

National Aeronautics and
Space Administration



EXPLORE EARTH

John Haynes, MS
Earth Action Program
Earth Science Division
NASA Headquarters

**The NASA Health and Air Quality
Applications Program**

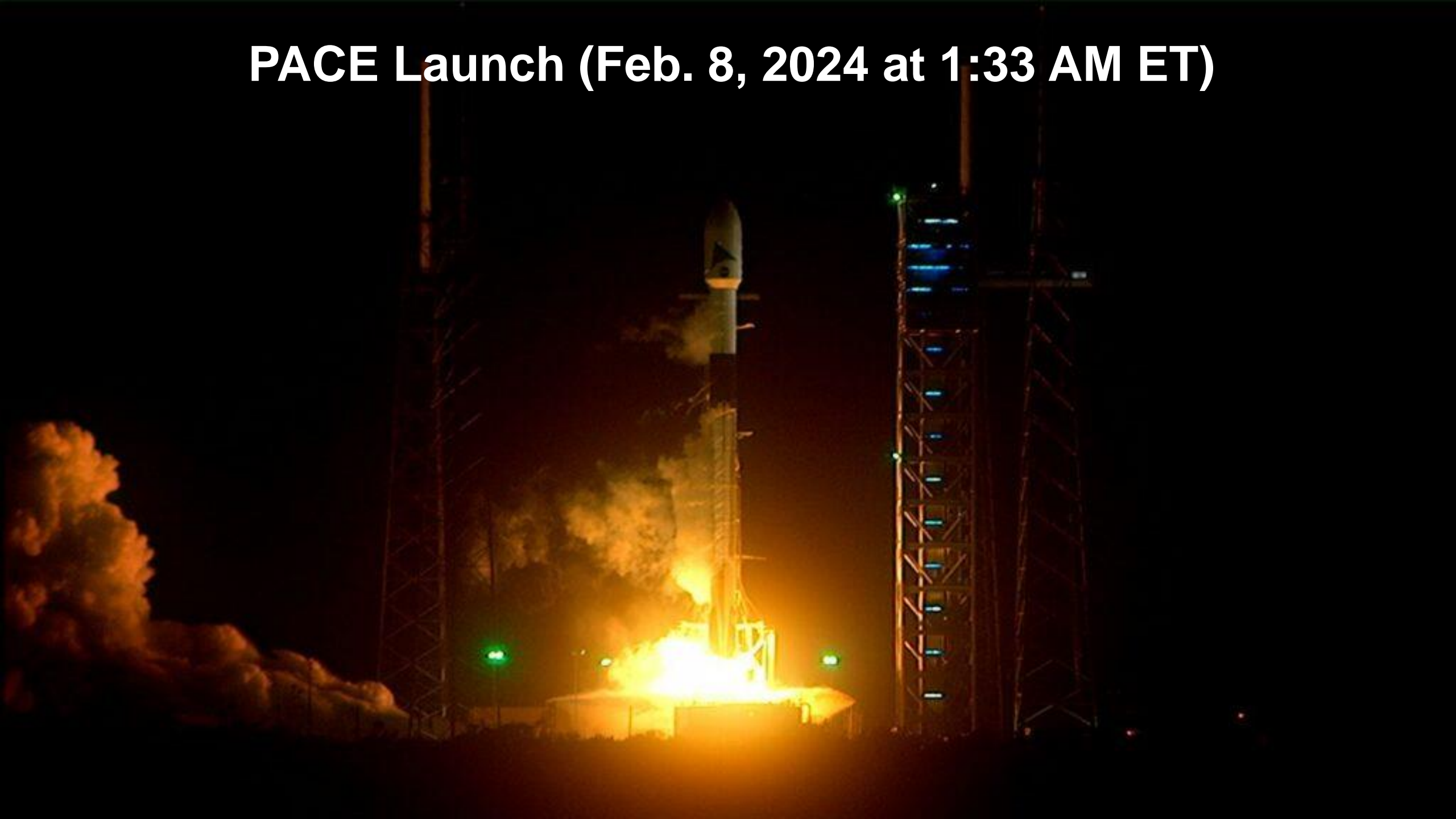
April 23, 2024



TEMPO Launch (April 7, 2023 at 12:30 AM ET)

