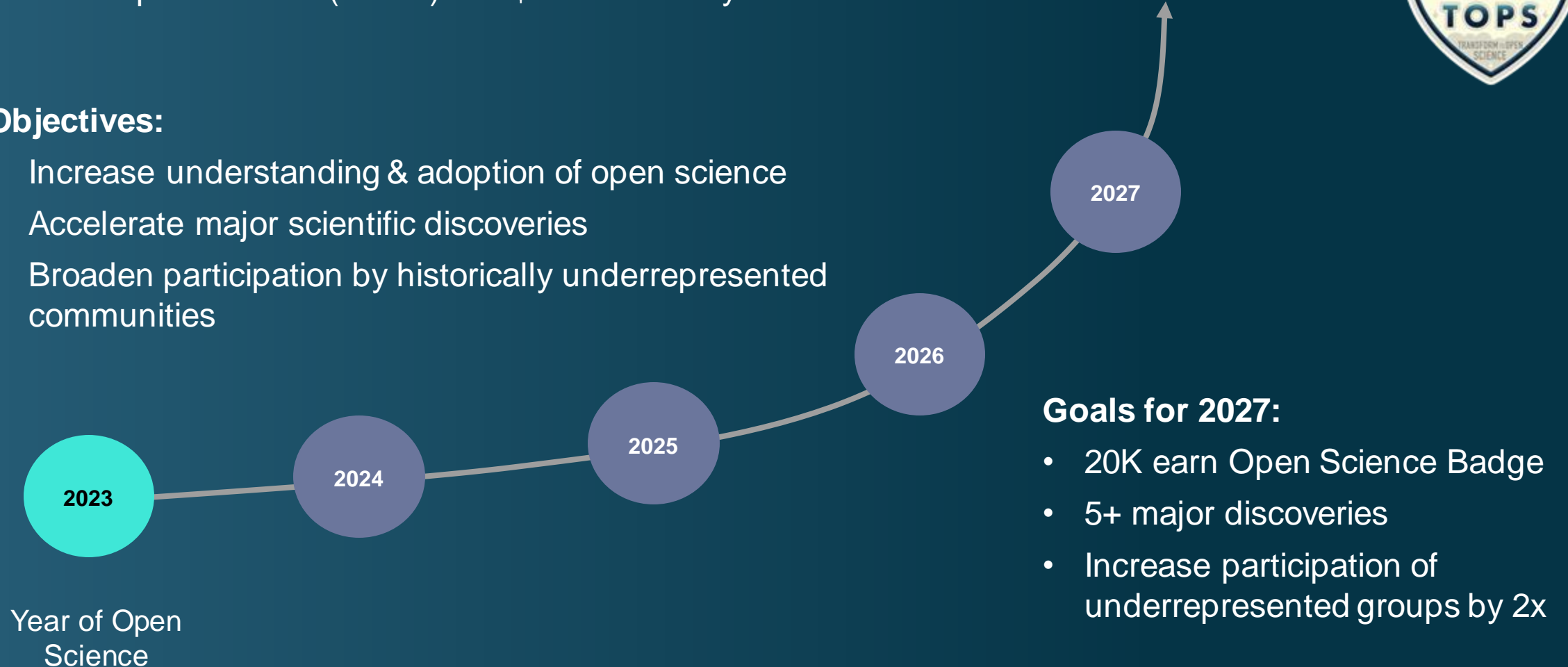
# Leading the Path to Open-Source Science



Transform to Open Science (TOPS) is a \$40 million\* 5-year NASA Science mission

## Objectives:

- Increase understanding & adoption of open science
- Accelerate major scientific discoveries
- Broaden participation by historically underrepresented communities



\*pending appropriations

# 2023 is NASA's Year of Open Science

TOPS will energize and uplift open science across the scientific community through:



## Visibility

Publishing articles, appearing on podcasts, developing targeted communication that expands footprint

