

National Aeronautics and
Space Administration



2024 NASA SCIENCE

Committee on Solar &
Space Physics
(CSSP): September
2024 Meeting

Dr. Therese Moretto Jorgensen
Director of Research Programs,
Heliophysics Division



A composite image featuring a woman in a floral dress standing on a rocky ledge overlooking a valley with a winding river, a hot air balloon, and a large celestial body in a starry sky.

HPD Leadership

NASA Heliophysics Division Leadership



Dr. Joseph (Joe) Westlake
Division Director



Nicole (Nicki) Rayl
Deputy Division Director (Acting)



**Dr. Therese Moretto
Jorgensen**
Director of Research



Brad Williams
Associate Director for
Flight (Acting)



Acting Director/Deputy
Roles Rotate



Dr. Asal Naseri
Deputy Associate Director
for Flight (Acting)



Heliophysics Notable Events





Credit: NASA/Keegan Barber

APRIL 8, 2024: TOTAL SOLAR ECLIPSE

400+

NASA employees
across 14 locations
engaging with the public



12,328,645

NASA Broadcast
viewers – English

LIVE

4,603,238

NASA Broadcast
viewers – Spanish



17,535

News stories with
an estimated
publicity value of
\$54.5 million

AP News
<https://apnews.com/hub/eclipses>

Eclipses

Looking at a solar eclipse can be dangerous without eclipse glasses. Here's ... About 20,000 eclipse chasers have witnessed a ra...

Space.com
<https://www.space.com/news/s...>

Solar eclipse 2024: Live updates

May 22, 2024 — On Oct. 2, 2024, an annular solar eclipse will be visible across parts of the South Pacific, southern Chile and Southern...

NBC News
www.nbcnews.com

Total solar eclipse 2024 highlights: Live coverage,...

Apr 8, 2024 — News and updates from the 2024 total solar eclipse: Tens of millions of people were treated to stunning views as the moon passed between ...



2M+

glasses distributed



Tens of Thousands

Of engagements with Barbie, Cookie
Monster, Elmo, Snoopy, LEGO and more

Parker Solar Probe

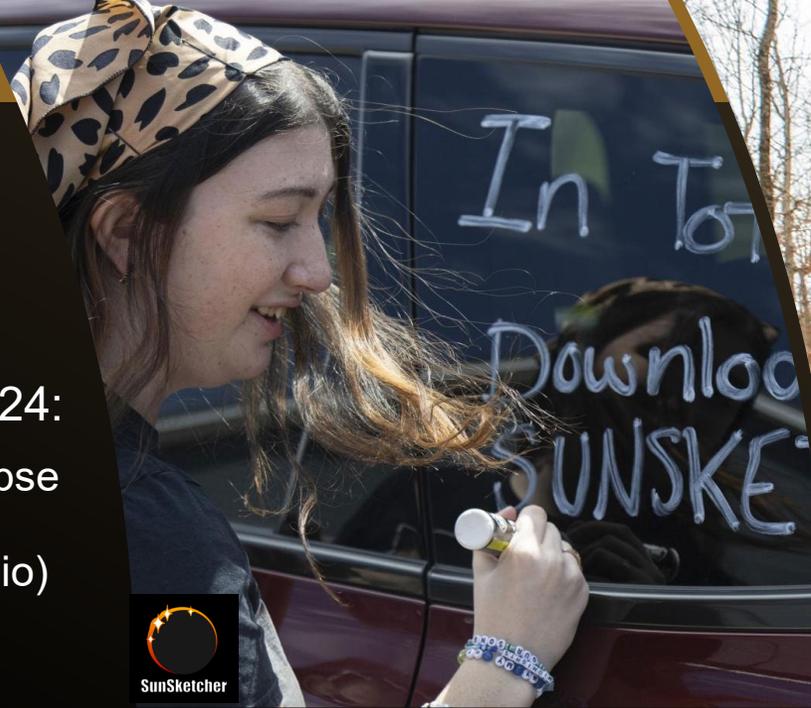


NASA's Parker Solar Probe completed 20th close approach to the Sun!

On June 30, 2024, Parker Solar Probe matched its own distance record by coming about 4.51 million miles (7.26 million kilometers) from the solar surface.

Heliophysics Big Year Keeps Getting Bigger!

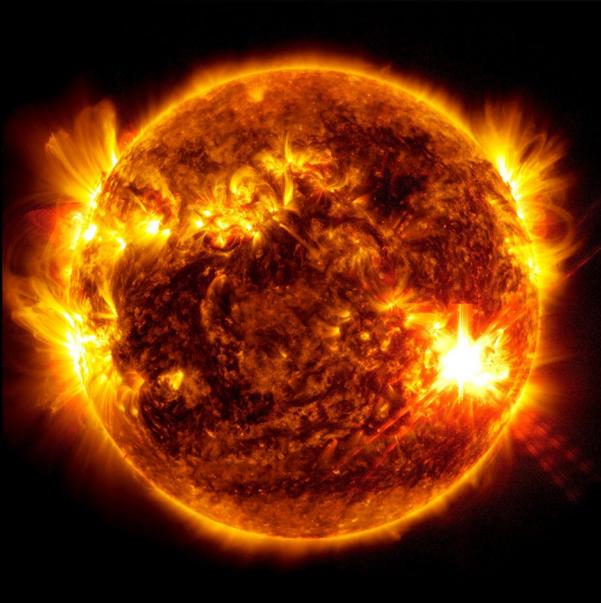
- 6 Citizen Science projects launched in 2023-2024:
 - More than 36,000 volunteers participated in eclipse citizen science
 - TBs of data like photos, QSO contacts (ham radio) audio, and notes on paper!
 - Calibration and science in process
- Continued observations and campaigns of solar maximum superstorms
- Maintaining community connection & building a stewardship feedback cycle with partners
- Citizen Science in ROSES24:
 - Seed Funding F.9 CSSFP due Nov 2024
 - H-Citizen Science Investigations



ECLIPSE
MEGAMOVIE



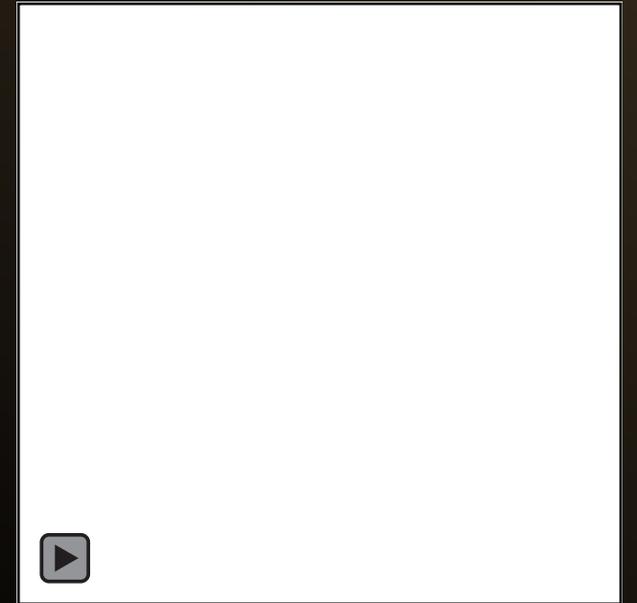
Geomagnetic Solar Storm



NASA's Solar Dynamics Observatory (SDO) captured this image of an X5.8 solar flare peaking at 9:23 p.m. EDT on May 10, 2024. The image shows a subset of extreme ultraviolet light that highlights the extremely hot material in flares.
Credit: NASA SDO



A coronal aurora appeared over southwestern British Columbia on May 10, 2024.
Credit: NASA/Mara Johnson-Groh

