

National Aeronautics and
Space Administration

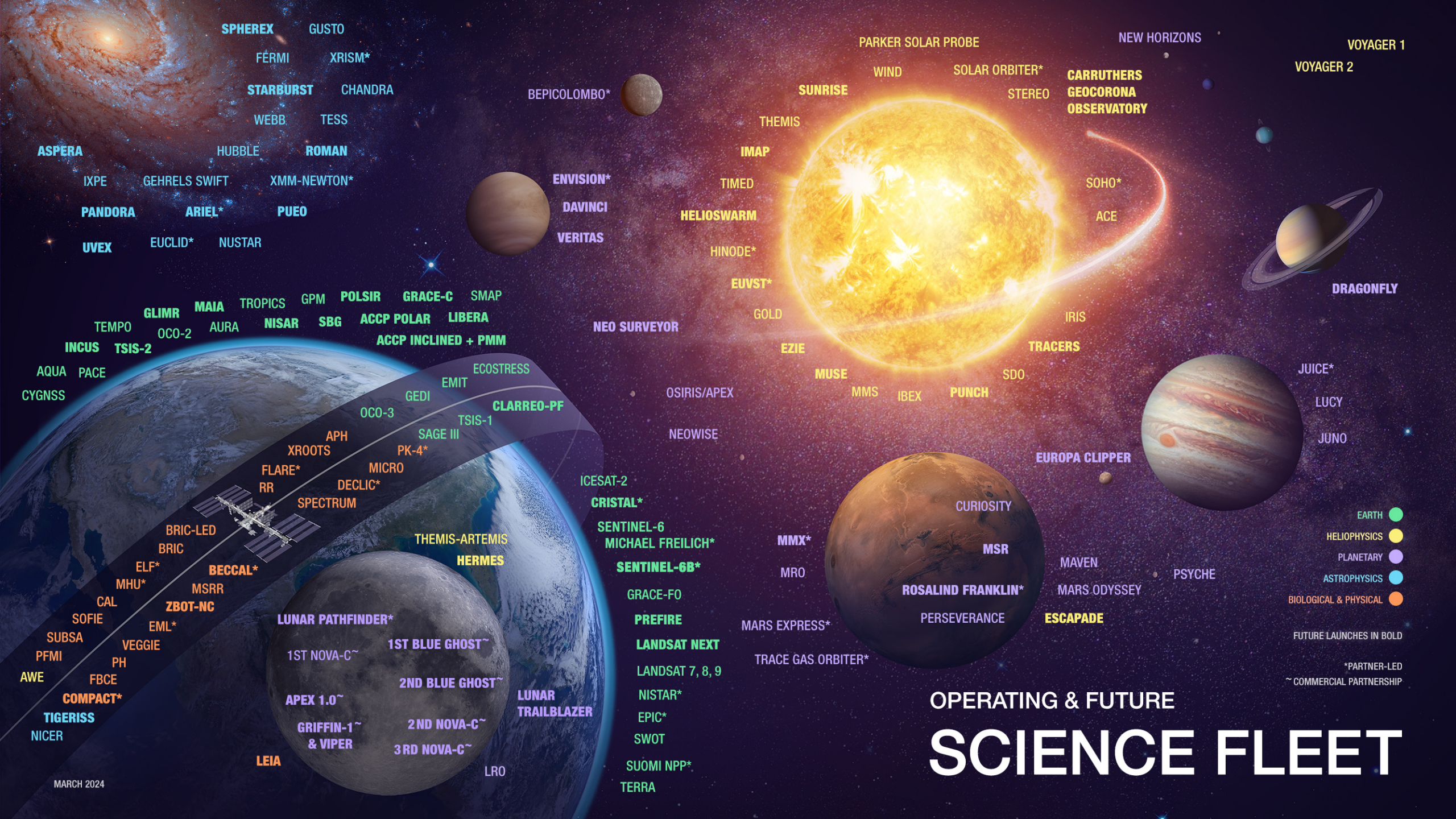


2024 NASA SCIENCE

FY25 Budget Town Hall

Dr. Nicola Fox

Associate Administrator
for Science Mission Directorate
[@NASAScienceAA](https://twitter.com/NASAScienceAA)



SPHEREX GUSTO
 FERMI XRISM*
 STARBURST CHANDRA
 WEBB TESS
 HUBBLE ROMAN

ASPERA
 IXPE GEHRELS SWIFT XMM-NEWTON*
 PANDORA ARIEL* PUEO
 UVEX EUCLID* NUSTAR

BEPICOLOMBO*
 ENVISION*
 DAVINCI
 VERITAS

NEO SURVEYOR

ICESAT-2
 CRISTAL*
 SENTINEL-6
 MICHAEL FREILICH*
 SENTINEL-6B*
 GRACE-FO
 PREFIRE
 LANDSAT NEXT
 LANDSAT 7, 8, 9
 NISTAR*
 EPIC*
 SWOT
 SUOMI NPP*
 TERRA

PARKER SOLAR PROBE
 WIND
 SOLAR ORBITER*
 STEREO
 CARRUTHERS
 GEORCORONA
 OBSERVATORY
 SOHO*
 ACE
 THEMIS
 IMAP
 TIMED
 HELIOSWARM
 HINODE*
 EUVST*
 GOLD
 EZIE
 MUSE
 MMS
 IBEX
 PUNCH
 SDO
 TRACERS

IRIS

EUROPA CLIPPER

MMX*
 MRO
 MARS EXPRESS*
 TRACE GAS ORBITER*
 CURIOUSITY
 MSR
 ROSALIND FRANKLIN*
 PERSEVERANCE

MAVEN
 MARS ODYSSEY
 PSYCHE
 ESCAPEDE

VOYAGER 1
 VOYAGER 2

DRAGONFLY

JUICE*
 LUCY
 JUNO

GLIMR MAIA TROPICS GPM POLSIR GRACE-C SMAP
 TEMPO OCO-2 AURA NISAR SBG ACCP POLAR LIBERA
 INCUS TSIS-2 ACCP INCLINED + PMM
 AQUA PACE
 CYGNSS
 ECOSTRESS
 GEDI
 EMIT
 OCO-3
 SAGE III
 TSIS-1
 CLARREO-PF
 XROOTS
 APH
 PK-4*
 SPECTRUM
 FLARE*
 MICRO
 RR
 DECLIC*
 BRIC-LED
 BRIC
 BECCAL*
 MSRR
 ZBOT-NC
 CAL
 SOFIE
 EML*
 SUBSA
 VEGGIE
 PH
 PFMI
 FBCE
 COMPACT*
 TIGERISS
 NICER
 THEMIS-ARTEMIS
 HERMES
 LUNAR PATHFINDER*
 1ST NOVA-C~
 1ST BLUE GHOST~
 APEX 1.0~
 GRIFFIN-1~
 & VIPER
 2ND BLUE GHOST~
 2ND NOVA-C~
 3RD NOVA-C~
 LUNAR TRAILBLAZER
 LEIA
 LRO

EARTH ●
 HELIOPHYSICS ●
 PLANETARY ●
 ASTROPHYSICS ●
 BIOLOGICAL & PHYSICAL ●
 FUTURE LAUNCHES IN BOLD
 *PARTNER-LED
 ~ COMMERCIAL PARTNERSHIP

OPERATING & FUTURE
SCIENCE FLEET

FY25 Science Budget Priorities

The FY25 President's Budget Request for Science emphasizes a balanced approach to achieving the vision and mission of SMD within the overall constraints of the NASA budget.