Integrating Open Science into themes at large-scale events and conferences



## Capacity Sharing

Producing online, free, Open Science curriculum on Open edX

Hosting workshops, events, cohorts, science team meetings, hackathons

Constructing multiple pathways to Open Science Badge



## Incentives

Developing Open Science Badge/Certification

Sponsoring high profile prizes and challenges

Establishing high profile awards in support of open science research



## Moving Towards Openness

Recognizing open science practices

Holding open meetings

Sharing hidden knowledge

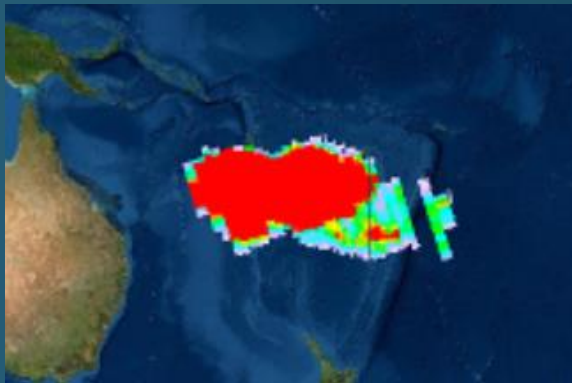
Inclusive collaboration



# Disaster Response Support

## NASA supported 18 major disaster events in 2022:

4 flooding events, 1 earthquake, 3 tropical storms / hurricanes, 3 volcanic eruptions, 1 man-made conflict (Ukraine) and 6 other events (compound disasters including hydrometeorological events triggering flooding, landslides and debris flows)



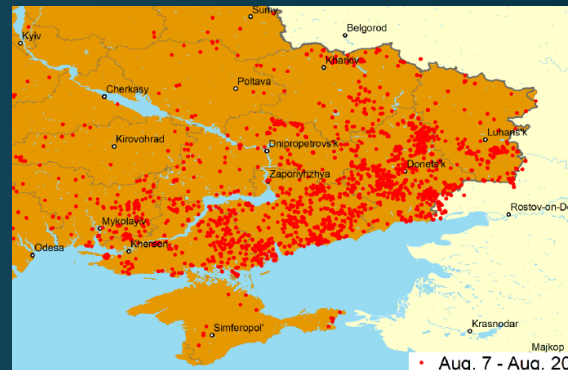
**Jan 2022 Tonga Eruption:**  
SO<sub>2</sub> from OMPS (pictured) and VIIRS, damage proxy maps, optical imagery



**Sept 2022 Hurricane Ian (FL, GA, SC):**  
damage proxy maps, Black Marble HD for power outages, flood extent from RADARSAT (pictured), optical imagery, multi-agency support



**June 2022 Yellowstone Flooding (WY, MT):**  
damage proxy maps (pictured), landslide mapping



**Feb 2022-onward Ukraine conflict:**  
VIIRS thermal anomaly estimates (pictured), seasonal hotspot anomalies for impact analysis

# NASA Data Advancing Agriculture



NASA has launched a new domestic agriculture consortium called Acres to bring together leaders from public and private sectors to put NASA data, science, and tools into the hands of U.S. agricultural producers



NASA is collaborating with agencies across the federal government, including 22 active projects with USDA and working with USGS to broaden the use of innovative tools like OpenET, which monitors evapotranspiration for improved water management



A NASA Earth Science team visited Kansas and Nebraska in August 2022 to hear from producers and share information at local university events

# Understanding Fire Stages: FireSense



**Pre-Fire:** Improved fire prevention by providing fire fuel maps with higher accuracy and resolution

Provision of near real-time fire risk assessments based on fuel conditions, soil moisture, surface temperature, etc.

*Stakeholders: USFS and USGS*



**Post-Fire:** Improved maps of burn severity to aid in post-fire ecosystem rehabilitation efforts

Predictions of post-fire hazards and impacts including debris flow and landslide risks and water quality impacts

*Stakeholders: USFS and USGS*



**Active Fire:** Better detection and tracking of fire via satellite, airborne, and ground-based imagery with higher spatial resolution and update frequency

Development of new, innovative sensors for precisely tracking and locating fires, fuel conditions, and smoke plumes

*Stakeholders: USFS and CalFire*



**Air Quality:** Enhanced tracking and characterization of smoke plumes and smoke transport

Improved forecasts of air quality impacts to human health and safety

*Stakeholders: NOAA and EPA*

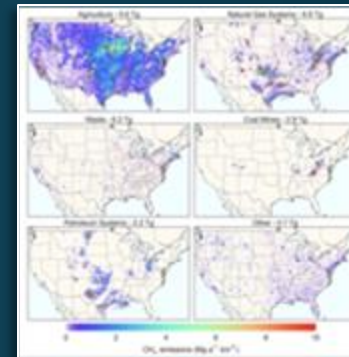
# Greenhouse Gas Monitoring and Information Center

**Mission:** To extend accessible and integrated greenhouse gas (GHG) data and modeling capabilities from U.S. Government and non-public sources for scalable impact

## Strategic Goals

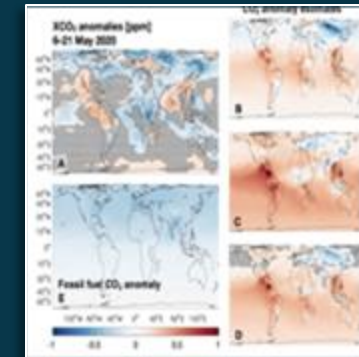
1. **Accelerate** GHG monitoring, measurement, reporting and verification **decision support**, connecting technology, tools, and data.
2. **Foster collaboration** with networks of interagency, intergovernmental and private sector partners to co-develop and increase adoption of impactful applications.
3. **Promote scientific innovation and transparency** by leveraging advanced data systems capabilities and open source science principles.
4. **Develop products needed by users**, updated on a regular basis, and enabled by advanced science-based capabilities.
5. **Establish bidirectional knowledge transfer** and engagement with federal, state, local and tribal governments, researchers, and the general public.
6. **Integrate diversity, equity and inclusion** in the Center's research, knowledge transfer, community engagement, management and operations functions.