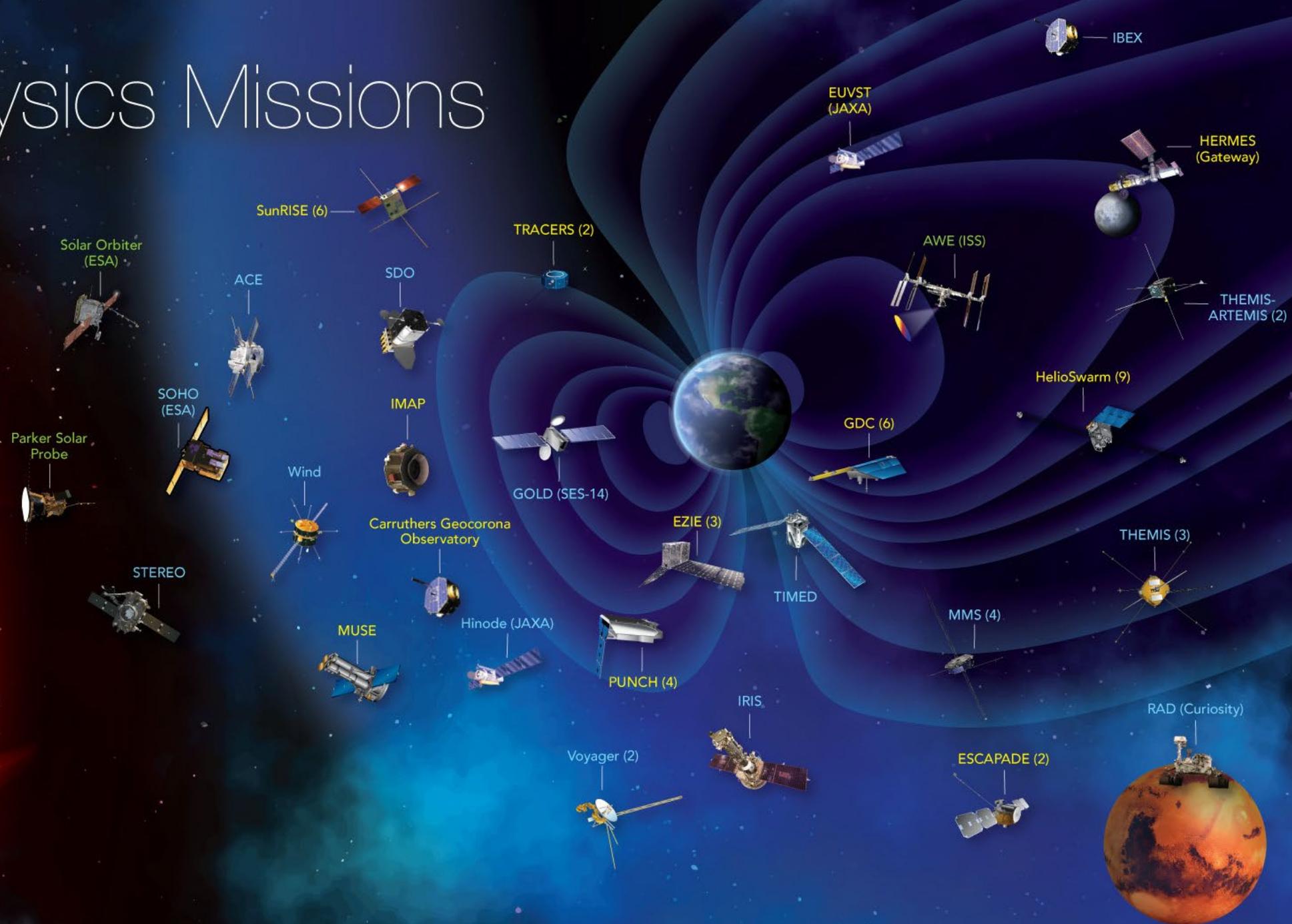


A series of CME's are launched from the Sun on May 8th, as captured by SOHO's LASCO instrument
Credit: NASA SOHO

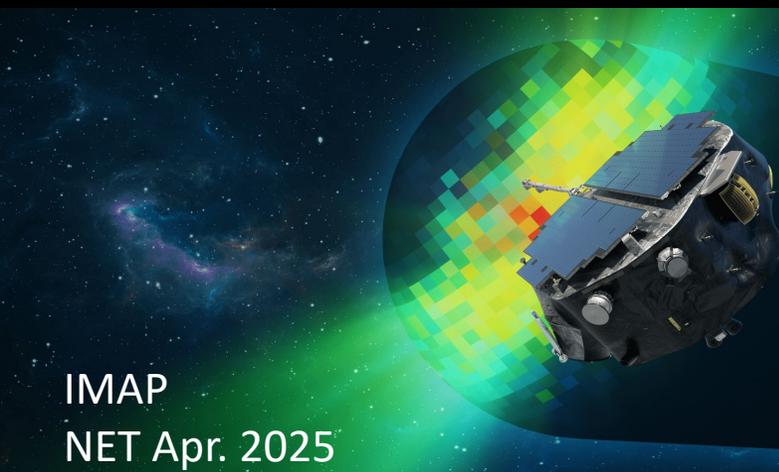
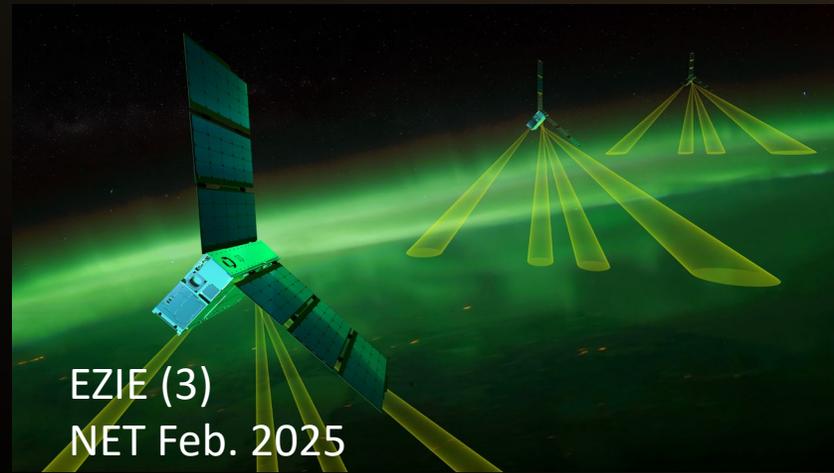
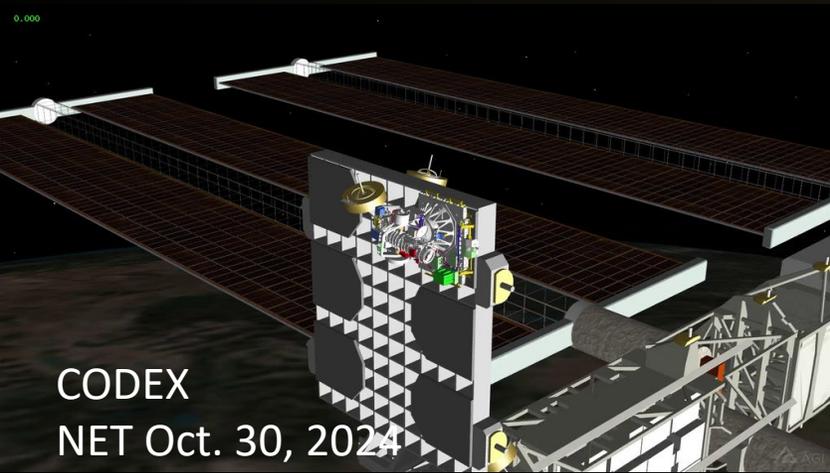


Mission Highlights

Heliophysics Missions



Upcoming Heliophysics Mission Launches



CODEX



COronal Diagnostic Experiment (CODEX) is a collaboration between NASA, the Korea Astronomy and Space Science Institute, and Italian National Institute for Astrophysics that will fly aboard the International Space Station.

This modern coronagraph will use multiple filters to obtain simultaneous measurements of electron density, temperature, and velocity of the solar wind for the **first time** within a single instrument.

CODEX is scheduled to fly aboard SpaceX Falcon 9 CRS-31 from Kennedy Space Center later this year.

EZIE



Blue Canyon Technologies (BCT) technicians Davy Hong and Dave Biancalana attach a solar array to the bus of the Electrojet Zeeman Imaging Explorer (EZIE) CubeSat. *Brooks Freehill, Blue Canyon Technologies*

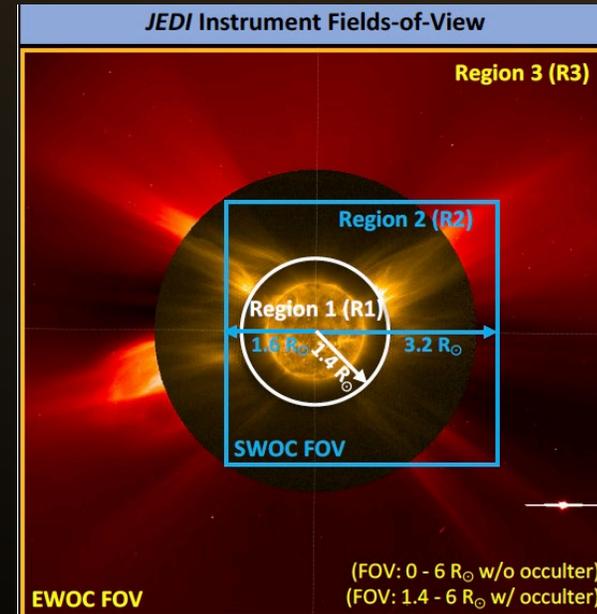


Members of the Electrojet Zeeman Imaging Explorer (EZIE) team representing NASA, the Johns Hopkins Applied Physics Laboratory (APL) in Laurel, Maryland, Blue Canyon Technologies (BCT) in Boulder, Colorado, and Maverick Space Systems in San Luis Obispo, California, pose with the EZIE SV-B Space Vehicle after completing vibration testing. *Lauren Ransom, Blue Canyon Technologies*

Vigil + JEDI



Vigil is an ESA Space Safety Programme space weather mission continuously providing space weather measurements away from Sun-Earth line to enhance the space weather services to protect critical infrastructure on Earth and in space. The mission design targets a stationary orbit at Sun-Earth Lagrange Point L5



In May, NASA selected the Joint EUV coronal Diagnostic Investigation (JEDI) as a contribution to the Vigil mission to obtain Extreme Ultraviolet (EUV) observations of the Sun's inner and middle corona. JEDI is led by SouthWest Research Institute (PI D. Hassler) and consists of two EUV imaging instruments

The JEDI observational continuity and unique perspective will provide important space weather warnings for Geospace as well as the basis for new science on how the Sun creates the solar wind and eruptions (Coronal Mass Ejections).

NASA's Sounding Rockets Program

- Current motor inventory is healthy
- FY24 (as of 09/20/24)
 - 17 missions launched (4 missions moved to FY25)
 - 2 campaign deployments to Poker Flat (4 total launches)
 - Two eclipse campaigns = 6 total launches from White Sands and Wallops
 - Solar flare campaign from Poker Flat Research Range
 - First use of upgraded SPARCS (solar pointing system) with MaGIXS launch at White Sands (successful)
 - 2 student outreach launches from Wallops
- FY25
 - 18 missions total on manifest
 - Four campaign deployments (Norway, Poker-x2, Kwajalein)
 - May begin Peru site improvements
- FY26
 - Currently 12 missions total (updates expected)
 - Three campaign deployments (Norway, Poker, Kwajalein)



CAPTION: Recovery of the second flight of the Marshall Grazing Incidence X-ray Spectrometer (MaGIXS) at the White Sands Missile Range (PI: Amy Winebarger, MSFC). The payload is a technology development science demonstration that successfully captured soft X-ray spectra of resolved features within solar active regions. Pictured are instrument team members, sounding rocket engineers, and military range personnel.