Exploration and
scientific discovery

IMAGE: JWST



Innovation

IMAGE: OSIRIS-REX



Interconnectivity
and Partnerships

IMAGE: IM-1



Inspiration

IMAGE: 2017 SOLAR ECLIPSE



FY25 BUDGET HIGHLIGHTS

Exploration & Scientific Discovery

- A balance of legacy operating missions and investments in new technologies and missions
- Future PI-led missions within each Division
- VERITAS mission
- Lead Artemis science
- Support fundamental research

CAPTION – James Webb Space Telescope: a Massive Cluster is Born (N79)

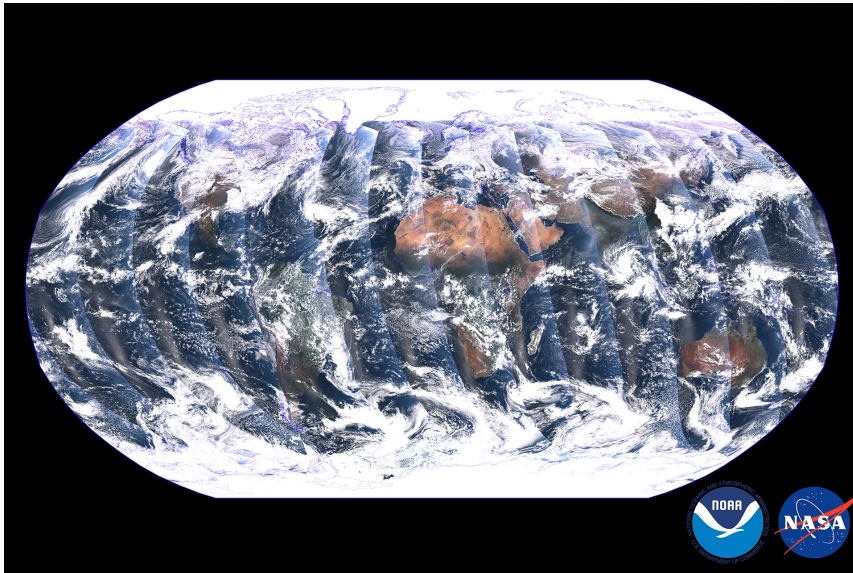
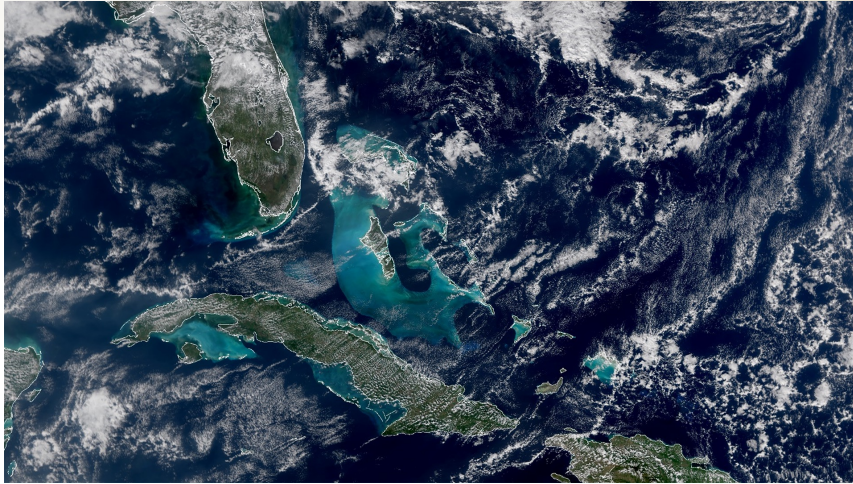
FY25 BUDGET HIGHLIGHTS

Innovation

- Mars technology development
- First space-borne gravity gradiometer
- Habitable Worlds Technology Maturation project
- Novel magnetometers
- Commercially Enabled Rapid Space Science (CERISS)



CAPTION – A NASA OSIRIS-REx curation engineer attaches one of the tools developed to help remove two final fasteners that prohibited complete disassembly of the TAGSAM (Touch-and-Go Sample Acquisition Mechanism) head that holds the remainder of material collected from asteroid Bennu



FY25 BUDGET HIGHLIGHTS

Interconnectivity & Partnerships

International:

- ExoMars Rosalind Franklin Rover mission
- EnVision
- LISA
- UltraSat
- EUVST/Solar-C
- Vigil
- JAXA PMM
- SBG-TIR (thermal infrared sensor free flyer) contribution to ASI mission

Industry: Commercial Lunar Payloads Services (CLPS)

Interagency:

- Landsat Next in partnership with USGS
- Earth Science Responsive Science Initiatives
- Advance Space Weather Research-to-Operations-to-Research capabilities in partnership with NOAA, NSF, and DoD

CAPTION – First images released from NOAA-21 VIIRS instrument



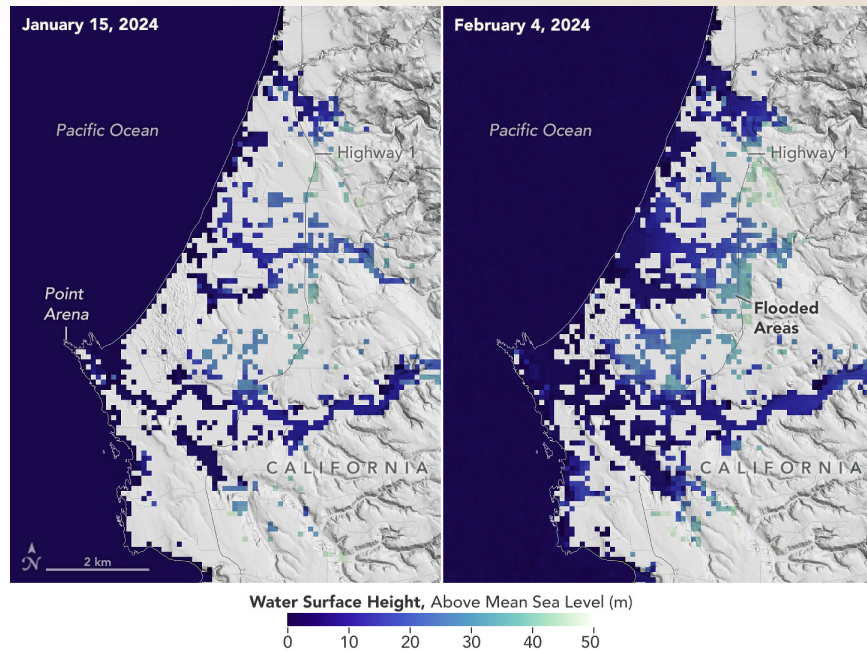
CAPTION – NASA's Student Launch Rocketry Competition 2022