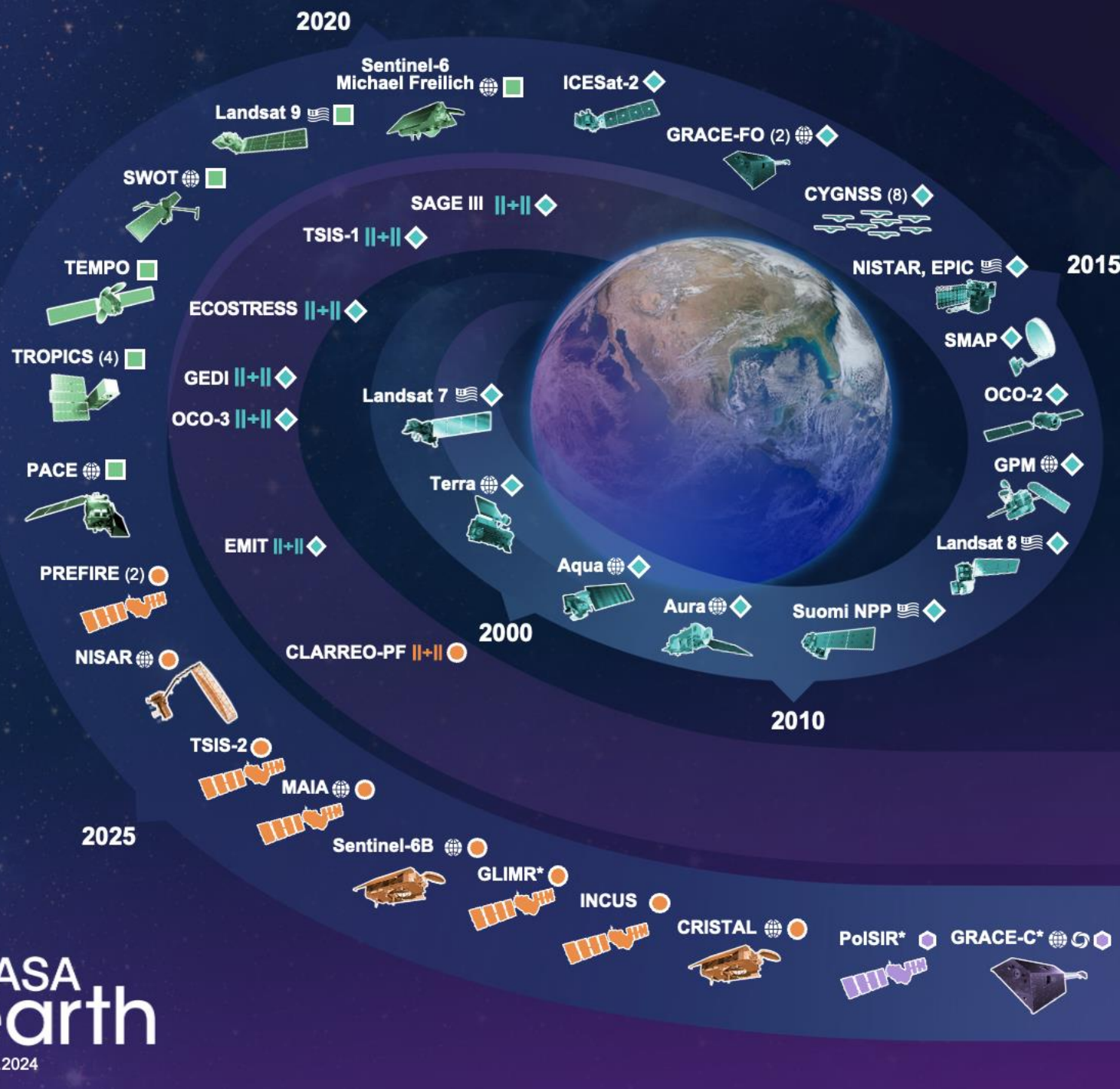


PACE Launch (Feb. 8, 2024 at 1:33 AM ET)





EARTH FLEET



Key

- International Partners
- U.S. Partner
- ISS Instrument
- JPSS Instrument
- Cubesat
- Launch Date TBD
- Earth System Observatory Mission
- (Pre) Formulation
- Implementation
- Operating
- Extended

Invest/CubeSats

- NACHOS 2022
- CTIM 2022
- NACHOS-2 2022
- MURI-FD 2023
- SNOOPI* 2024
- HYTI* 2024
- ARGOS* 2024

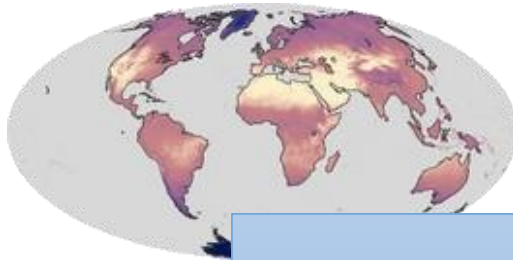
JPSS Instruments

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

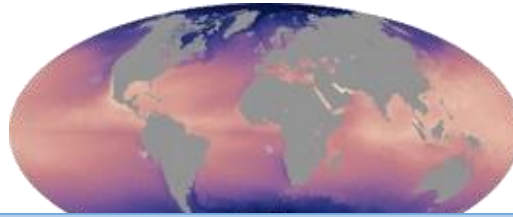
ISS INSTRUMENTS

MISSIONS

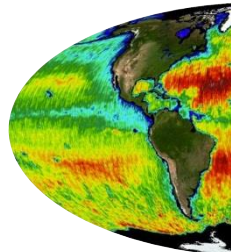
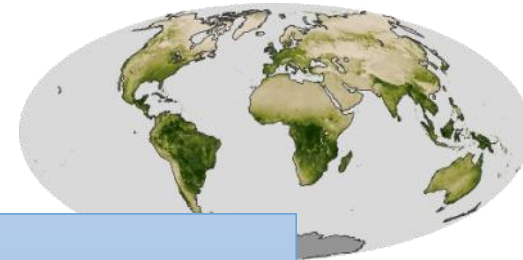
Various Types of Earth Observations...and many are critical for Health and Air Quality Applications



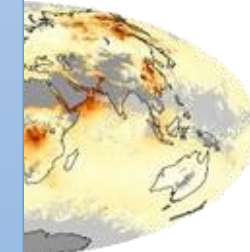
Land Temperature



Precipitation

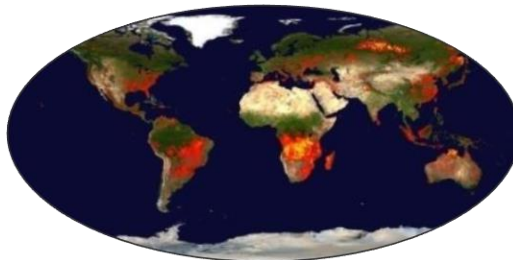


Sea Surface Salinity

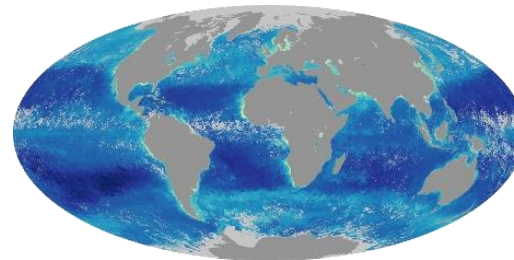


Soil Moisture

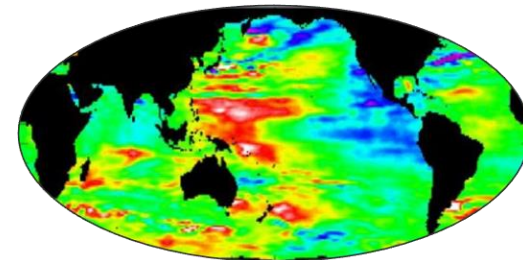
All data are free and open access at: <https://earthdata.nasa.gov/>