Programmatic Updates

Research & Analysis Update

RECENT ROSES-23 SELECTIONS

HSR 2023 (notified 10.20.23)	HGIO 2023 (notified 1.08.24)	HFOS 2023 (notified 1.25.24)	HTIDES 2023 (notified 1.25.24)	LWS 2023 (notified 5.01.24)
<ul style="list-style-type: none"> • 161 proposals received • 24 selected • 14% selection rate 	<ul style="list-style-type: none"> • 82 proposals received • 19 selected • 23% selection rate 	<ul style="list-style-type: none"> • 6 proposals received • 1 selected • 17% selection rate 	<ul style="list-style-type: none"> • 26 proposals received • 6 selected • 23% selection rate 	<ul style="list-style-type: none"> • 62 proposals received • 16 selected • 26% selection rate

ROSES-2023 solicitation provided the greatest scope ever offered for NASA Heliophysics

- New Technology Program and Space Weather Program
- Growing number of Cross-Divisional programs

Maintaining a robust R&A program through solicitation of 25 ROSES-24 elements

NASA DRIVE Science Centers

In response to the 2013 Heliophysics Decadal Survey, NASA established three DRIVE (Diversify, Realize, Integrate, Venture, Educate) Science Centers to create breakthrough science in heliophysics by integrating models from different domains and approaches.



COFFIES: Consequences of Fields and Flows in the Interior and Exterior of the Sun



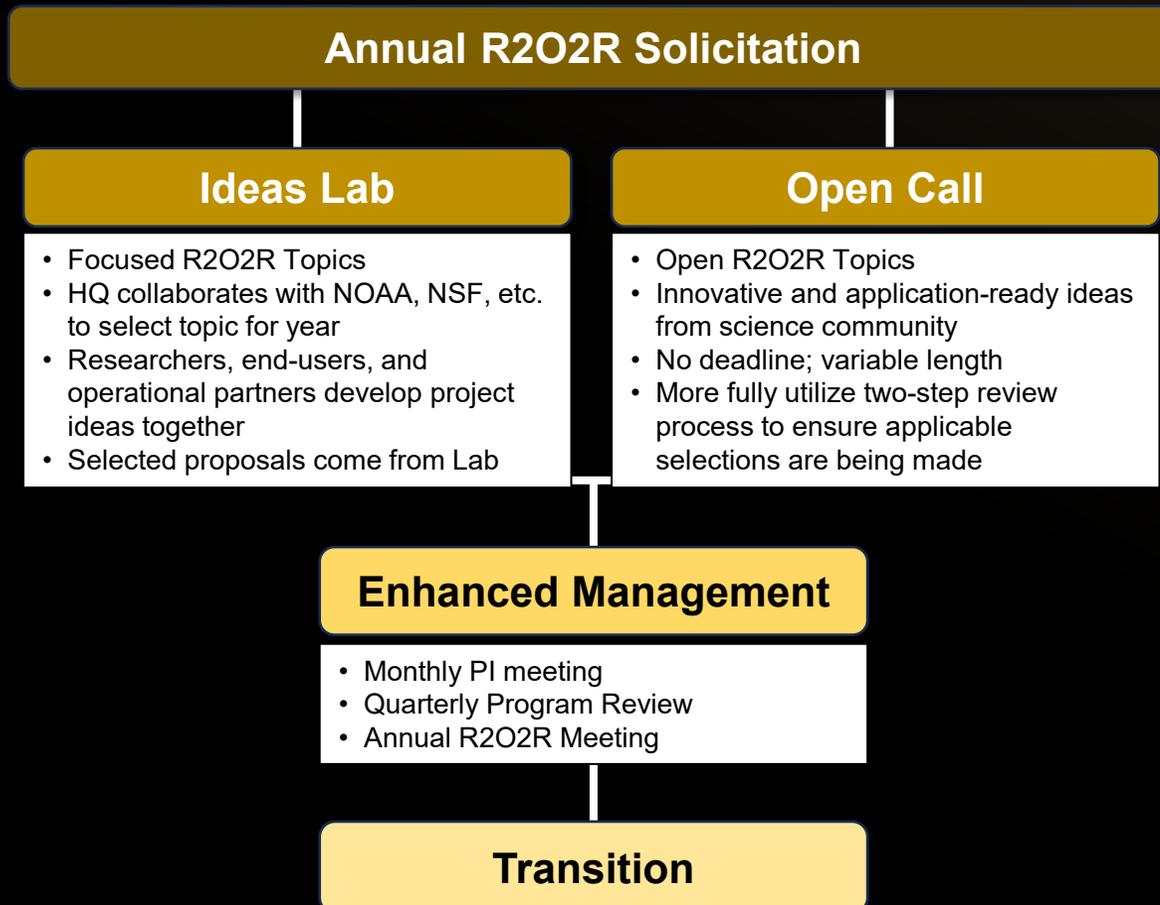
CGS: Center for Geospace Storms



SHIELD: Solar wind with Hydrogen Ion charge Exchange and Large-Scale Dynamics

NASA Space Weather Program

R2O2R Program Element – New Approach



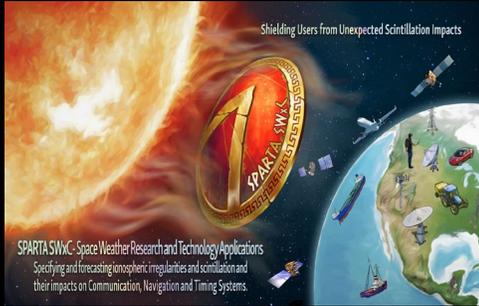
New approach **continues to meet NASA’s responsibilities** as defined in PROSWIFT Act, National Space Weather Strategy & Action Plan, etc.

New approach **addresses issues & actions** identified by NASA, NOAA, NSF, DoD, and the science community. **Truly interagency approach.**

New approach **leverages successful pilot efforts and lessons learned** from similar programmatic activities (i.e., UK SWIMMR and NASA Applied Sciences)

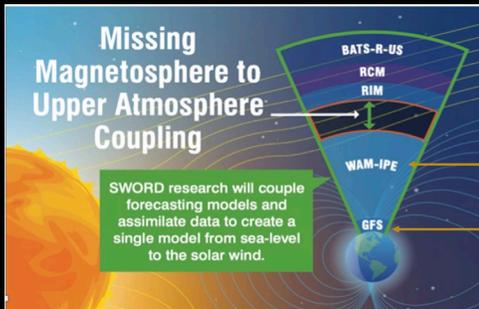
NASA Lead: Dr. Lisa Winter, Program Scientist (on detail from NSF)
NASA Deputy Lead: Dr. Esayas Shume, Program Scientist

Space Weather Centers of Excellence



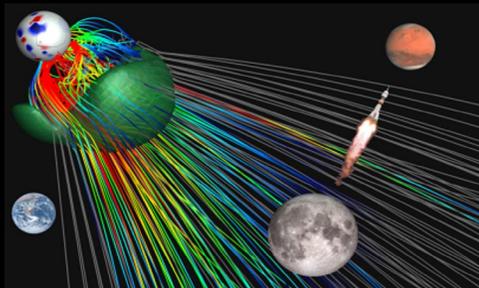
Space Weather Research and Technology Applications (SPARTA) Center of Excellence

- PI: Keith Groves, Boston College



Space Weather Operational Readiness Development (SWORD) Center

- PI: Thomas Berger, University of Colorado, Boulder



CLEAR: Center for All-Clear SEP Forecast

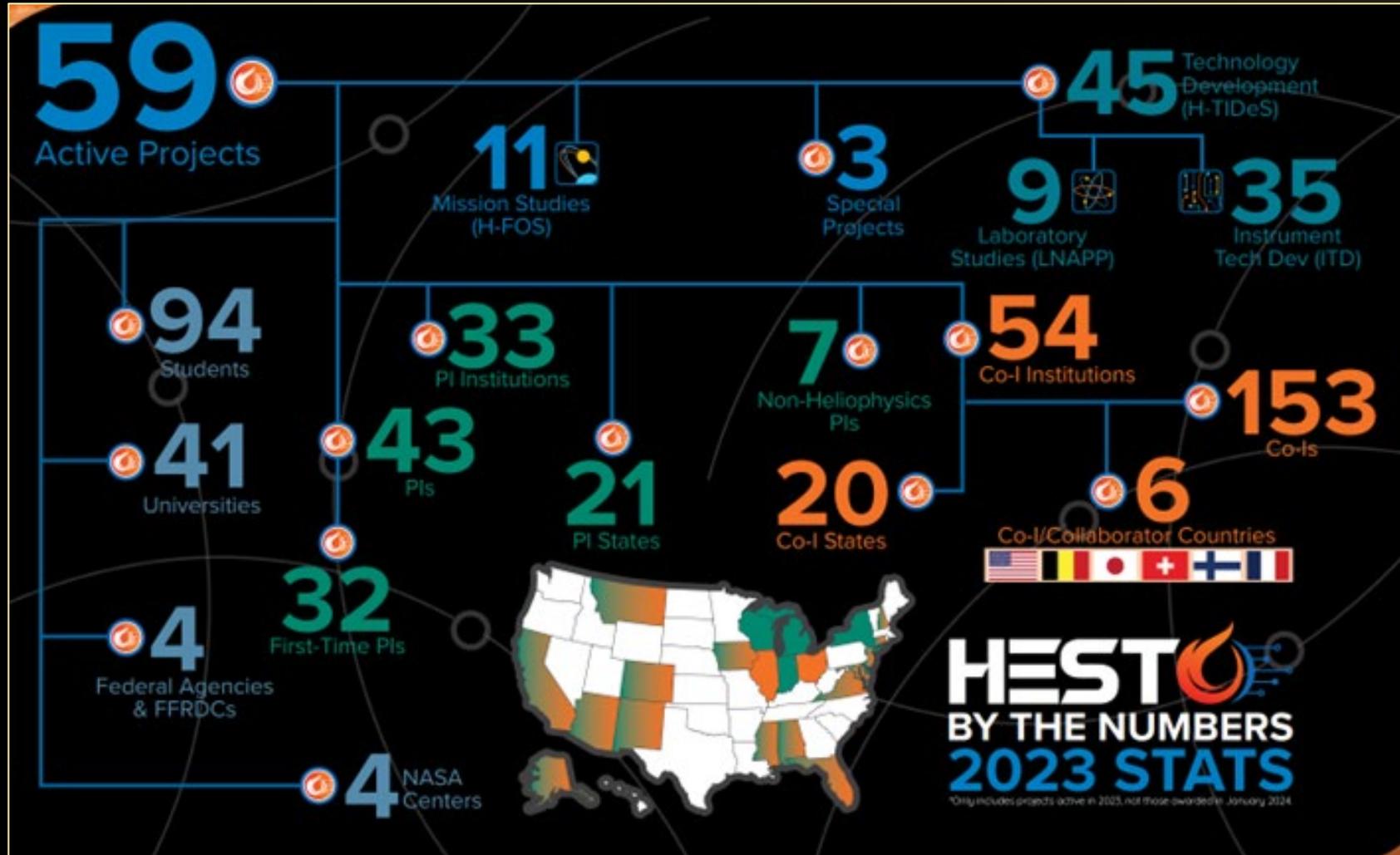
- PI: Lulu Zhao, University of Michigan, Ann Arbor