FY25 BUDGET HIGHLIGHTS

Inspiration

- Science Activation Program
- Bridge Program
- FIRST Robotics
- Here to Observe
- RockOn/RockSat
- Growing Beyond Earth
- GeneLab for High School
- Student Airborne Research Program
- Open Source Science

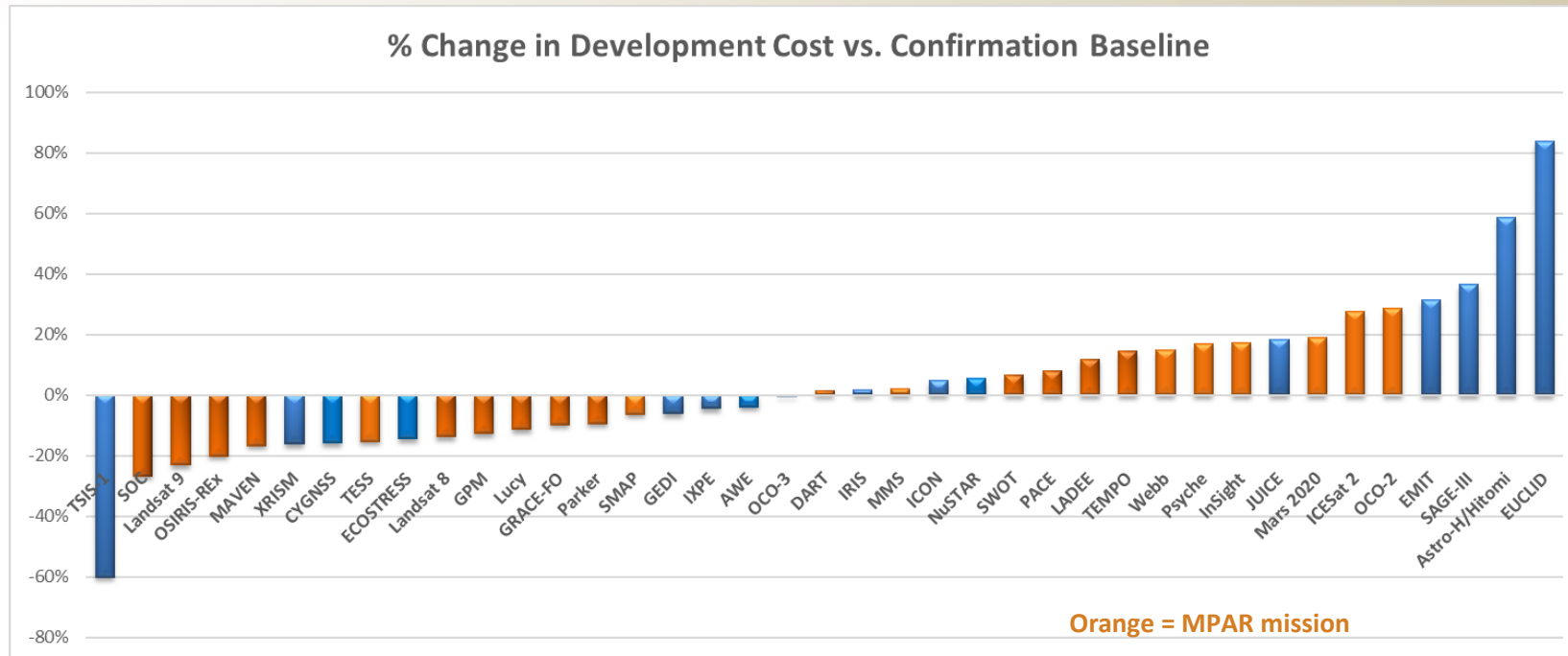
FY25 SMD Budget Changes



- MSR mission architecture is still under review; FY25 MSR budget is TBD while NASA completes internal reviews. Funding levels for Planetary Science missions are subject to change pending finalization of the path forward and proposed FY25 budget for MSR.
- Provide support for Dragonfly to uphold anticipated budget requirements for a 2028 launch to explore Saturn's moon Titan
- “Decouple, Partner, and Compete” implementation approach to the Earth System Observatory approach for the Atmosphere Observing System and Surface Biology and Geology missions
- Proposes cancellation of GDC rather than mission pause in recognition of outyear budget constraints

CAPTION – SWOT Coastal Flooding Data

Recent Development Cost Performance



Since the establishment of the 70% JCL requirement for major missions in 2009, SMD has confirmed and launched 39 missions

- Including Webb, these missions have overrun their Phase C/D commitments by a net 4.5%
- Excluding Webb, these missions have underrun their Phase C/D budget commitments by a net 0.5%
- 19 of these missions completed development under their cost commitment
- Recently launched missions now included: TEMPO, EUCLID, JUICE, XRISM, Psyche, AWE, PACE

SMD continues to refine its ability to execute missions within cost commitments by implementing improved management techniques (particularly on large strategic missions) and the use of independent review boards and cost estimates, including joint cost and schedule (JCL) estimates.

FY2025 Science Budget Request Summary (\$M)