Fires & Thermal Anomalies



Chlorophyll



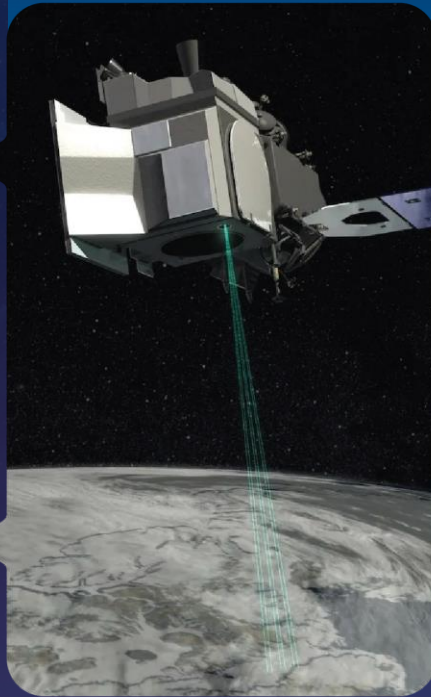
Sea Surface Height

Advancing Earth System Science End-to-end

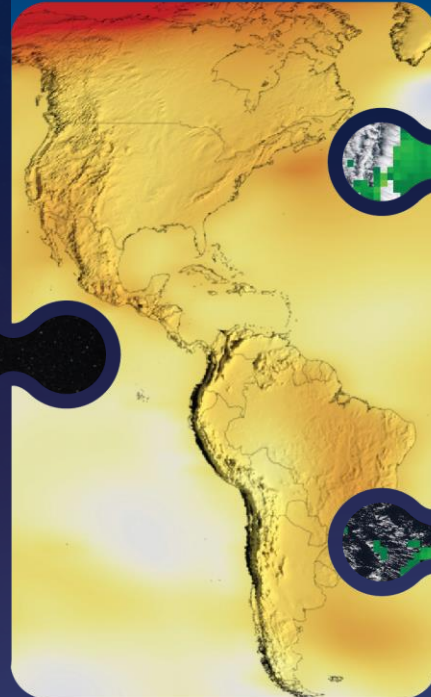
Technology



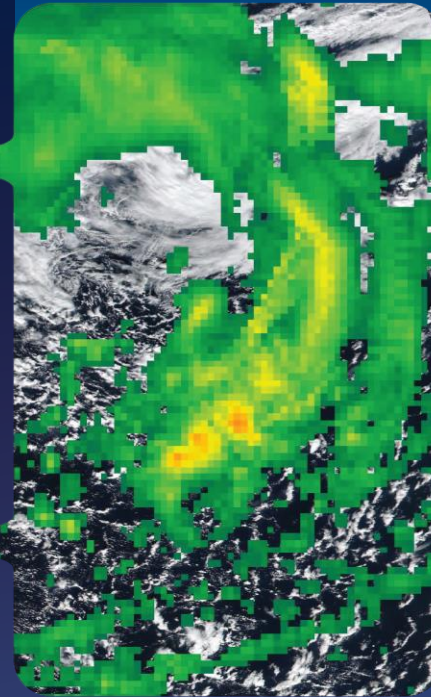
Flight



Research and Analysis



Data and Modeling



Earth Action



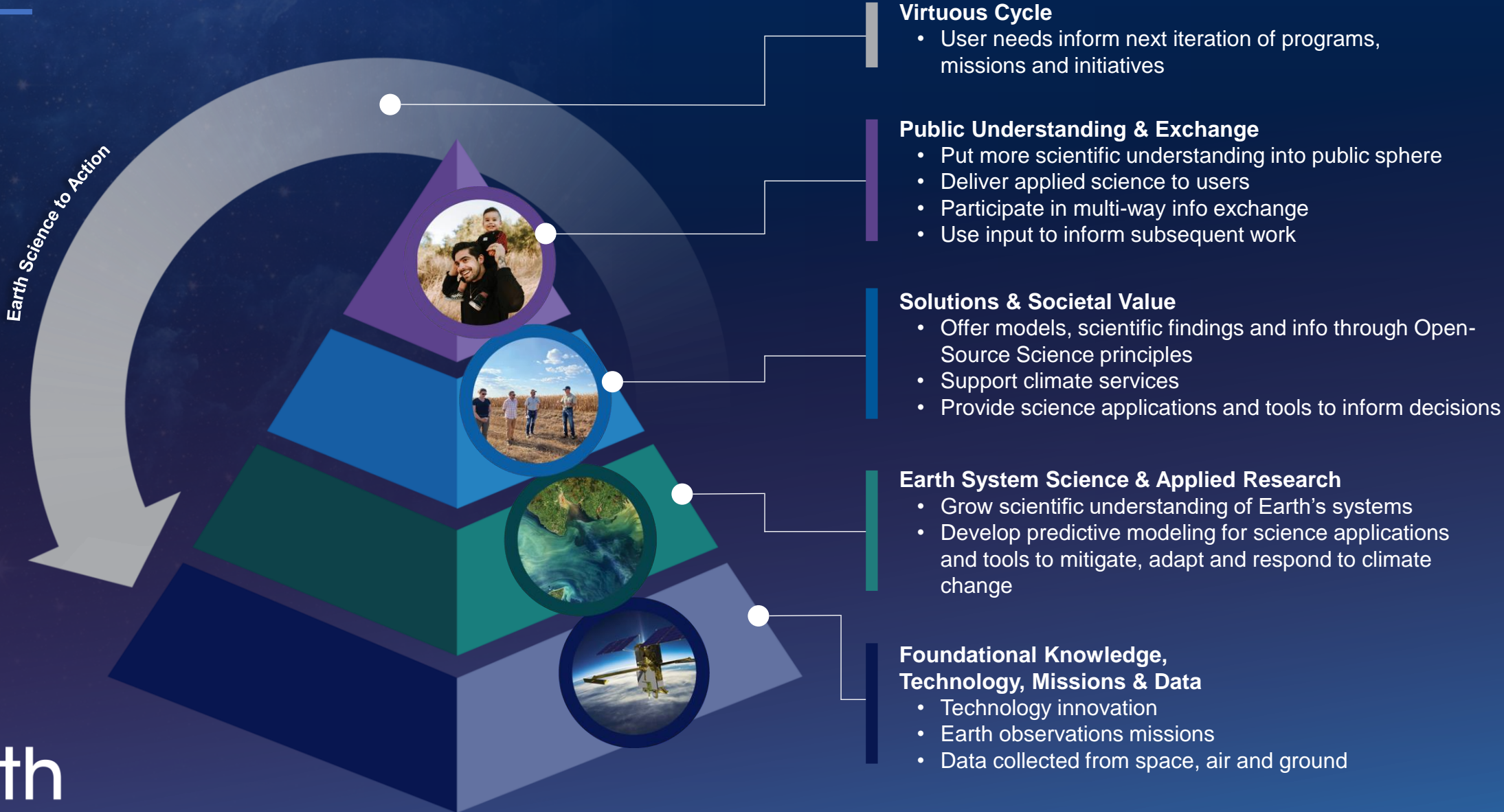
What do we mean by “action”?

Our definition of action is accelerating the use of Earth science to support policy and decision-making for society’s well-being

- **Scale up:** Scale up existing efforts to get NASA science and data into hands of end users to solve real-world challenges
- **Build bridges:**