Joint Selection w/ Department of Commerce:

Center of Excellence for Advanced Forecasting of Drag for Enhanced, Sustainable, and Conscientious Space Operations

- PI: Piyush Mehta, West Virginia University, Morgantown

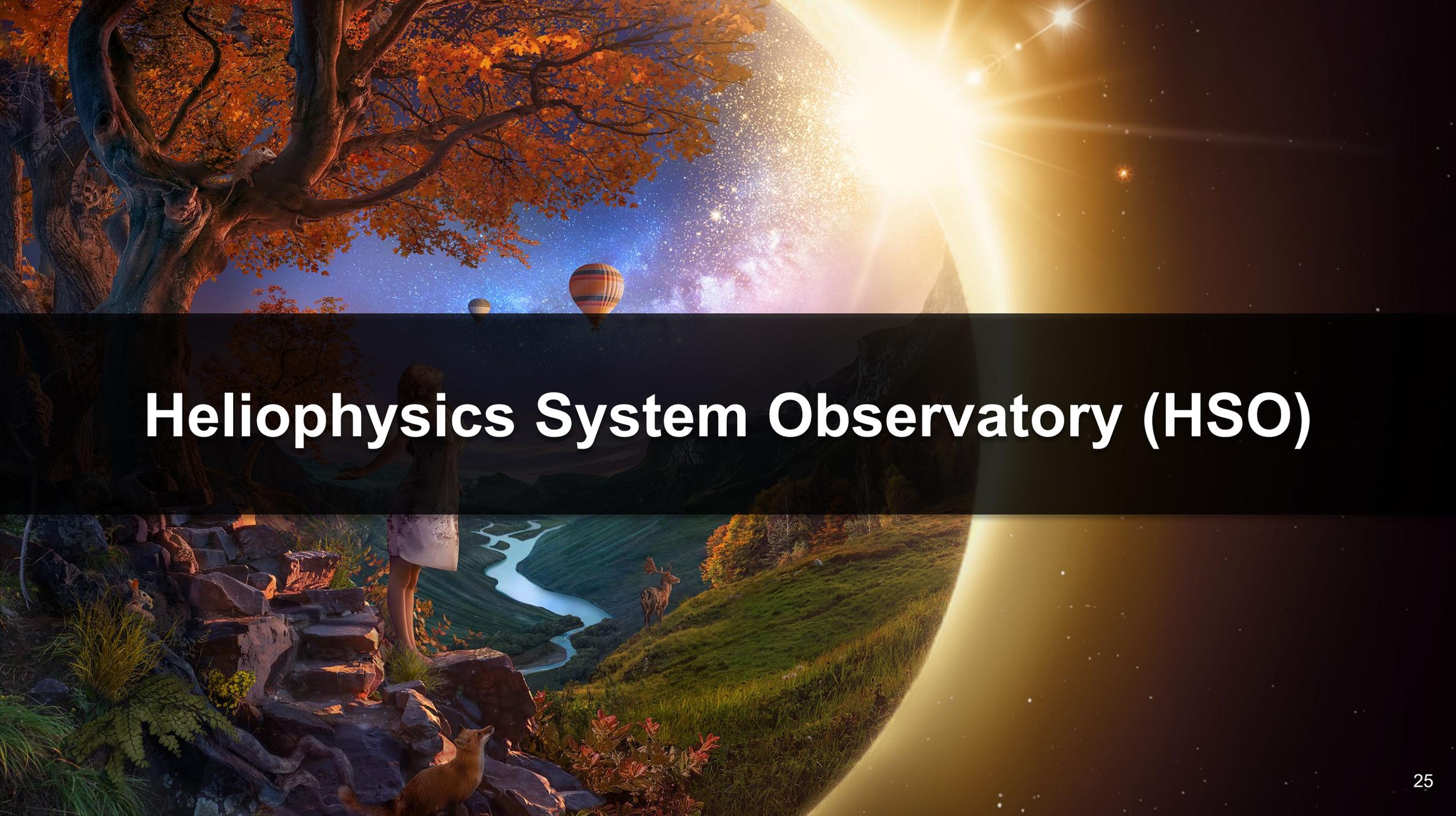
Heliophysics Strategic Technology Office (HESTO)



HESTO helps manage the Heliophysics technology program, which works closely with the Sounding Rocket Program and Balloon program.

Recent Accomplishments:

- Held the 2nd 2024 Heliophysics Technology Symposium on September 18-19, 2024 at the Wallops Flight Facility
- Launched the Heliophysics Technology website (hesto.smce.nasa.gov)
- Released the first annual Heliophysics Technology report (on HESTO website)



Heliophysics System Observatory (HSO)

Extended Mission Policy Activities

2023 Senior Review Findings

“ Individual extended mission proposals lacked system-level coherence and perpetuated closed communities. ”

The following would strengthen the HPD portfolio and engage broader community:

- Develop opportunities for HSO science working groups
- Expand HSO Guest Investigator funding opportunities
- Expand HSO community frameworks to share and leverage the development of code, team science efforts, and coordination with HDRL

Results 12 missions proposed, 4 designated project-funded, 6 designated infrastructure, 2 terminated due to technical feasibility

Framework Development

- Address terminology and definition concerns
- Establish research funding transition and competition processes for missions phasing out of prime phase
- Outline Senior Review criteria for transitioning missions

Stakeholder Feedback

- Solicit feedback from internal and advisory stakeholders on:
 - Overall framework
 - Terminology
 - Metrics for evaluation

Policy Development

- Draft written policy to foster open science, healthy competition, and opportunities for early career scientists
 - Incorporate stakeholder feedback
 - Address concerns raised in HDP feedback form

Community Feedback

- Share framework at future HPD Town Hall
- Answer questions and accept live feedback
- Identify format/method and timeline for formal feedback submission

Finalize & Release Policy

- Finalize written policy based on feedback
- Issue policy and guiding direction to operating missions
- Leverage appropriate communication channels to ensure awareness across the community
- Feed into 2026 Senior Review and ROSES



GDC & DYNAMIC

Geospace Dynamics Constellation (GDC) and Dynamical Neutral Atmosphere-Ionosphere Coupling (DYNAMIC)

GDC and DYNAMIC provide a whole-system study of upper atmospheric dynamics by combining their scientific and technical capabilities

- **Science**

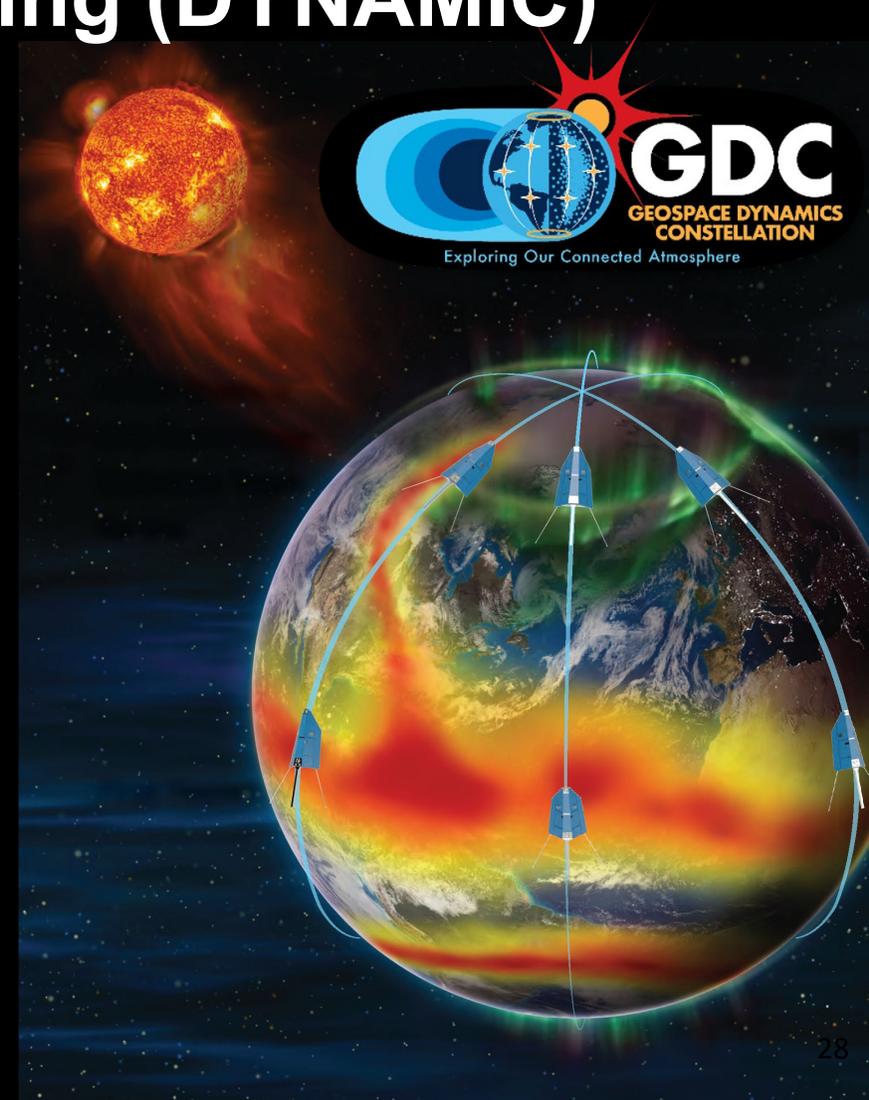
- GDC: Understand the upper atmosphere's internal processes and dynamics, and response to energy inputs from Earth's space environment (*energy from above*)
- DYNAMIC: Understand the effect of lower atmosphere variability on the processes and dynamics of the upper atmosphere (*energy from below*)

