

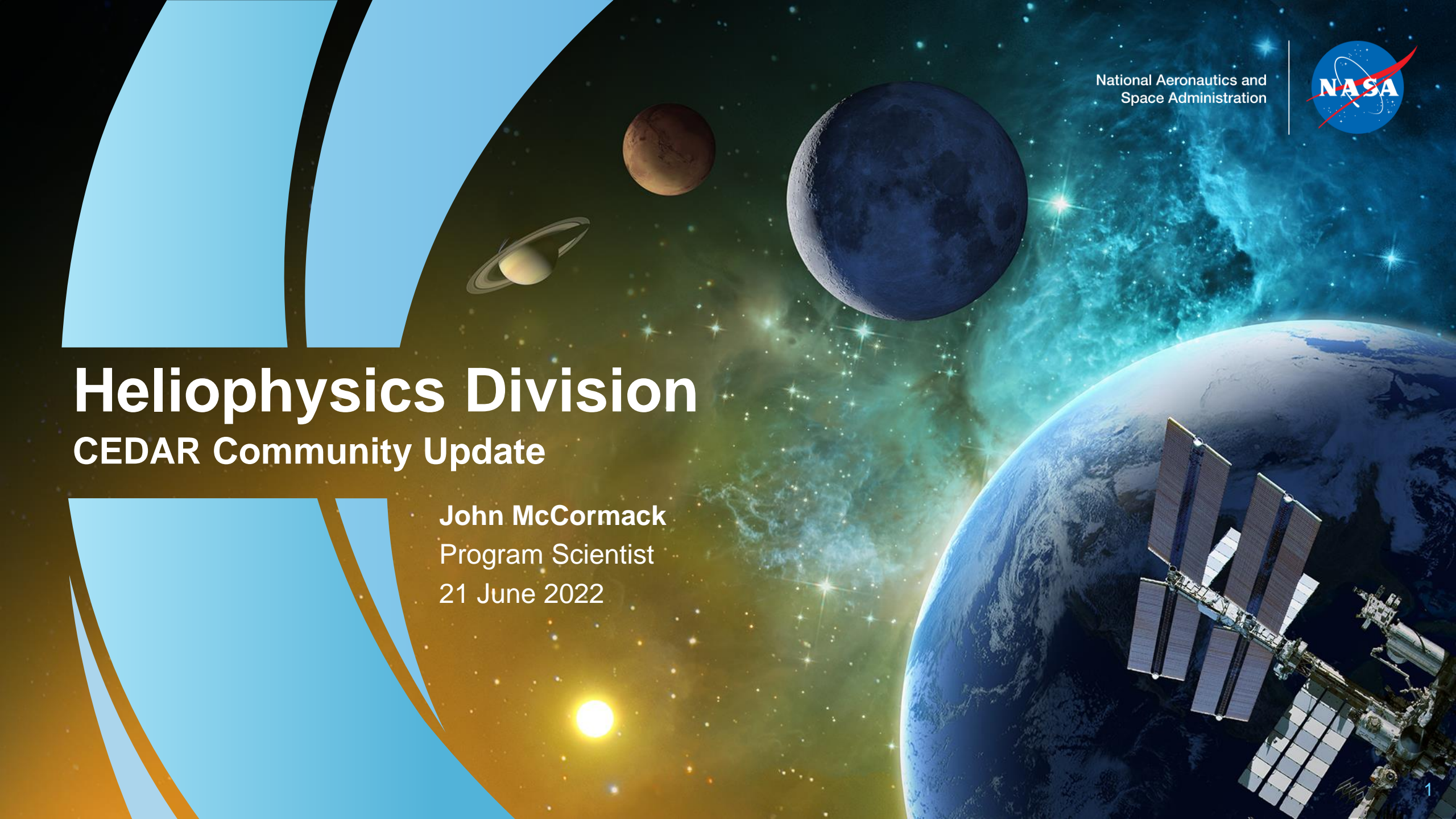
National Aeronautics and
Space Administration