 - Build structural and cultural bridges between research, technology, flight, data, and Earth action elements
 - Identify and remove barriers to collaboration
- **Be user centered:** Prioritize info exchange with end users to allow their experiences to inform future programs



Earth Science to Action Strategy



EARTH ACTION PROGRAM

Mission

Enable people & organizations to apply insights from Earth science to benefit the economy, health, quality of life, and environment.

What We Do

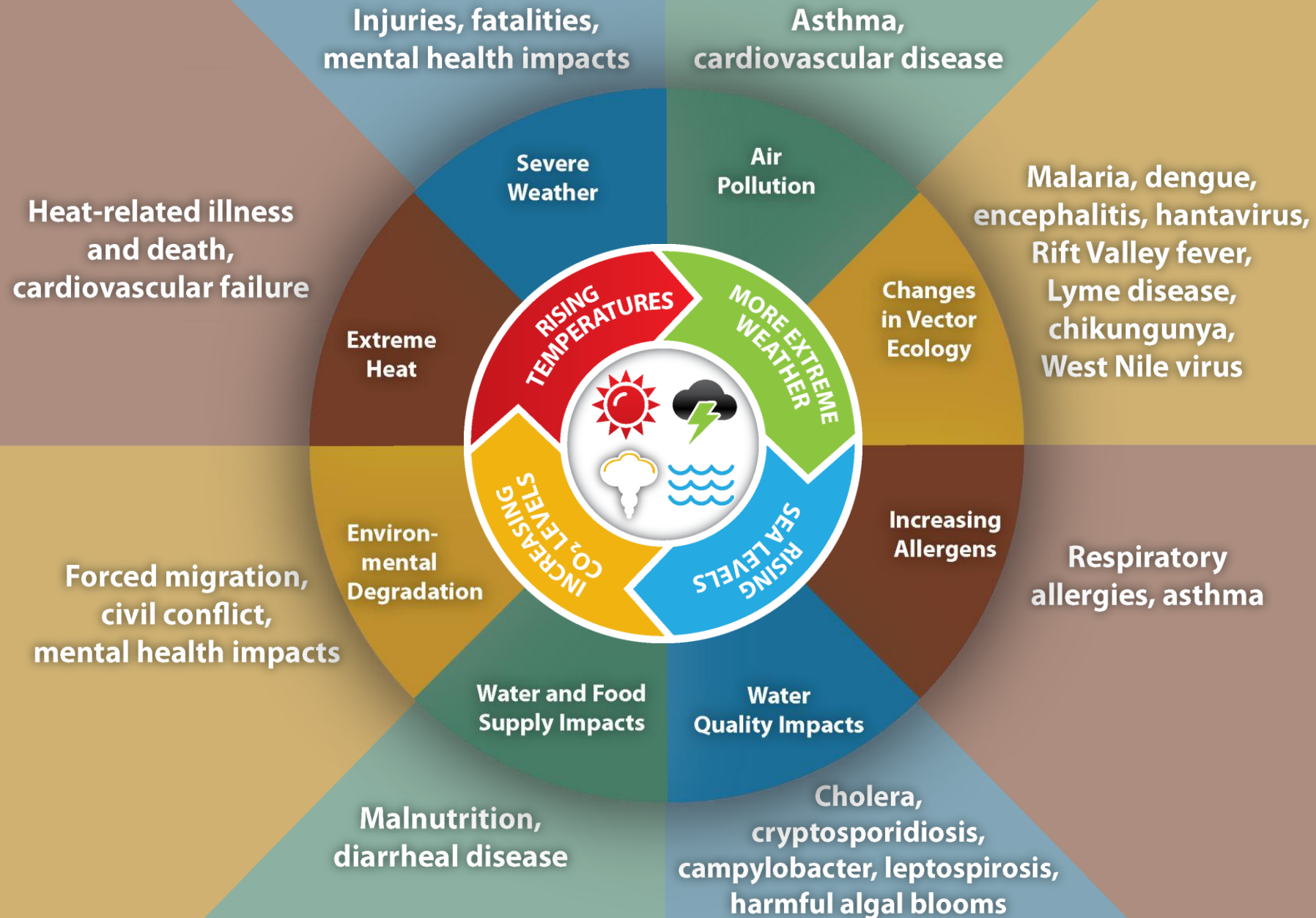
We make financial and programmatic investments to generate creative solutions and lower the technical and institutional barriers to using Earth science information