- **Architecture**

- GDC: Provides in situ measurements above 300 km
- DYNAMIC: Provides remote sensing of vertical profiles below 300 km altitude, leverages GDC measurements

- **DYNAMIC AO**

- Three teams selected in June 2024 to conduct Phase A studies



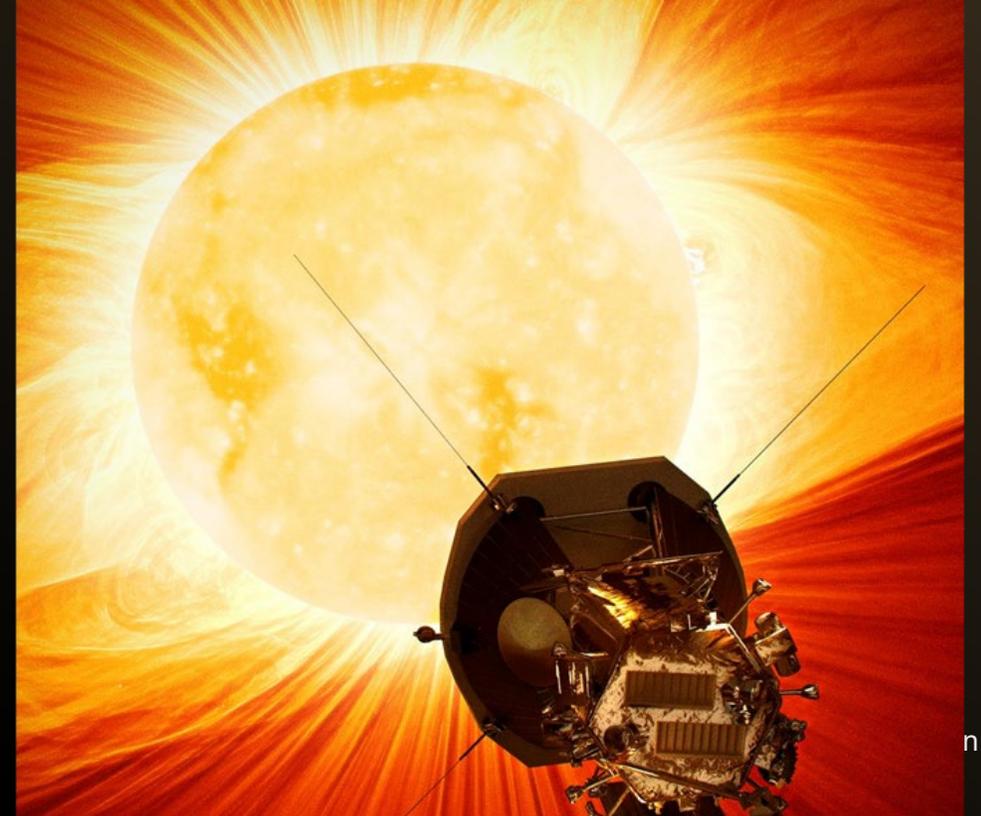
A composite image featuring a woman in a purple dress standing on a rocky path overlooking a valley with a river and a deer. In the background, there is a large tree with orange leaves, a hot air balloon, and a bright sun in a starry sky.

Budget Updates

Heliophysics Budget Priorities

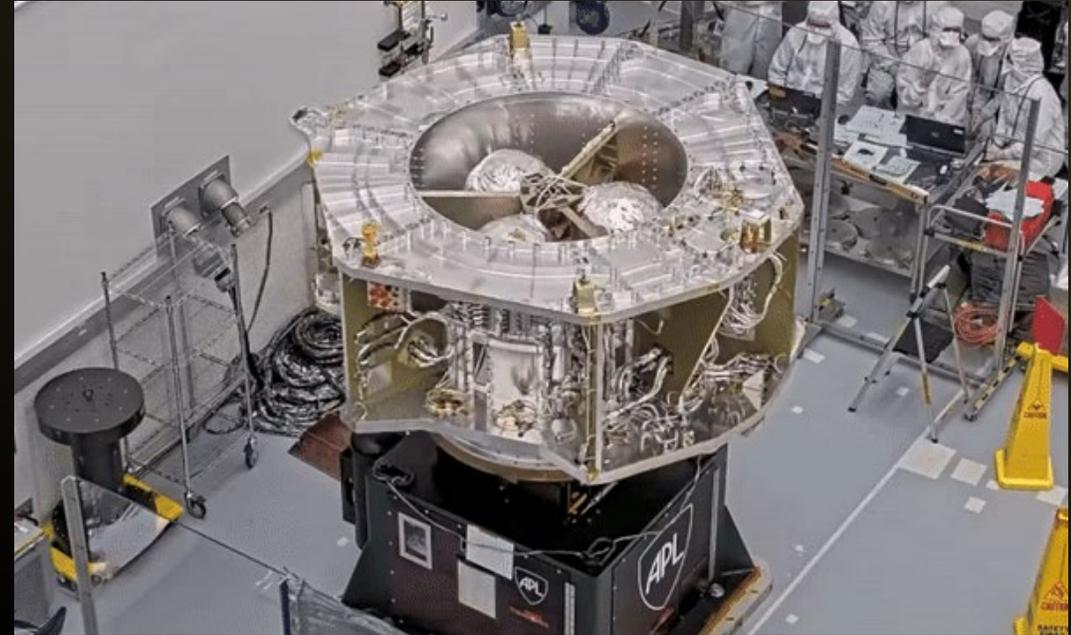
Explore/Innovate/Partner/Inspire

- 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 greatest 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



Heliophysics Budget Highlights

- Advances **EZIE, SunRISE, TRACERS, PUNCH, Carruthers, IMAP, and ESCAPEDE** toward launch in 2024-2025
- Supports a healthy cadence of PI-led Explorer missions
 - **MUSE** and **HelioSwarm** confirmations in 2024 and 2025
 - Final **SMEX** selections planned for 2025
 - Future Explorer solicitations in FY25 (MIDEX) and FY28 (SMEX)
- Proposes cancellation of **GDC** rather than a 3-year pause in recognition of outyear budget constraints



Coronal mass ejections — traveling disturbances in the solar wind — can be deflected by the Sun's magnetic field to bend back on itself — an effect that might help scientists uncover more about the solar wind accelerated from the Sun.

Get Involved & Stay Informed!

Stay in touch and help us find new ways to highlight your work and keep you in the loop!