	Actual 2023	CR 2024	Request 2025	2026	Out-Years		
					2027	2028	2029
Science	\$7,791.5	\$7,795.0	\$7,565.7	\$7,717.0	\$7,871.3	\$8,028.7	\$8,189.3
Earth Science	\$2,175.0		\$2,378.7	\$2,396.3	\$2,446.1	\$2,489.7	\$2,543.4
Earth Science Research	\$502.0		\$606.2	\$608.4	\$627.6	\$628.8	\$637.2
Earth Systematic Missions	\$915.0		\$854.4	\$868.7	\$888.2	\$869.9	\$757.8
Earth System Explorers	\$2.5		\$19.6	\$59.0	\$99.5	\$130.6	\$194.7
Responsive Science Initiatives	\$55.0		\$167.7	\$173.9	\$176.4	\$177.9	\$179.5
Earth System Science Pathfinder	\$232.1		\$251.7	\$246.0	\$202.1	\$225.0	\$308.9
Earth Science Data Systems	\$291.1		\$263.2	\$257.6	\$268.3	\$269.8	\$276.3
Earth Science Technology	\$102.2		\$147.2	\$109.4	\$110.6	\$111.8	\$113.0
Applied Sciences	\$75.2		\$68.6	\$73.3	\$73.5	\$75.8	\$75.9
Planetary Science	\$3,216.5		\$2,731.5	\$2,850.5	\$2,911.6	\$2,976.8	\$3,042.5
Planetary Science Research	\$310.6		\$390.1	\$386.4	\$392.5	\$405.3	\$407.8
Planetary Defense	\$135.5		\$276.6	\$369.3	\$299.6	\$81.0	\$78.1
Lunar Discovery and Exploration	\$486.3		\$458.3	\$456.8	\$467.8	\$479.1	\$488.5
Mars Sample Return	\$818.8		TBD	TBD	TBD	TBD	TBD
Discovery	\$217.5		\$261.5	\$418.3	\$588.0	\$790.8	\$912.4
New Frontiers	\$488.2		\$500.5	\$533.0	\$484.2	\$471.6	\$298.3
Mars Exploration	\$248.1		\$324.5	\$298.6	\$305.8	\$353.3	\$390.7
Outer Planets and Ocean Worlds	\$356.8		\$319.0	\$197.4	\$197.1	\$226.3	\$304.3
Radioisotope Power	\$154.9		\$201.1	\$190.7	\$176.6	\$169.4	\$162.5

FY2025 Science Budget Request Summary (\$M)

	Actual	CR	Request	Out-Years			
	2023	2024	2025	2026	2027	2028	2029
Astrophysics	\$1,510.0		\$1,578.1	\$1,587.0	\$1,613.6	\$1,647.1	\$1,673.4
Astrophysics Research	\$284.8		\$300.5	\$378.7	\$390.5	\$390.3	\$377.1
Cosmic Origins	\$314.8		\$319.0	\$312.8	\$307.7	\$300.4	\$282.1
Physics of the Cosmos	\$180.7		\$210.8	\$184.3	\$168.6	\$176.1	\$133.7
Exoplanet Exploration	\$502.9		\$478.5	\$459.0	\$366.1	\$323.8	\$339.9
Astrophysics Explorer	\$226.8		\$269.3	\$252.2	\$380.6	\$456.4	\$540.6
Heliophysics	\$805.0		\$786.7	\$791.9	\$807.0	\$820.3	\$833.4
Heliophysics Research	\$238.2		\$252.3	\$247.7	\$255.8	\$257.8	\$258.5
Living with a Star	\$155.2		\$107.7	\$100.1	\$112.1	\$106.3	\$101.4
Solar Terrestrial Probes	\$198.0		\$133.2	\$82.9	\$64.9	\$56.1	\$38.1
Heliophysics Explorer Program	\$167.9		\$236.7	\$309.4	\$325.4	\$355.4	\$385.4
Heliophysics Technology	\$19.9		\$9.3	\$9.2	\$8.8	\$8.8	\$15.8
Space Weather	\$25.8		\$47.5	\$42.6	\$40.0	\$35.9	\$34.2
Biological and Physical Sciences	\$85.0		\$90.8	\$91.3	\$93.0	\$94.8	\$96.6



Science Mission Directorate
Earth Science



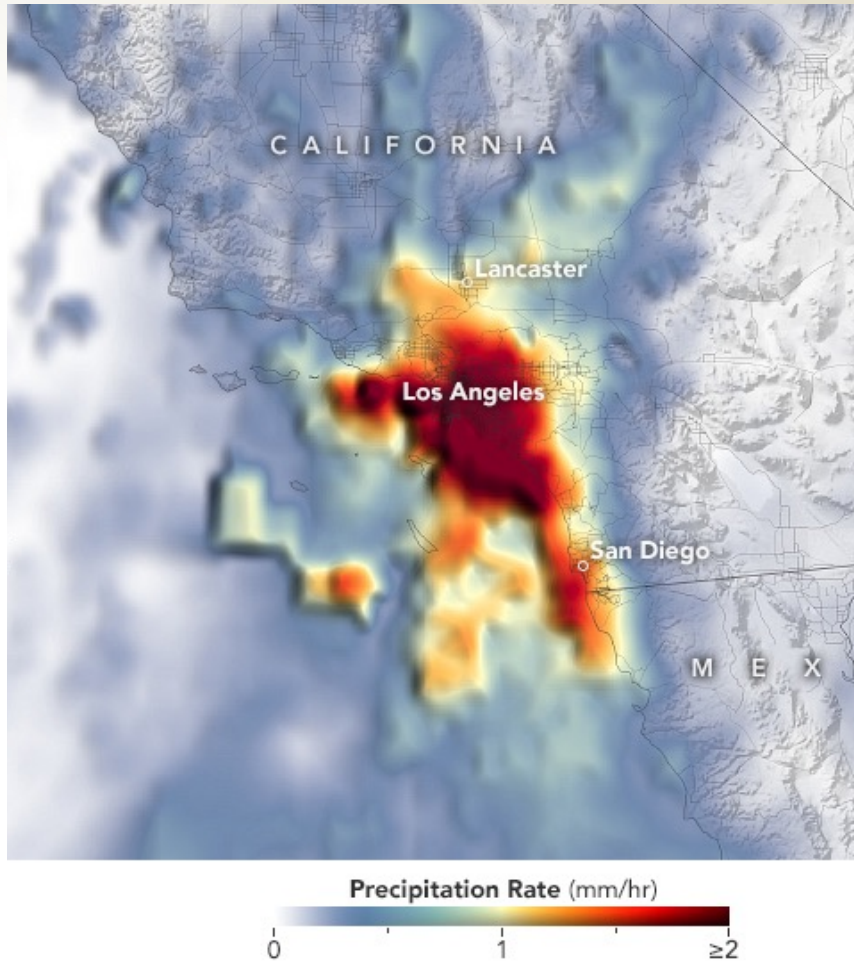
Earth Science Budget Priorities

Explore/Innovate/Partner/Inspire

Achieve high priority science objectives within a cost constrained environment through the integrated missions of the **Earth System Observatory** and provide continuity and advancement of the capabilities of economically critical **Landsat Next**.