- Work with organizations to improve their decisions and actions
- Draw on our connections with users to bring their feedback and inquiries back to ESD

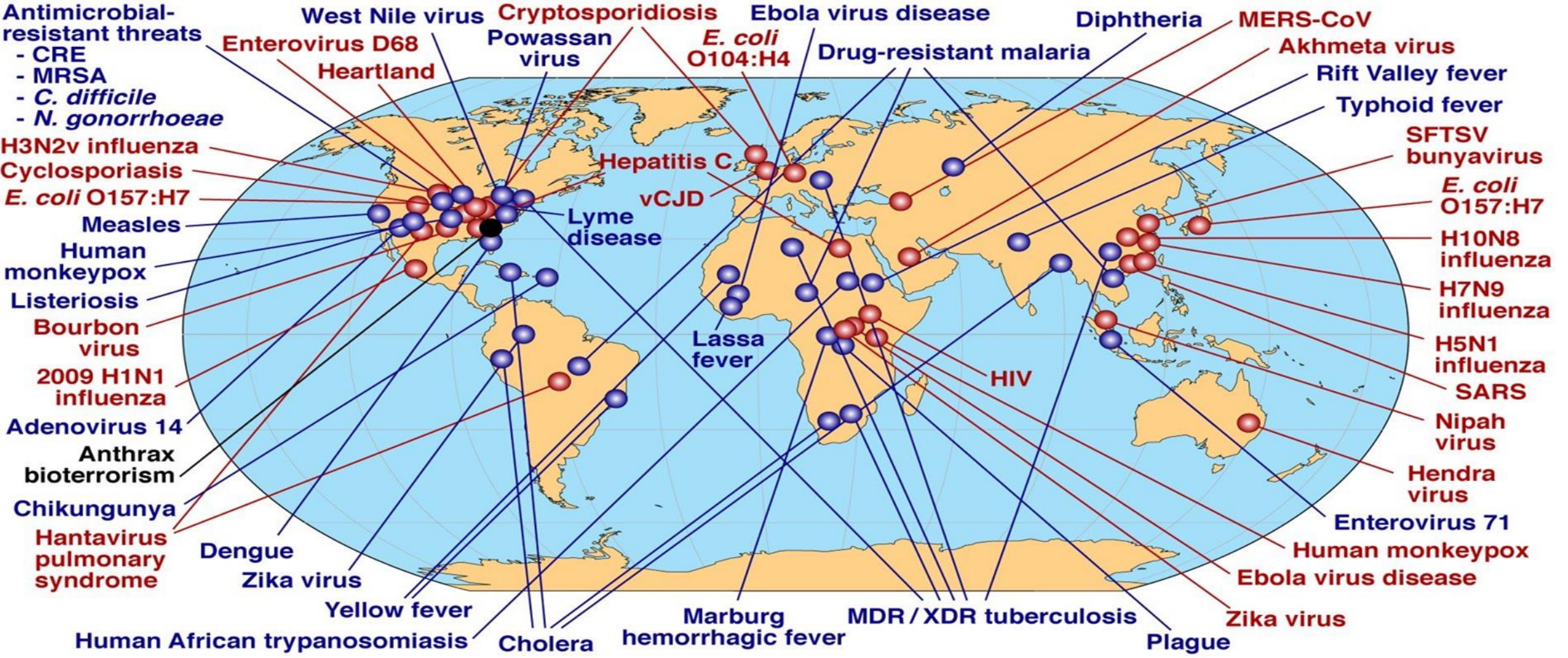


*Scalability
Building Bridges
User-Centric Solutions*

Impact of Climate Change on Human Health

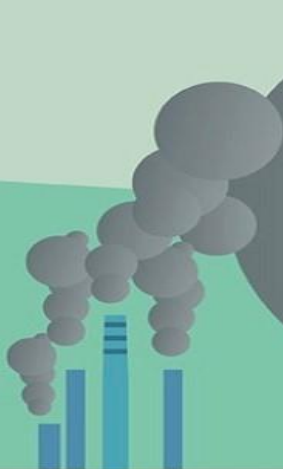


Global Examples of Emerging and Re-Emerging Infectious Diseases



● Newly emerging
 ● Re-emerging/resurging
 ● “Deliberately emerging”

AIR POLLUTION – THE SILENT KILLER



Every year, around **7 MILLION DEATHS** are due to exposure from both outdoor and household air pollution.