Submit science highlights to us here:
HQ-HelioHighlights@mail.nasa.gov



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Questions & Answers



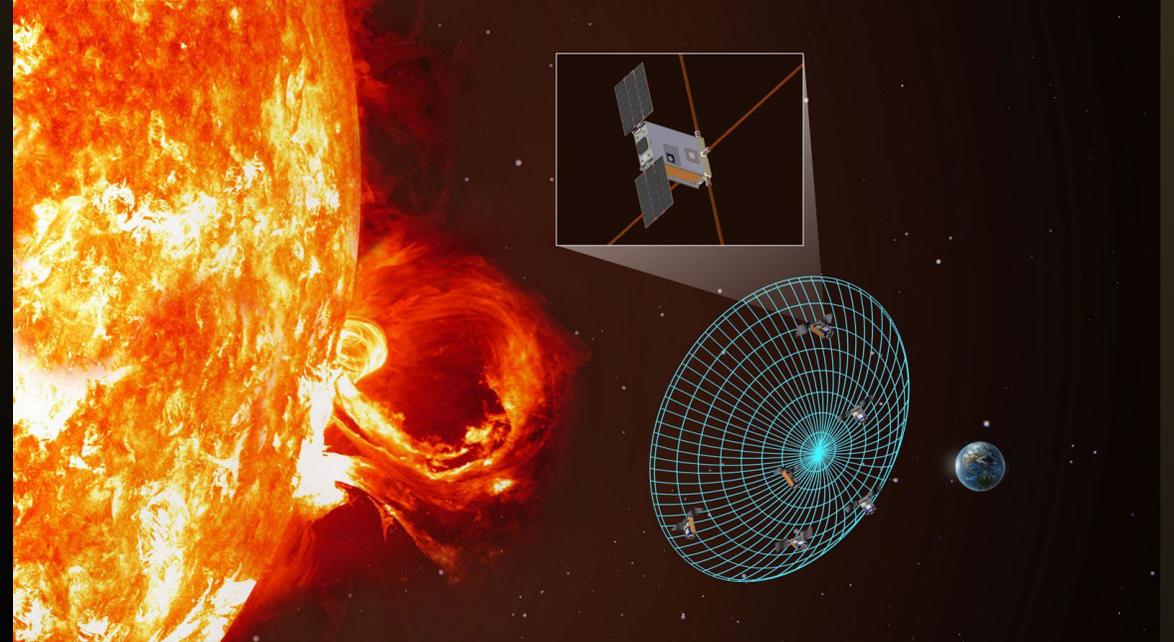
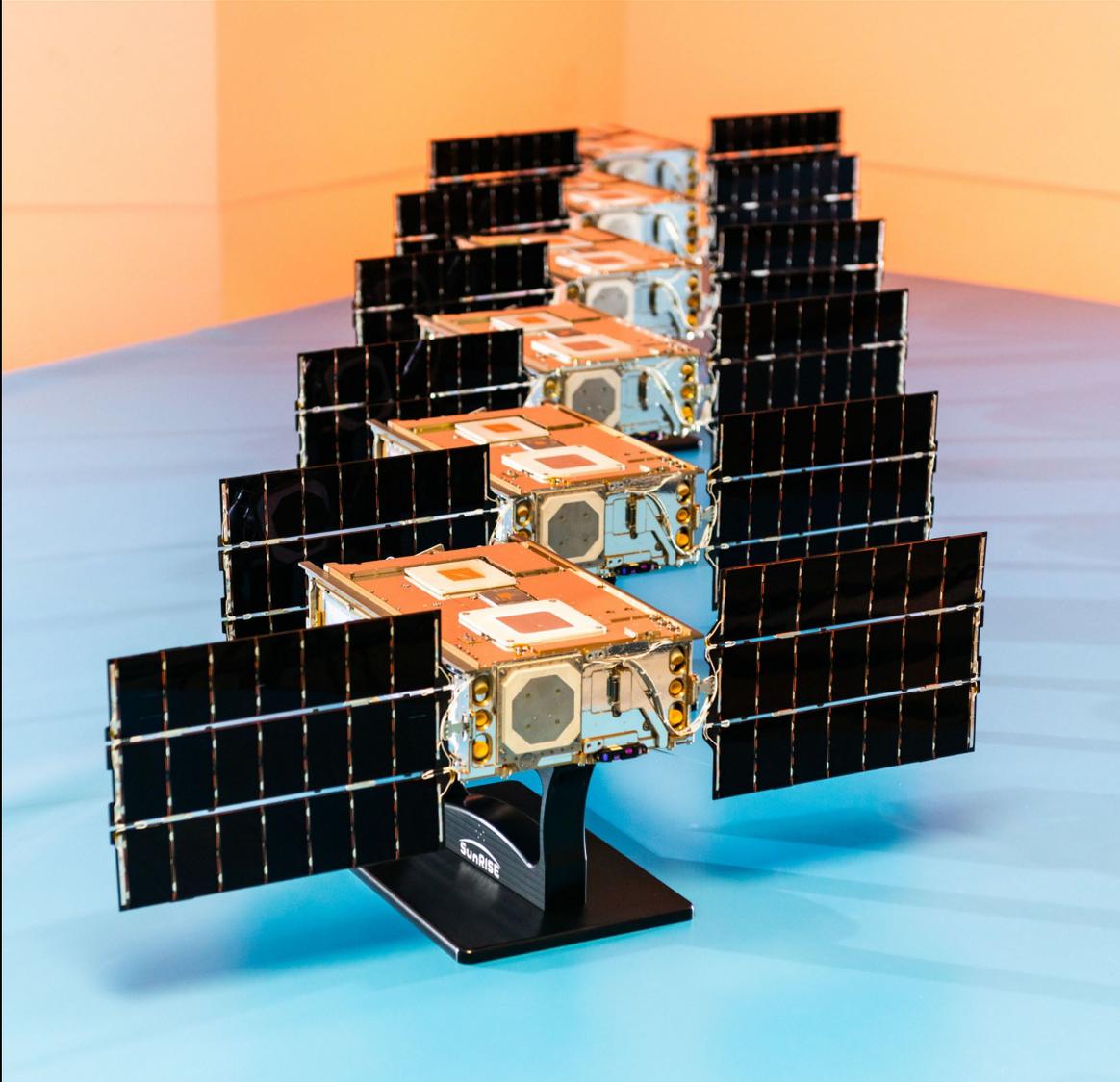
BACKUP

ESCAPADE



ESCAPADE Blue spacecraft (left) completed vibe and shock testing and is gearing up for TVAC. ESCAPADE Gold spacecraft (above) progressing through component closeout.
Image Credits: Rocket Lab / April 2024

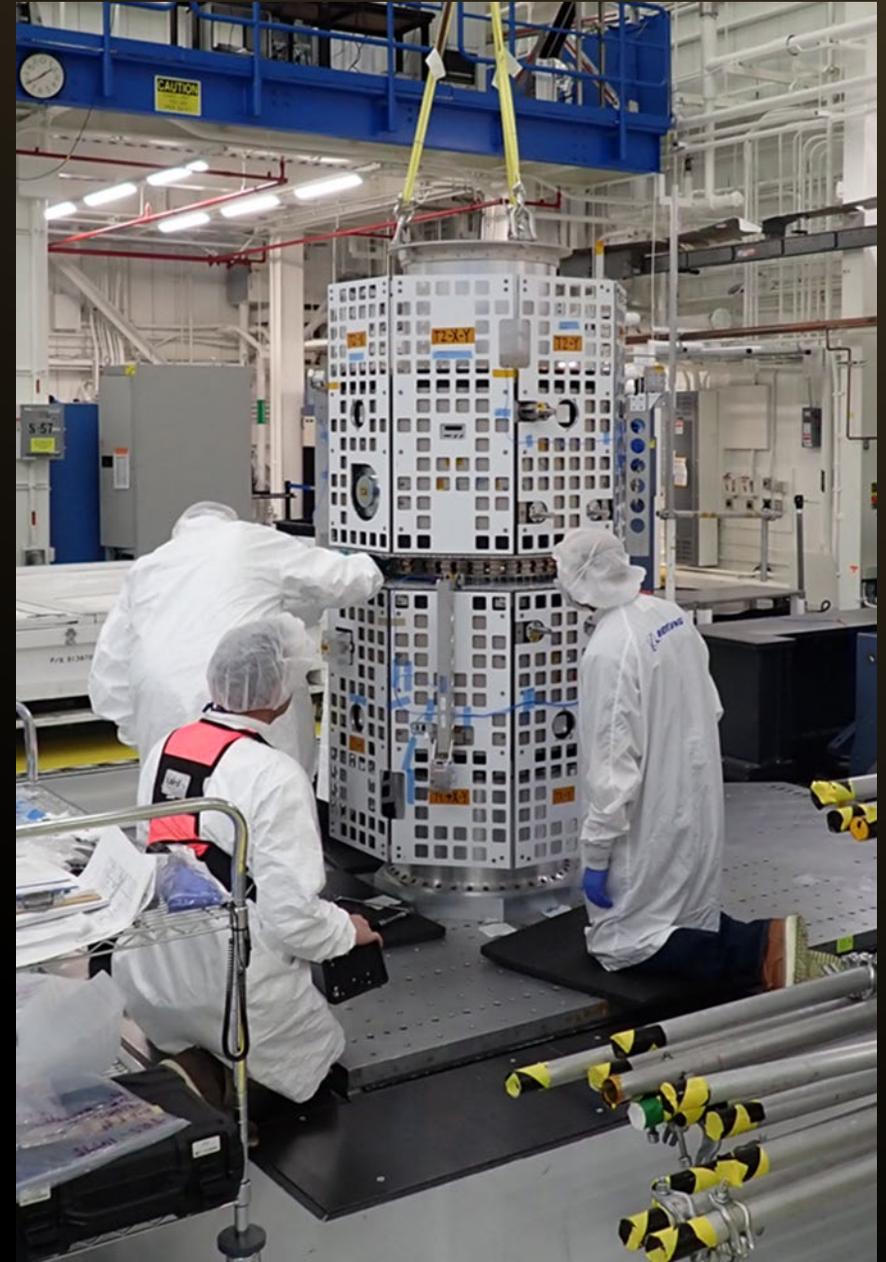
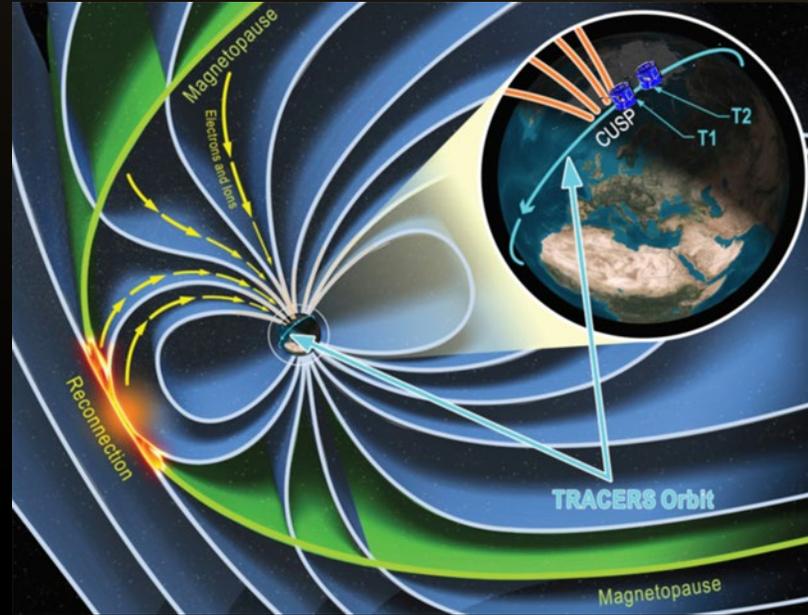
SunRISE