Adapt implementation of **Earth Venture** and **Senior Review** process to ensure their sustainability, in response to National Academies review

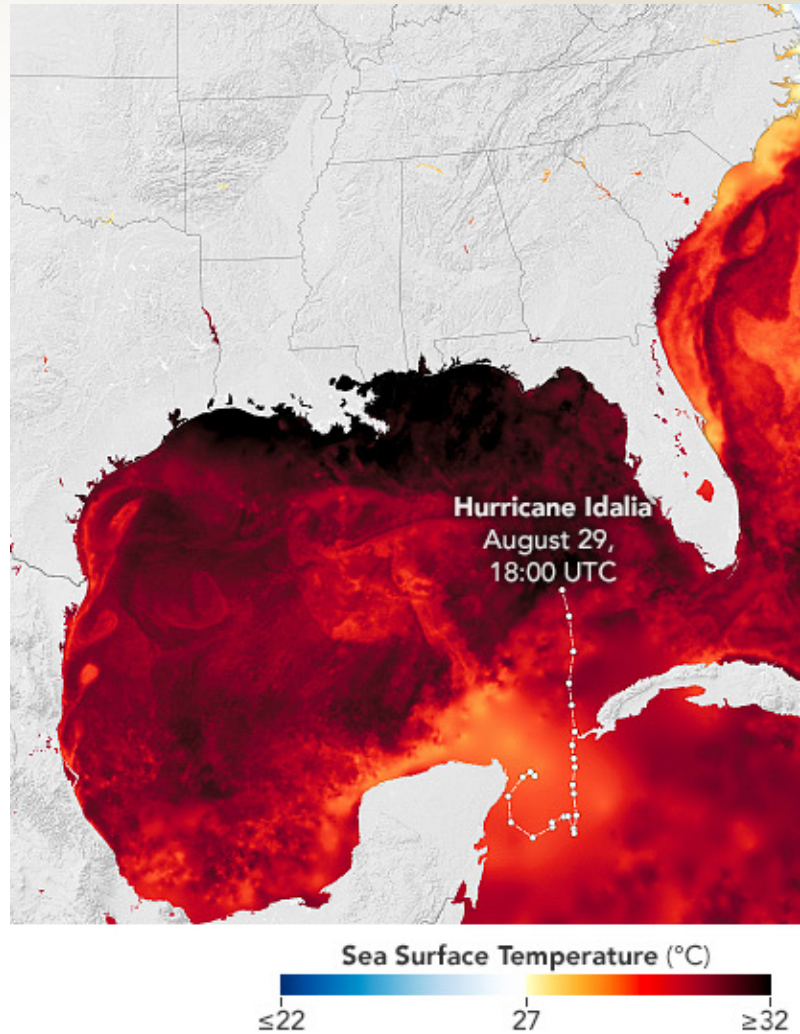
Consolidate our strategy to improve the impact and management of our support of information about changes in the Earth system across Federal and international partners through the realigned **Responsive Science Initiatives** program.



CAPTION – A potent storm drenches California on February, 5-6 2024, IMERG precipitation data as part of NASA-JAXA Global Precipitation Mission.

Earth Science Budget Highlights

- **Earth System Observatory** used a “Decouple, Partner, and Compete” approach to follow Decadal Survey recommendations and significantly reduce cost and optimize scope while remaining on track to deliver new knowledge
 - **Atmospheric Science** restructure from Atmospheric Observing System (AOS) architecture—still includes high priority observables and multiple missions; now mix of directed and at least one competed mission, with decoupled schedules
 - **Precipitation Measurement Mission** in partnership with Japan
 - **Surface Biology and Geology** directed instrument contribution to an international mission plus a mission with industry partners, with decoupled schedules
 - **Surface Deformation and Change** study discontinued, NISAR mission meets the observable
- **Landsat Next** proceeds to instrument procurement and supports agriculture, resource management
- **Venture & Explorer** cadence; better supports proposal development pacing



CAPTION – Hurricane Idalia track on August 29, 2023 superimposed over Multiscale Ultrahigh Resolution sea surface temperatures modeled from Terra MODIS data.

Earth Science Budget Highlights

- Extension of **Terra/Aqua/Aura** to end of life, all missions in extended operations through 2026, senior review wedge in 2027 bounds future cost growth
- Supports critical **research, applications, data and technology** for mission schedules
- Consolidation of some mission science teams and discipline research areas for greater synergies across fields
- **Responsive Science Initiatives Program** realigns elements of research, tech, applied, and data programs and will focus on areas of national importance to work with interagency partners and provide products, information, and research with significant societal value
- Includes a sustained budget increase for **Interagency Satellite Observation Needs** (formerly SNWG)
- Doubles the investment in **Geodesy** infrastructure, supporting NASA, civil space and national security needs for accurate Earth positioning
- New content in Earth Science Technology to begin developing the first space-borne **quantum gravity gradiometer (QGG)**.

A close-up, curved view of a planet's surface, likely Mars, showing a dense network of reddish-brown lines and veins against a lighter, sandy background. The lines vary in thickness and direction, creating a complex, web-like pattern. The lighting is soft, highlighting the texture of the surface.

Science Mission Directorate

Planetary Science

Planetary Science Budget Priorities

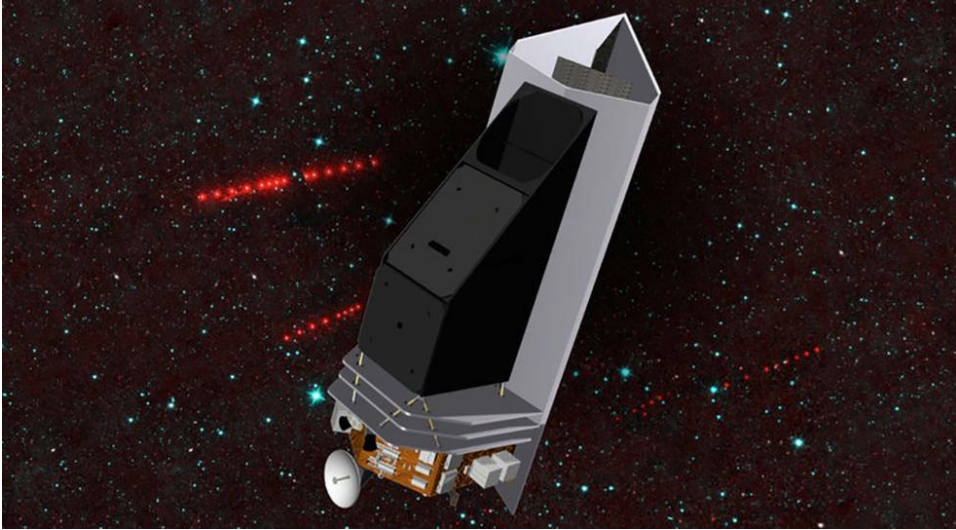
Explore/Innovate/Partner/Inspire

Successfully complete confirmed high-priority missions including **Europa Clipper, NEO Surveyor**