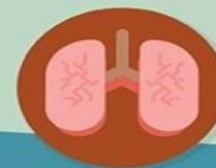
Air pollution is a major environmental risk to health. By reducing air pollution levels, countries can reduce:



Stroke



Heart disease



Lung cancer, and both chronic and acute respiratory diseases, including asthma

REGIONAL ESTIMATES ACCORDING TO WHO REGIONAL GROUPINGS:



Over 2 million in South-East Asia Region

Over 2 million in Western Pacific Region

Nearly 1 million in Africa Region

About 500 000 deaths in Eastern Mediterranean Region

About 500 000 deaths in European Region

More than 300 000 in the Region of the Americas

CLEAN AIR FOR HEALTH

#AirPollution



World Health Organization

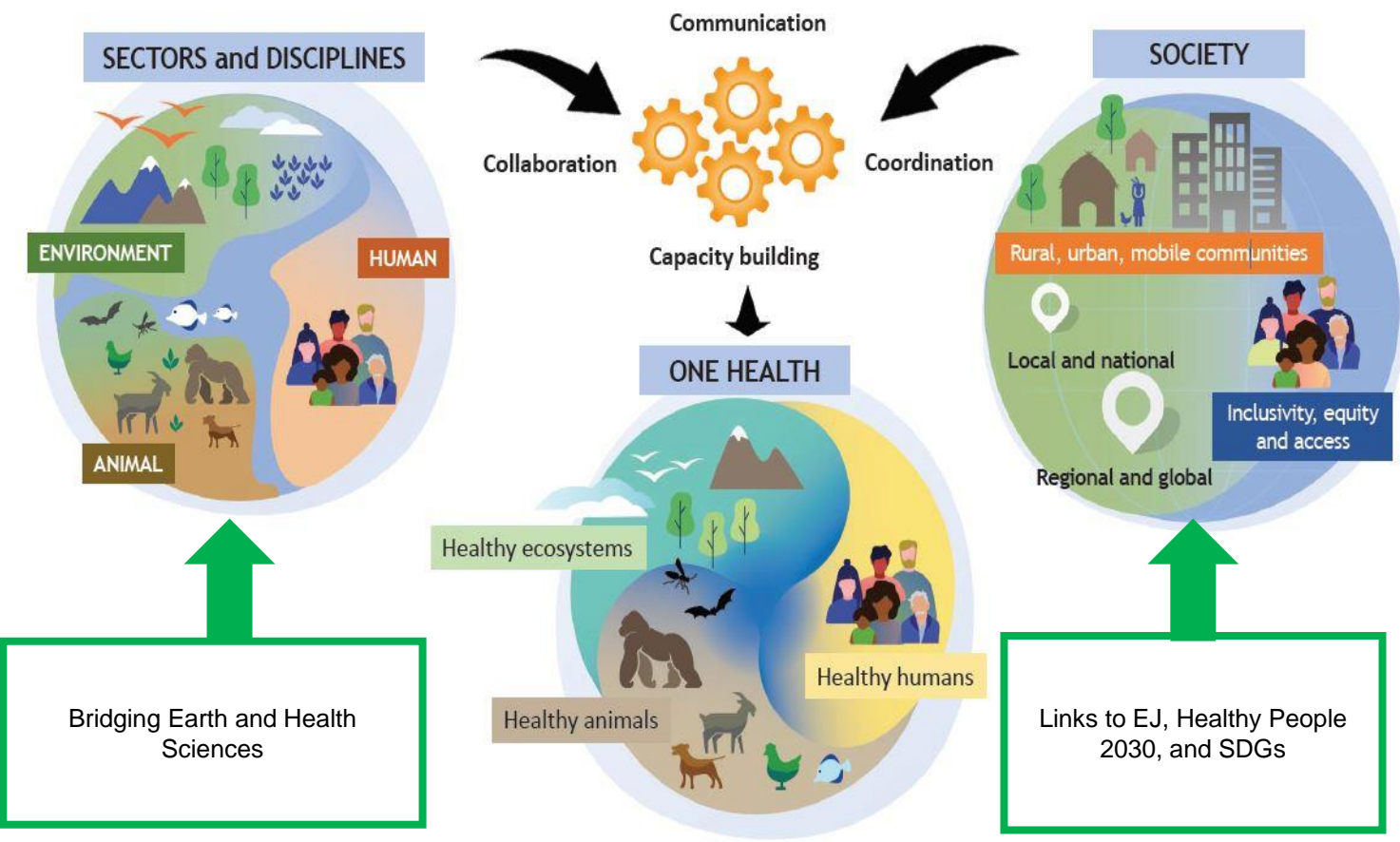
NASA Health & Air Quality Applications Objectives:

We support the use of Earth observations in air quality management and public health, particularly regarding...

- **Infectious disease and environmental health**
- **Toxic and pathogenic exposure and health-related hazards**
- **Implementation of air quality standards, policy, and regulations**
- **Effects of climate change on public health and air quality**



Major Partners include International (e.g., GEO, WHO, UNICEF, PAHO), Federal (e.g., CDC, EPA, NIH, NOAA), State (e.g., South Dakota, California, Texas), and Private sectors (e.g., AER, Inc., Moore Foundation).