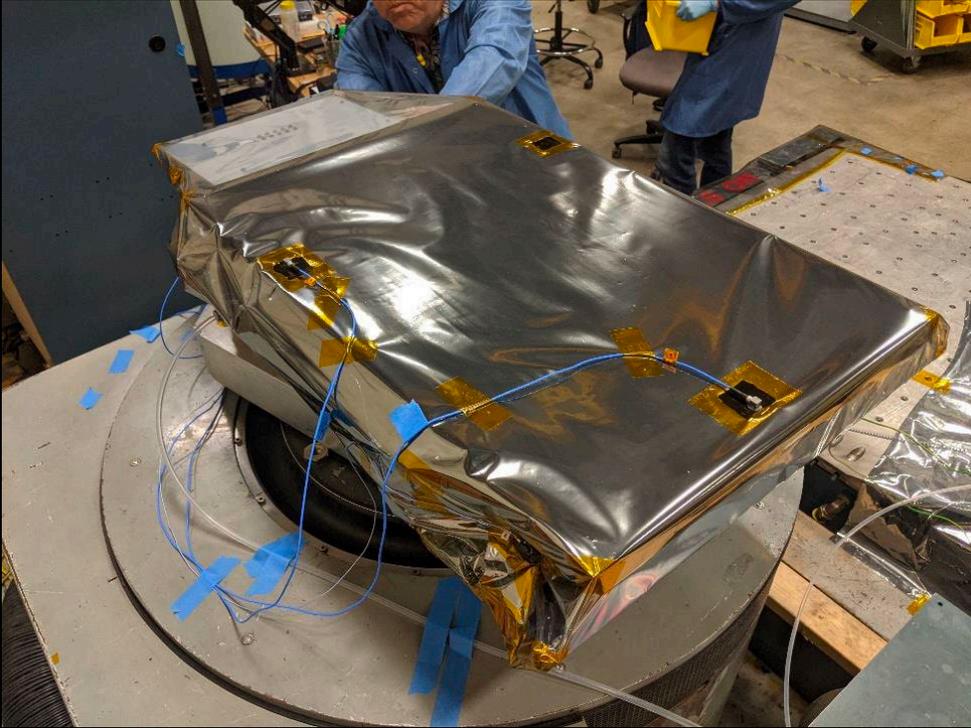
The six satellites that make up NASA's SunRISE mission are each only about the size of a cereal box, flanked by small solar panels. This fleet of six SmallSats will work together to effectively create a much larger radio antenna in space.