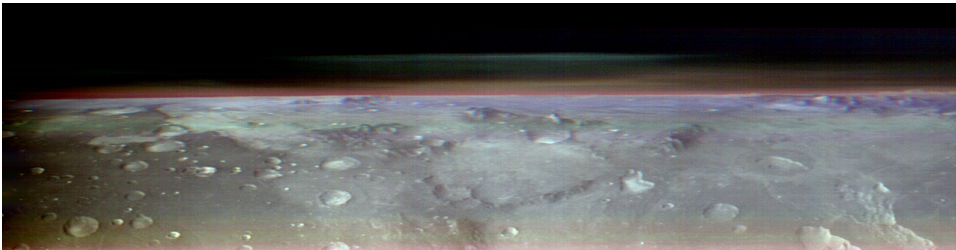
Support **international partnerships**: JUICE, MEGANE/MMX, Rosalind Franklin Mission, EnVision

Ensure Decadal-recommended science investigations are included in **Artemis** campaign; support stable cadence of future CLPS deliveries to the lunar surface

Support Planetary Science **research** community to ensure continued scientific discovery from NASA mission data



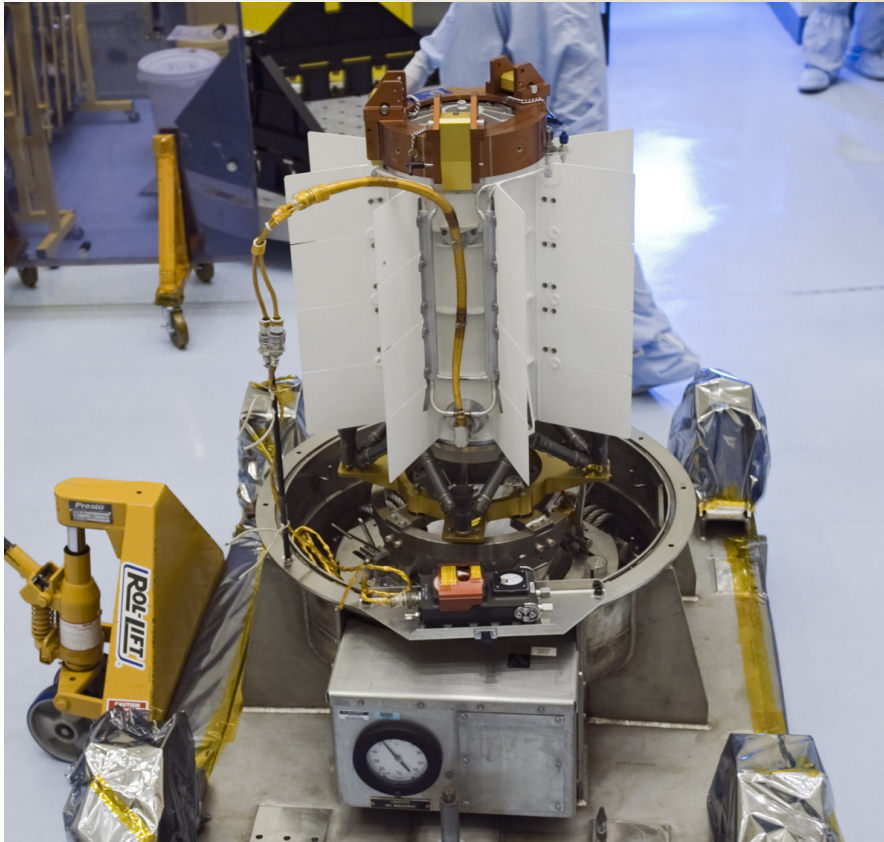
CAPTION – Artist conception of the NEO Surveyor spacecraft.
Image credit: NASA/JPL-Caltech



CAPTION – This view of Mars was captured by NASA's Odyssey orbiter using its THEMIS camera. It combines three channels of infrared data that highlight water-ice clouds and dust in the atmosphere.
Image credit: NASA/JPL-Caltech/ASU

Planetary Science Highlights

- **Mars Sample Return** has slowed down in FY24 while architecture studies are completed; NASA expects to provide an FY25 budget for MSR this spring
- Supports launches of **Europa Clipper** (Oct 2024) and **NEO Surveyor** (2028)
- Supports **Dragonfly** mission for 2028 LRD in anticipation of confirmation decision in 2024
- Three missions to study Venus: **DAVINCI**, **VERITAS** (both to launch in 2031-32 timeframe) and contributions to ESA **EnVision**
- **Mars Exploration Program** supports ongoing operation of 5 missions at Mars, including Perseverance and MSL, and new investments in technology to enable future Mars missions
- Robust **Lunar Discovery and Exploration Program** which includes
 - Two **CLPS** awards per year in most years
 - Annual **PRISM** calls for instruments
 - Artemis Science instruments, including handheld instruments for astronauts and the lunar terrain rover
 - Lunar Reconnaissance Orbiter operations
 - Support for **VIPER** and **Lunar Trailblazer** for planned launches in FY 2025



Planetary Science Highlights

- The next **New Frontiers, Discovery, and SIMPLEx** AOs expected to be released no earlier than 2026
- New **Planetary Technology** strategy and project, to provide integrated technology development for future Planetary science missions
- Pre-formulation studies of the Decadal Survey-recommended Uranus Orbiter and Probe mission will begin in the current budget horizon
- Investments in **Open Source Science** to enhance transparency, inclusivity, accessibility and reproducibility in publicly-funded scientific research.
 - This project also supports SMD's transition to cloud computing services
- **Radioisotope Power Systems** program investments in technology to enable successful trips to distant solar system destinations with harsh environments; includes development of the Dragonfly MMRTG
- **Planetary Data System** data archives, which now span more than 50 years of NASA-funded research, and will expand to include ground-based observations of Near-Earth objects

CAPTION – An RPS MMRTG. This unit is currently installed and operating on the Curiosity Rover.
Image Credit: NASA/DOE