WHO: Urgent Health Challenges for the Next Decade

- Elevating health in the climate debate
- Delivering health in conflict and crisis
- Making health care fairer
- Expanding access to medicines
- Stopping infectious diseases
- Preparing for epidemics
- Protecting people from dangerous products
- Investing in the people who defend our health
- Keeping adolescents safe
- Earning public trust
- Harnessing new technologies
- Protecting the medicines that protect us
- Keeping health care clean

Other Items of Note

- Tom Wagner announced as new AD for NASA Earth Action.
- Slow response from NSSC on placing grants/augmentations.
- Remember your Annual Reports are due 60 days *prior* to your anniversary date.
- Five new HAQAST Tiger Teams announced in July 2023.
- HAQAST Rapid Response project announcements soon.
- NASA received its full FY24 appropriation; however, ESD funding was less than the PBR for FY24. HAQ absorbed a 5% cut.
- High-level interest from leadership on poor costing.
- ROSES 2024 solicitations on the street for HAQ (A.43, Due 8/6/24) and HAQAST (A.44, Due 7/9/2024).
- Renewed MOU Annex with CDC/EPHTN.
- 2023 NASA Earth Science Senior Review complete. Report link: <https://science.nasa.gov/earth-science/operating-missions/>
- First physical space for the NASA Earth Information Center opened at NASA HQ in June 2023 (<https://earth.gov/>).
- Sessions at ATS, AWMA, AmeriGEO week, AGU (inc. AGU Chapman Conferences), AMS, AMCA – along with presentations at NASA Earth Day events, the World Medical Association, UNEP Int'l Day of Clean Air for Blue Skies, and with various universities and stakeholders.
- Asia-AQ Field Campaign in Winter/Spring 2024.
- ATS in San Diego – May 17-22.
- AWMA in Calgary – June 24-27.
- APHA in Minneapolis – October 27-30.

FY25 ESD President's Budget Request by Program

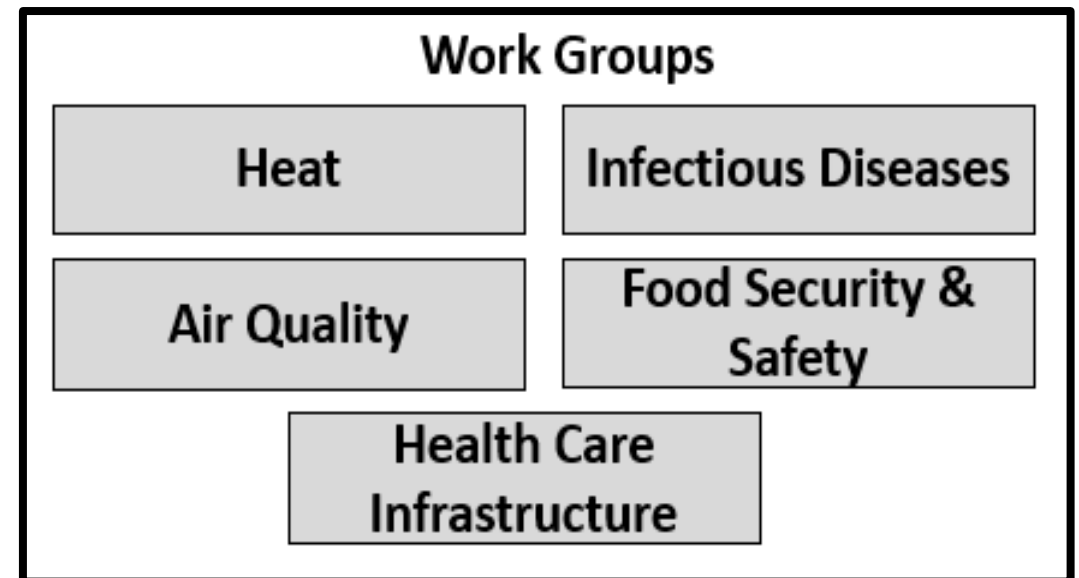
(\$K)	Actual	Plan	Request	Outyears			
	FY23	FY24	FY25	FY26	FY27	FY28	FY29
Total Earth Science	2,194,000	2,251,635	2,378,651	2,396,300	2,446,100	2,489,700	2,543,400
Earth Systematic Missions	914,956	771,336	854,432	868,694	888,155	869,878	757,827
Earth System Science Pathfinder	232,116	245,474	251,726	245,979	202,066	224,988	308,934
Earth System Explorers	2,459	22,064	19,581	58,969	99,491	130,638	194,710
Earth Science Data Systems	365,087	392,341	263,236	257,569	268,340	269,798	276,340
Earth Science Technology	102,181	105,349	147,248	109,392	110,596	111,812	113,040
Applied Sciences	75,205	87,560	68,591	73,344	73,470	75,804	75,901
Earth Science Research	501,996	627,511	606,152	608,425	627,558	628,848	637,188
Responsive Science Initiatives	-	-	167,685	173,928	176,424	177,934	179,460



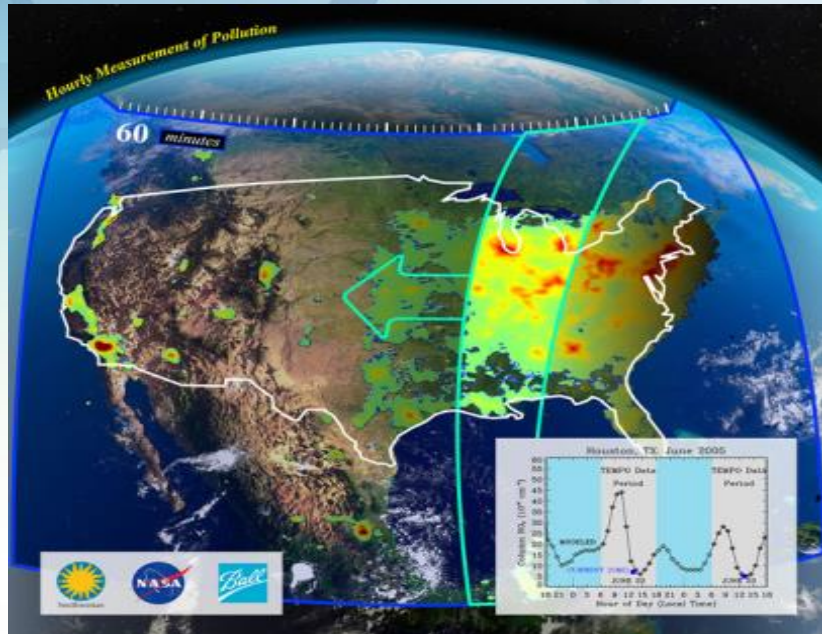
Improving Health Decision-Making Using Environmental Observations