## Pilot Use Cases



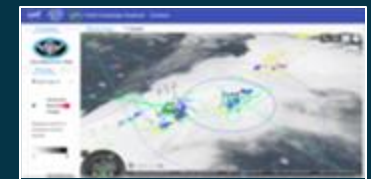
Use Case 1. Improve access of gridded anthropogenic GHG inventory data to federal, state, local and tribal governments, and the general public.

*Credit* Maasakkers et al., *Env. Sci. and Tech.*, 2016



Use Case 2. Complement EPA's anthropogenic GHG emission data with up-to-date NASA data on natural GHG emissions and fluxes.

*Credit* Weir et al., *Env. Res. Lett.*, 2022, submitted



Use Case 3. Identify, and quantify estimates from super emitting events, leveraging aircraft and satellite data.

*Credit* Carbon Mapper, NASA Field Campaign Explorer

# Earth Information Center

Improving access to key climate information is a priority for the Agency. Building on his previous announcement, NASA Administrator Bill Nelson released the first concept, and shared a new video for the Earth Information Center. The Center will allow the public to see how the Earth is changing and guide decision makers to mitigate, adapt, and respond to climate change.



Sep 9, 2022  
RELEASE 22-094

## NASA Hosts National Space Council Meeting, Vice President Chairs Event

Vice President Kamala Harris highlighted the importance of climate, human spaceflight, and STEM education during the Biden-Harris Administration's second...

makers to mitigate, adapt, and respond to climate change.

"Just like we use mission control to monitor operations during spaceflight, we're embarking on this effort to monitor conditions here on our home planet, and it will be available to everyone in an easy-to-access format," Nelson said.

Planning for the Earth Information Center is underway with the initial phase providing an interactive visual display of imagery and data from NASA and other government agencies. NASA Headquarters plans to house this initial interactive display with goals to expand in person and virtual access over the next five

**For more than 50 years, NASA satellites have provided open-source and publicly available data on Earth's land, water, temperature, weather, and climate.**

# Earth Information Center

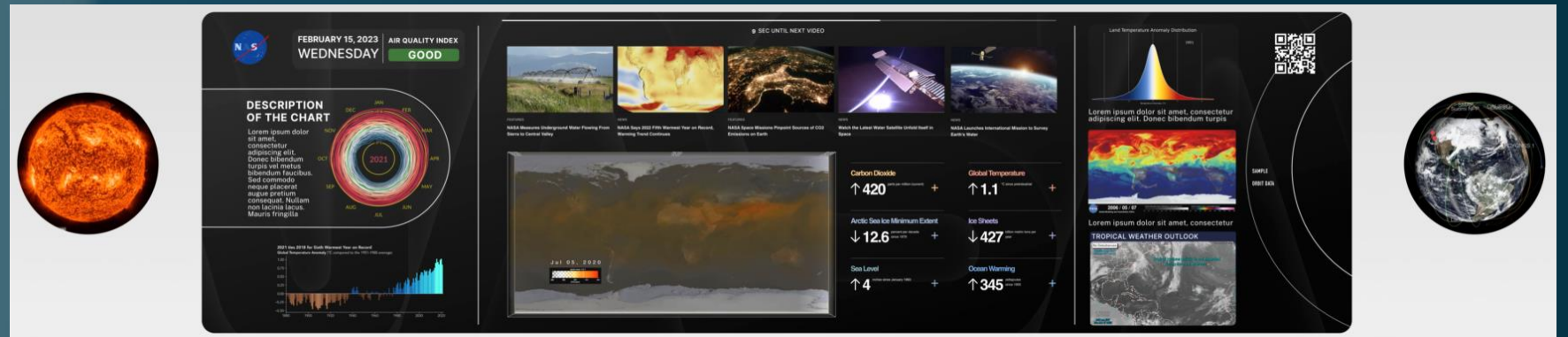


A physical and virtual space to engage and amplify impact – *to show people our Earth as we see it.*



This Center will showcase large, awe-inspiring visualizations, as well as interactive media, stories, and narratives to inspire action.

The intent is to stimulate communities to explore solutions and provide opportunities for connecting science to action.





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