Science Mission Directorate Astrophysics

Astrophysics Priorities

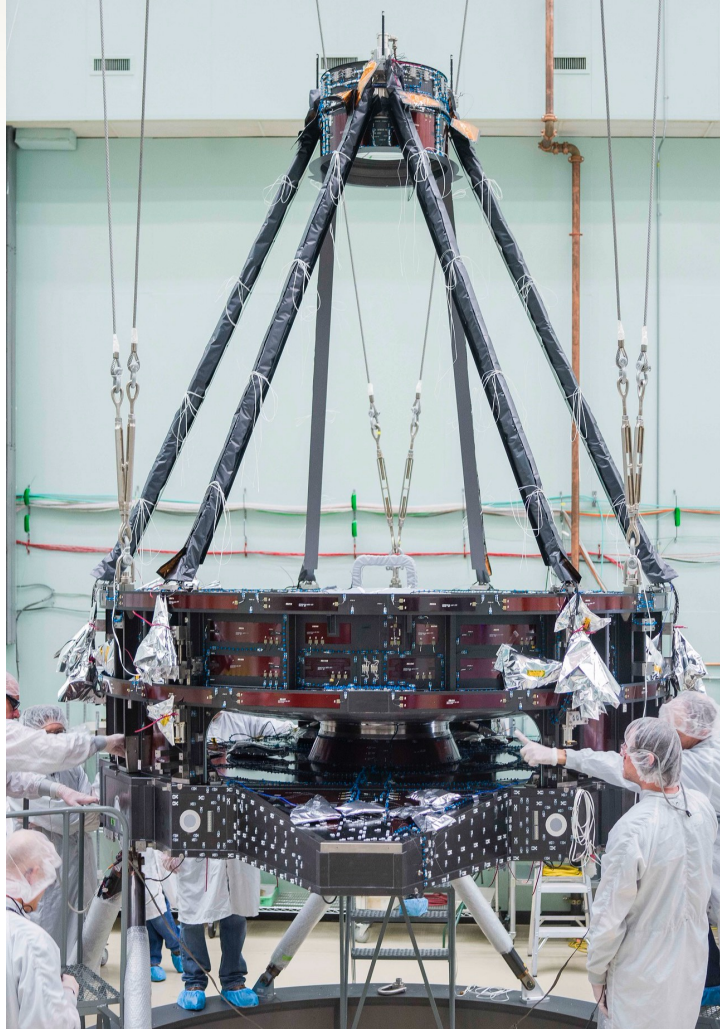
Explore/Innovate/Partner/Inspire

Maintain a **balanced portfolio** during this decade and the next, by balancing investments in missions under development and future missions, against funding for large missions in extended science operations.

Investment to advance the Astro2020 Decadal Priorities, including technology maturation for the **Habitable Worlds Observatory**, and the selection of an **Astrophysics Probe** mission.

Ensure successful completion of the **Roman Space Telescope**, within the Agency commitment

Protect international **partnerships** such as the Laser Interferometer Space Antenna (LISA)

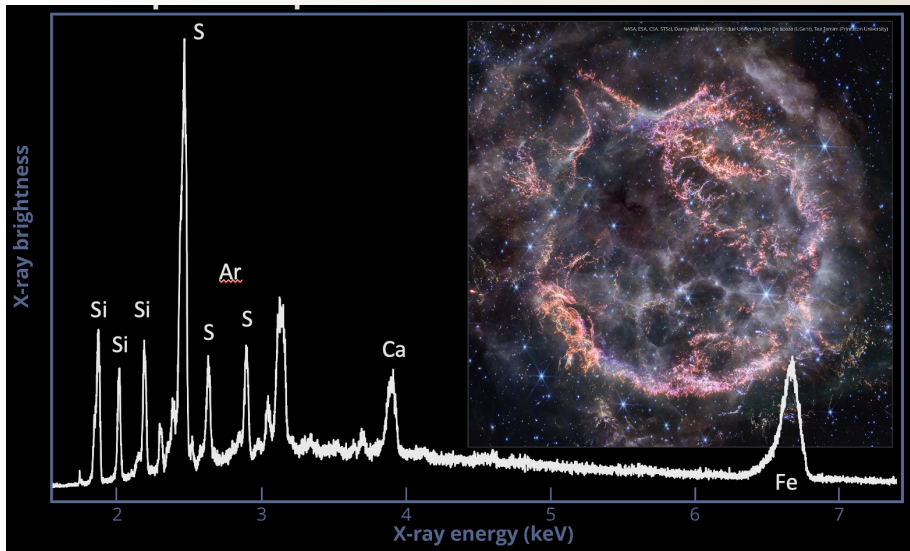


Astrophysics Budget Highlights

- Nancy Grace **Roman** Space Telescope is on track for launch in 2027. NASA's first survey astrophysics flagship, each year of **Roman** observations will comprise community defined and proposer-led surveys.
- Investments in future missions:
 - **Habitable Worlds Observatory** technology maturation increase in FY25
 - First Astrophysics Probe selections planned for Q1 in FY25
 - Support a healthy cadence of **Explorer** missions
 - SPHEREx (2025) preparing for launch
 - COSI proceeding towards confirmation;
 - UVEX will begin formulation activities
 - Future AOs for SMEX (2025) and MIDEX (2027)
- Mini-Senior Review planned for **Chandra** and **Hubble** to seek community guidance on options for future science operations model.

CAPTION – Nancy Grace Roman Telescope assembly

Astrophysics Budget Highlights



CAPTION – XRISM (X-ray Imaging and Spectroscopy Mission), a partnership with the Japanese Space Agency (JAXA) has released a first look at the supernova remnant CAS-A. The spectrum shows elements produced in the supernova explosion and the extreme velocities of the ejected material. The image of CAS-A is a recent JWST observation.

Credit: JAXA/NASA/XRISM

Operate **James Webb Space Telescope** with a robust competed science program (Webb Science)

Senior Review funding allocated to remaining APD missions recommended for continued operations until next Senior Review in 2026

- **Balloon** program funding for new North American launch site and foreign campaigns
- **SOFIA** funding to complete shutdown with aircraft parts disposition in FY25
- **R&A** funding to maintain healthy selection rates as well as workforce development and early career faculty awards
- **Technology** investments in SR&T lines within each program to prepare for future missions and to drive innovation
- Key international **partnerships**: LISA, UltraSat



Science Mission Directorate
Biological & Physical Sciences

BPS Budget Priorities

Explore/Innovate/Partner/Inspire

Support fundamental research in the **Artemis** campaign

Prepare to respond to 2023 **Decadal Survey** recommendations

Pursue **partnership** opportunities to achieve Decadal Survey and agency priorities

Utilize multiple research platforms to advance BPS research and prepare for the transition to the **commercial space economy**



BPS Budget Highlights

- Developing transformative research capabilities with commercial space industry to dramatically increase the pace of research through the **CERISS** initiative
- Optimizing BPS's budget through **partnerships**, including
 - Artemis campaign research will include science on Artemis II
 - ISS Program: Development of facility class payloads
 - International Partnerships: rideshares, facilities, joint studies
 - Other Government Agencies and ISS National Lab: Joint solicitations and studies
- Aligning with high-priority, high-visibility initiatives such as **Cancer Moonshot**
- Transformative science to address **Decadal Survey** recommendations
- Sustaining core capabilities, open science platforms, education and engagement, training programs, and inclusion, diversity, equity and accessibility (**IDEA**)