Space Dynamics Laboratory/Allison Bills

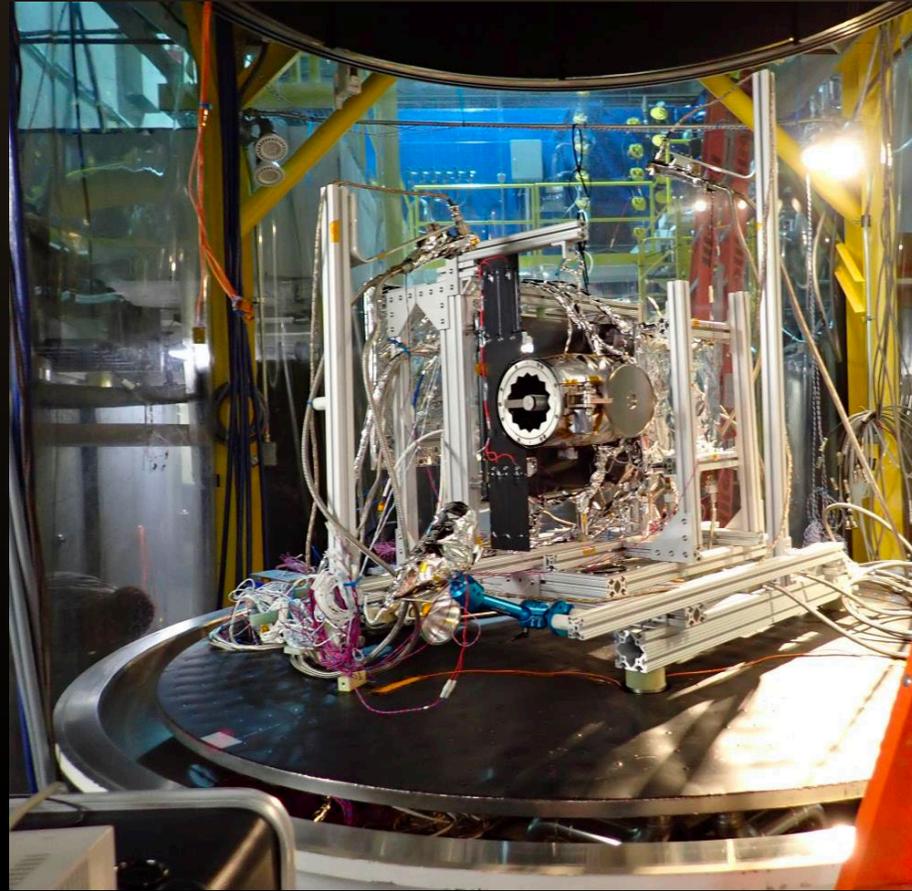
TRACERS



PUNCH

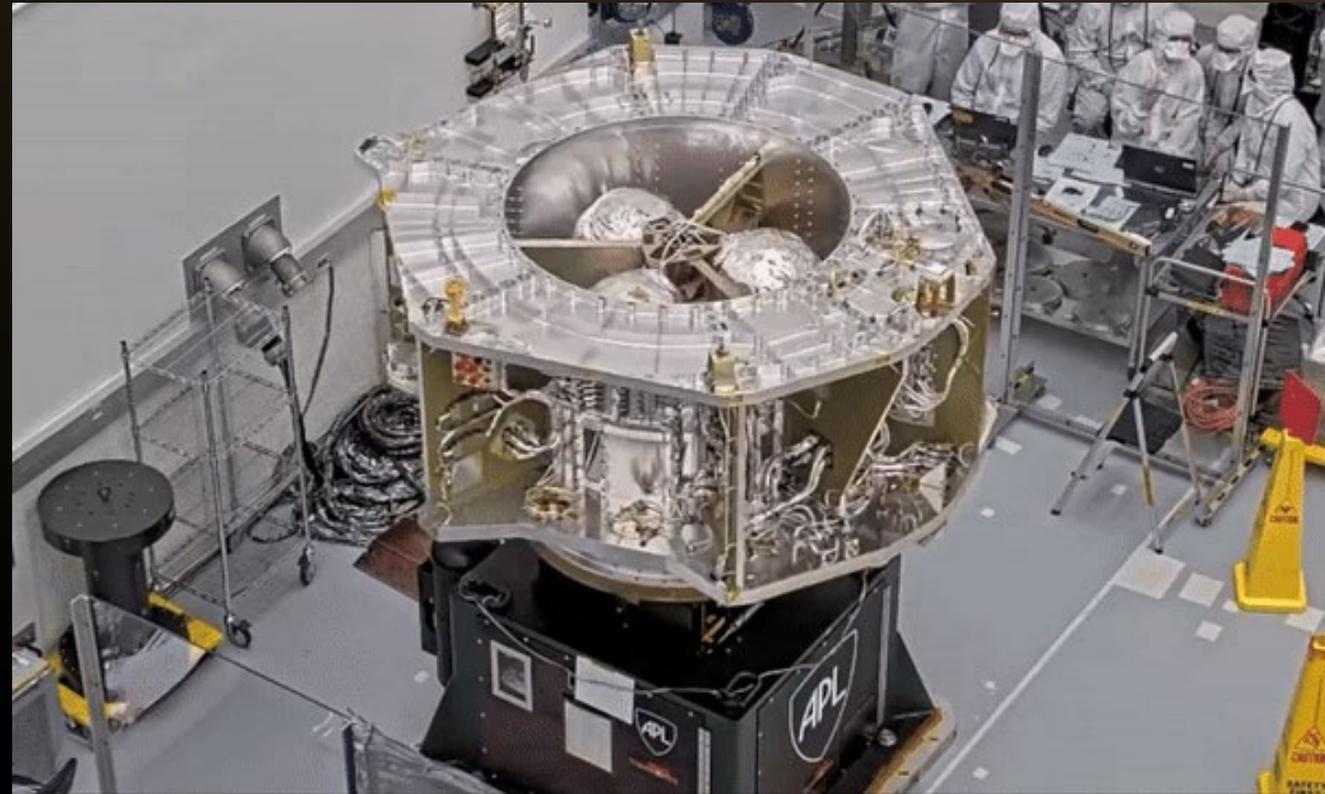


PUNCH Wide Field Imager undergoes vibration testing



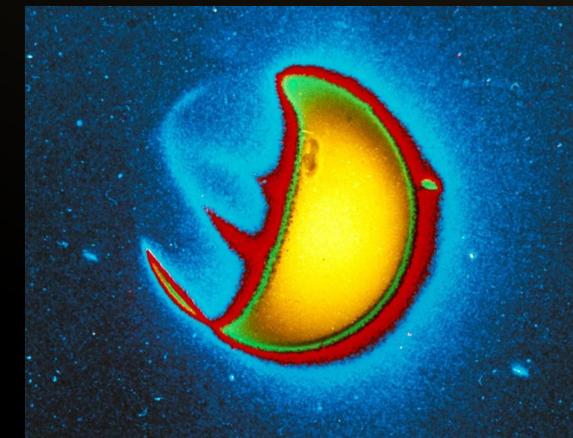
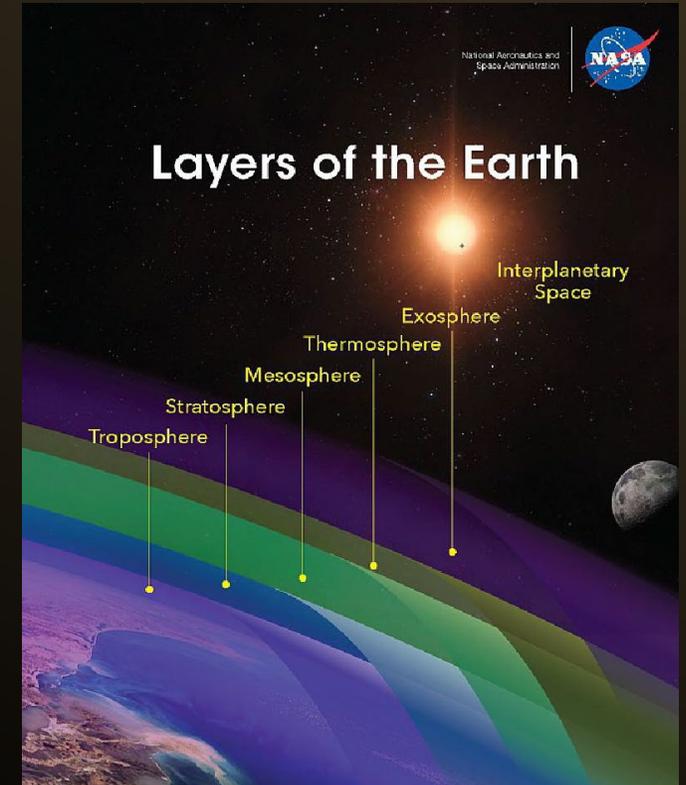
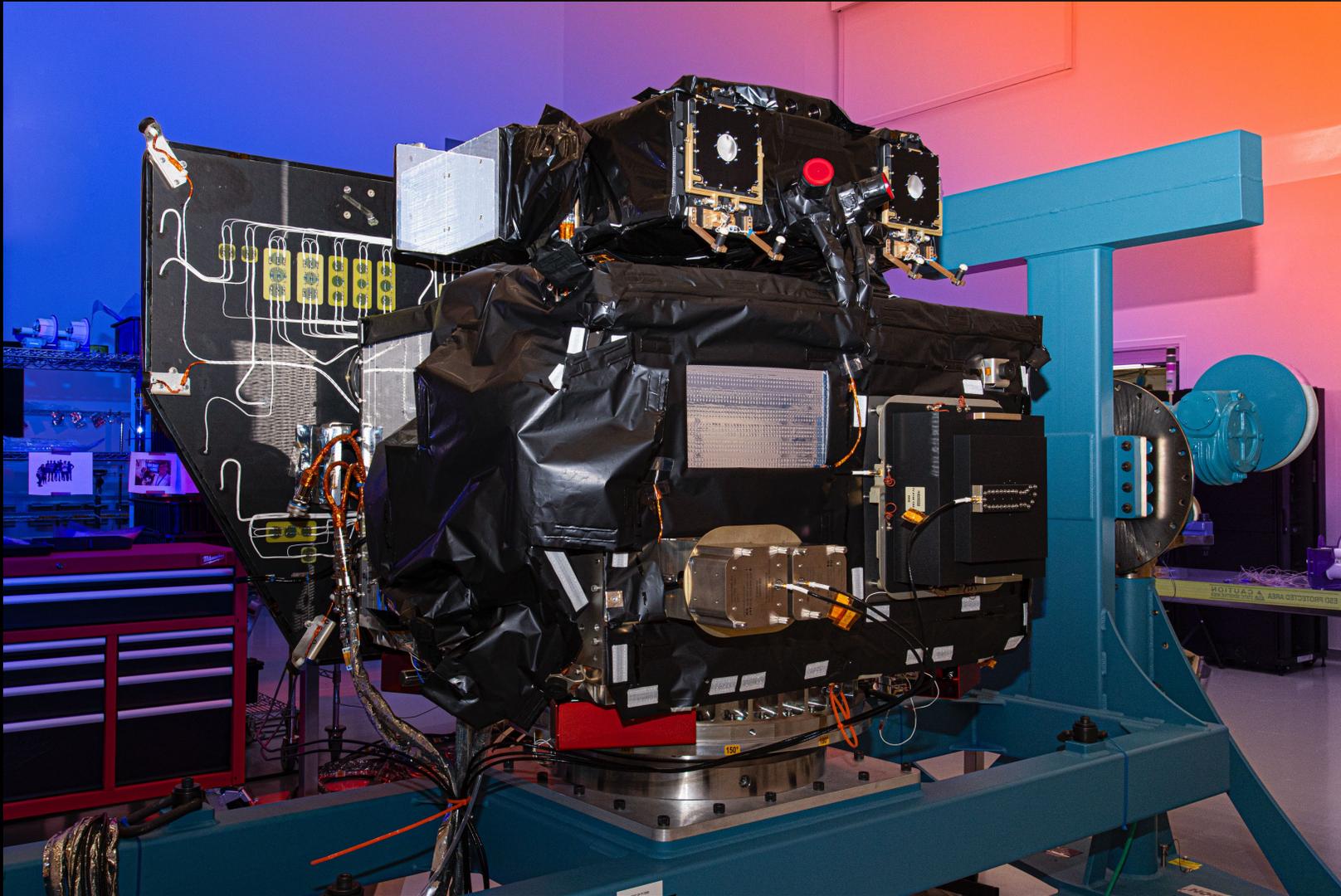
PUNCH Near Field Imager undergoes thermal vacuum testing

IMAP



HIT instrument installed in the vacuum chamber at the Tandem Van de Graaff accelerator facility at Brookhaven National Laboratory in Upton, New York. Credit: Brookhaven National Laboratory.

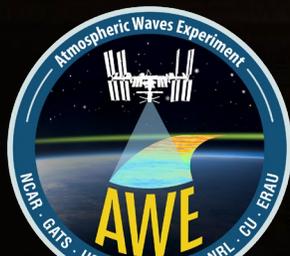
Carruthers



This colorised image of Earth in ultraviolet (UV) light was taken from the surface of the Moon by the Far Ultraviolet Camera/Spectrograph designed and built by Dr. George R. Carruthers 7) (Image credits: G. Carruthers (NRL) et al., Far UV Camera, NASA, Apollo 16)

Atmospheric Waves Experiment (AWE)

- AWE is the first NASA mission dedicated to characterizing global properties of atmospheric gravity waves (GWs) at the edge of space.
- AWE is the first Helio mission to fly on the International Space Station.
- AWE is the first HPD mission to launch during the Helio Big Year.



AWE launch 10 November 2023

Missions in Development



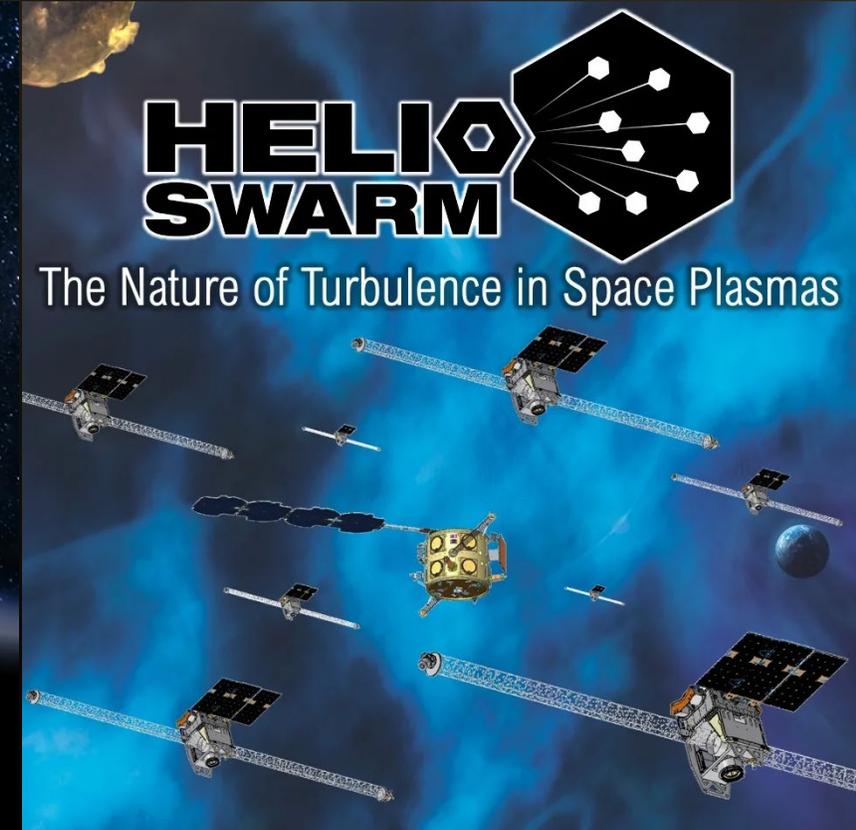
MUSE

Observing the Sun's
Extreme Ultraviolet Radiation

EUVST



EXTREME ULTRAVIOLET HIGH-THROUGHPUT
SPECTROSCOPIC TELESCOPE



HELIO SWARM

The Nature of Turbulence in Space Plasmas

Heliophysics System Observatory (HSO) Senior Review Feedback

The **Triennial Senior Review** is used to evaluate all missions in extended operations

- The 2023 Senior Review was recently completed
- All operating missions are continuing with only minor adjustments to budgets

2023 Senior Review Recommendations

- Develop opportunities for HSO science working groups
- Expand HSO Guest Investigator funding opportunities
- Expand HSO community frameworks to share and leverage development of code, team science efforts, and coordination with HDRL