Global network of governments, organizations, and observers, who seek to use Earth observation data to improve health decision-making at the international, regional, country, and district levels

**Community Teleconferences
AGU Fall Meeting (USA)
GEO Symposium & Week
AmeriGEO Week**



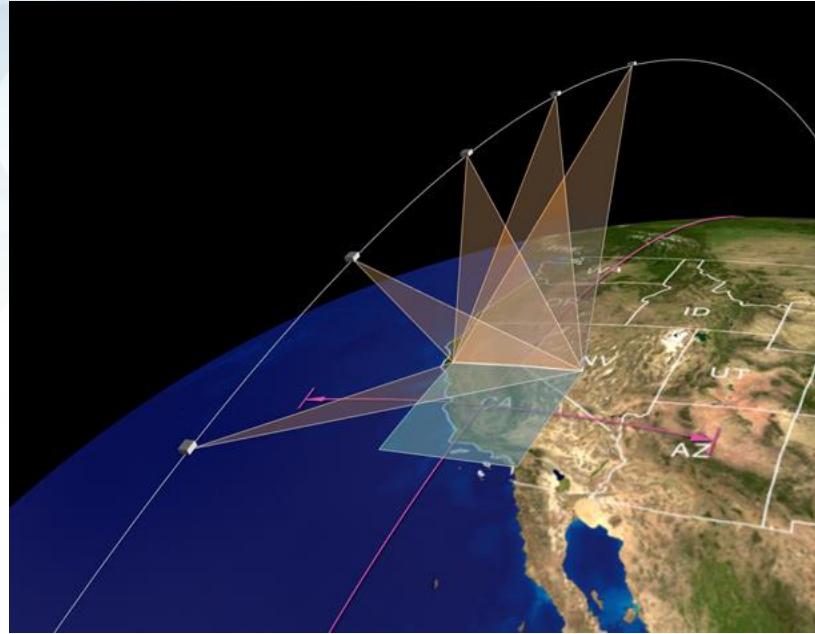
Earth Venture Instrument-1: Tropospheric Emissions: Monitoring of Pollution (TEMPO)



“Monitoring the air we breathe, hour by hour”
Credits: TEMPO website

- ❖ **TEMPO is a pathfinder to using hosted commercial payloads from GEO.**
- ❖ Collects tropospheric pollution observations from geostationary orbit: Ozone, NO₂, CH₂O.
- ❖ Forms a global air quality constellation in GEO with Copernicus Sentinel 4 and Korean GEMS.
- ❖ Instrument delivered in 2018; Launched April 2023; First Light August 24, 2023.

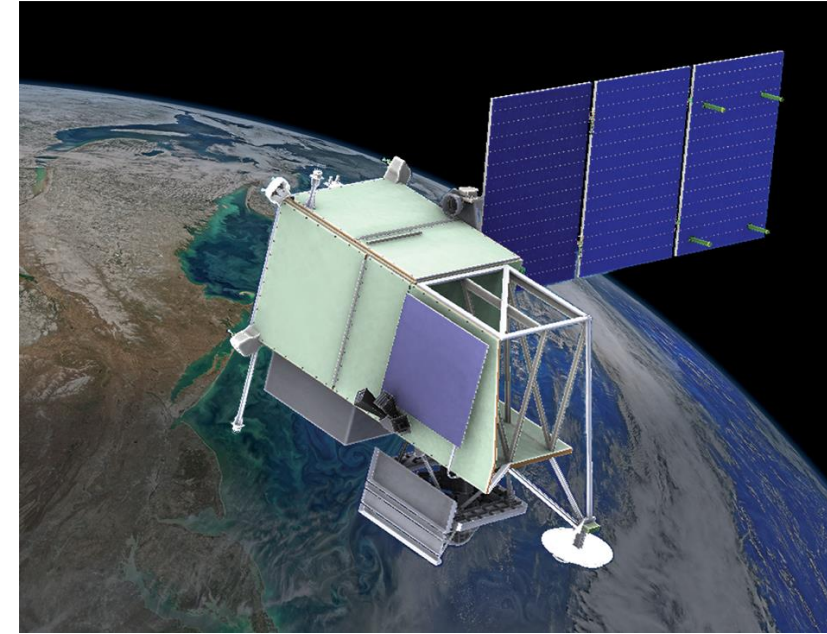
Earth Venture Instrument-3: Multi-Angle Imager for Aerosols (MAIA)



Credits: MAIA website

- ❖ **MAIA represents a sentinel partnership between NASA and epidemiologists/health organizations on a satellite mission.**
- ❖ Assesses linkages between different airborne PM types and adverse birth outcomes, cardiovascular and respiratory disease, and premature deaths.
- ❖ Will measure particle types, sizes, concentrations, and geolocation of atmospheric aerosols.
- ❖ Launch expected 2025.

Plankton, Aerosol, Cloud, ocean Ecosystem (PACE)



Credits: PACE website

- ❖ **PACE's Ocean Color instrument will be the most advanced for observing ocean color in NASA's history.**
- ❖ Assesses ocean color, aerosol, and cloud data records for Earth system and climate studies.
- ❖ Multi-angle polarimeter to measure the particle sizes and compositions of atmospheric aerosols and ocean color.
- ❖ Launched February 2024. First light April 11, 2024.



National Aeronautics and
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Questions:

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<http://AppliedSciences.NASA.gov>