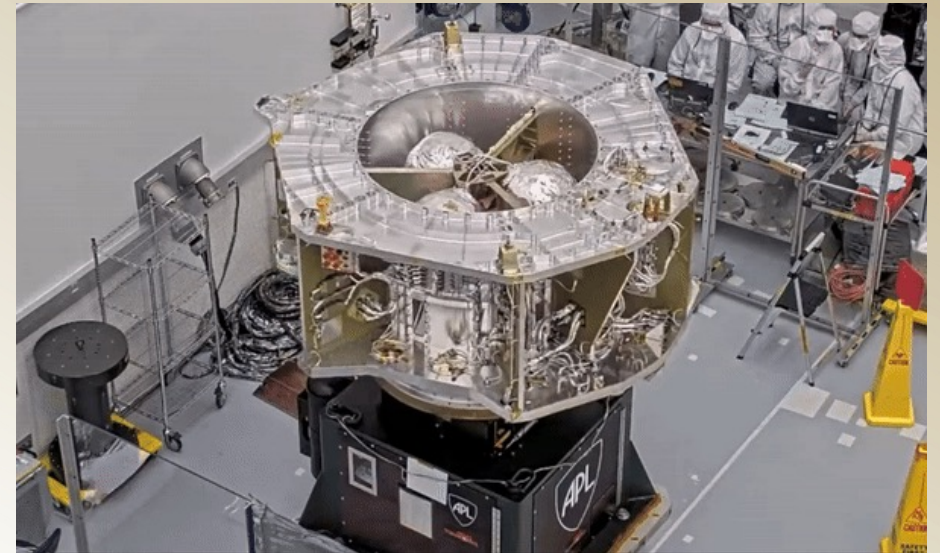
Science Mission Directorate

Heliophysics

Heliophysics Budget Priorities

Explore/Innovate/Partner/Inspire

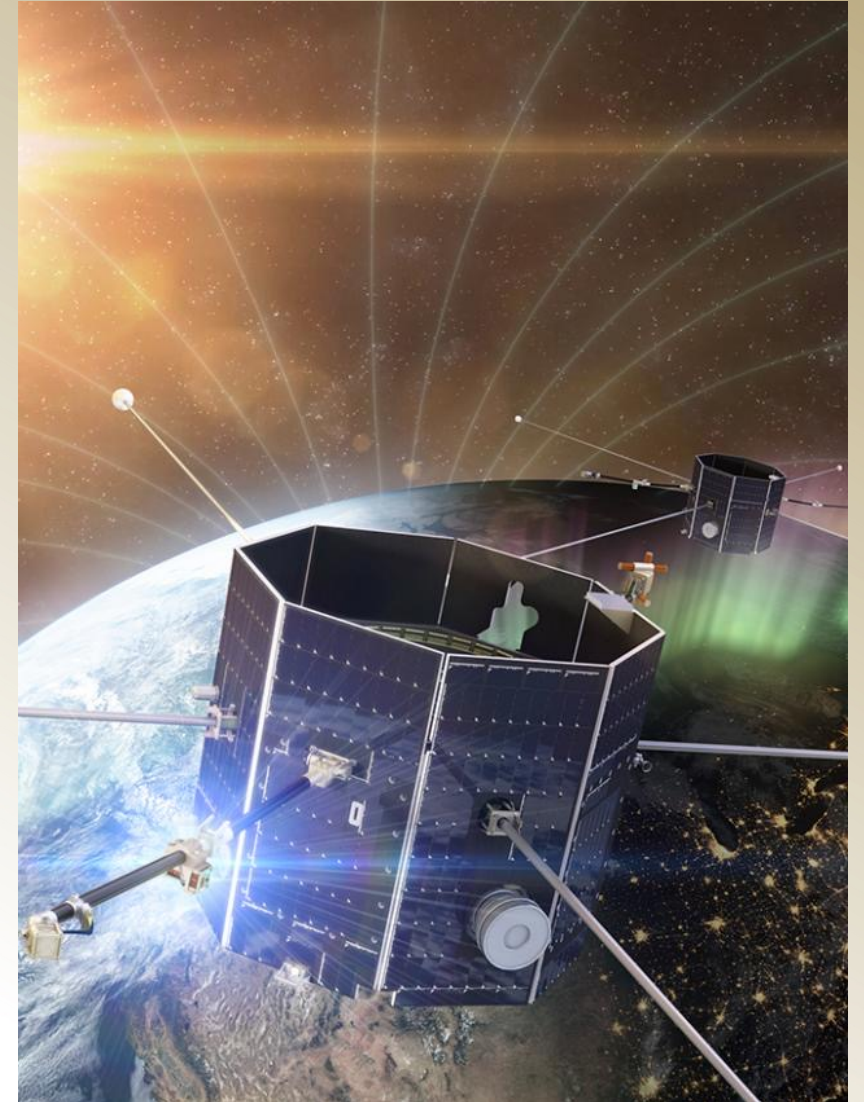
- Maintain a **balanced mission portfolio** - ensuring the success of missions currently in development, stewarding the operating Heliophysics System Observatory, and enabling future missions to the extent possible
- Nurture a vibrant and inclusive **R&A** program
- Support **partnerships** with international space agencies
- Support **National priorities** in Space Weather, Orbital Debris and Space Situational Awareness



CAPTION: IMAP spacecraft integration.

Heliophysics Budget Highlights

- Advances **Carruthers**, **ESCAPADE**, **EZIE**, **IMAP**, **PUNCH**, **SunRISE**, and **TRACERS** toward launch in 2025-2026
- Supports a healthy cadence of PI-led Explorer missions
 - **MUSE** and **HelioSwarm** confirmations in 2024 and 2025
 - SMEX-22 Step 2 down-selection(s) planned for 2025
 - Future Explorer solicitations in FY25 (MIDEX) and FY28 (SMEX)
- Provides NASA contributions to **partnerships**:
 - Space Weather program includes **HERMES** instrument for **Gateway** and contribution to **ESA Vigil** mission
 - Explorers **EUVST** instrument for **JAXA Solar-C** mission
 - **CODEX** being developed through **NASA-KASI** partnership for launch to ISS
- Proposes cancellation of **GDC** rather than a 3-year pause in recognition of outyear budget constraints



CAPTION – Illustration of the TRACERS satellites in space.

Heliophysics Budget Highlights

- Supports **Space Weather** Centers of Excellence and quad-agency efforts in Research-to-Operations-to-Research (R2O2R) to advance space weather research and applications
- Provides agency capabilities in **Research Range** and **Sounding Rockets** in support of innovative small payloads
- Invests in advancement of Heliophysics technologies
- Supports demonstration of technologies for characterizing **orbital debris**
- Supports continued scientific discovery through the Heliophysics DRIVE Science Centers
- Increases funding for **CubeSats** and open science initiatives within R&A
- Improves sustainability of Heliophysics System Observatory and missions in **extended operations** consistent with recommendations from 2023 Senior Review



CAPTION – A sounding rocket soars skyward at Launch Complex 36 at White Sands Missile Range in New Mexico on Oct. 14 to capture data on the annular solar eclipse.

Photo Credit: U.S. Army by Judy Hawkins/Released



Materials, future town halls, and more
science.nasa.gov/researchers/virtual-townhall/