Heliophysics Division

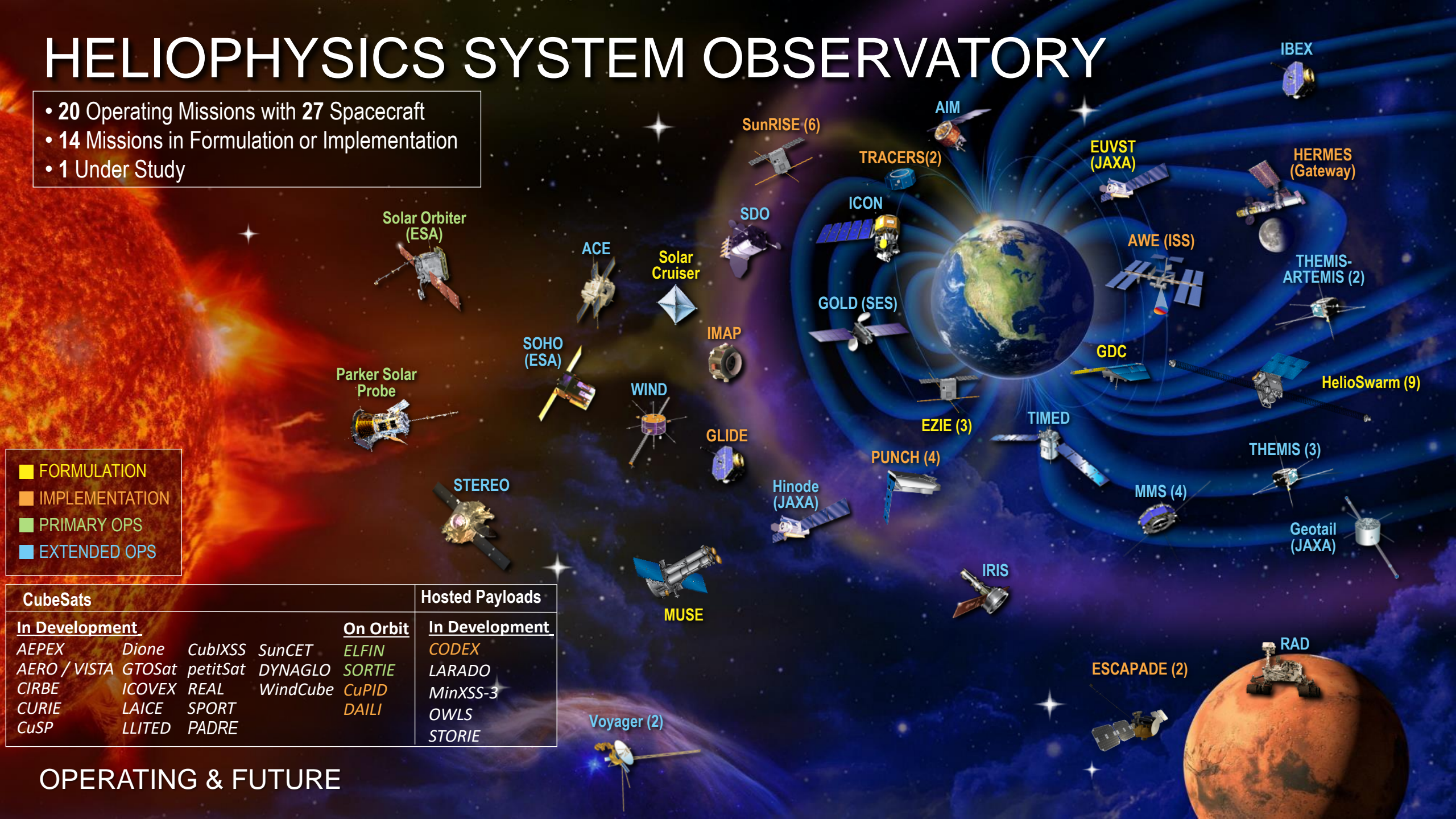
CEDAR Community Update

John McCormack
Program Scientist
21 June 2022



HELIOPHYSICS SYSTEM OBSERVATORY

- 20 Operating Missions with 27 Spacecraft
- 14 Missions in Formulation or Implementation
- 1 Under Study



- FORMULATION
- IMPLEMENTATION
- PRIMARY OPS
- EXTENDED OPS

CubeSats				Hosted Payloads			
In Development				On Orbit			
AEPEX	Dione	CubIXSS	SunCET	ELFIN	CODEX		
AERO / VISTA	GTOsat	petitSat	DYNAGLO	SORTIE	LARADO		
CIRBE	ICOVEX	REAL	WindCube	CuPID	MinXSS-3		
CURIE	LAICE	SPORT		DAILI	OWLS		
CuSP	LLITED	PADRE			STORIE		

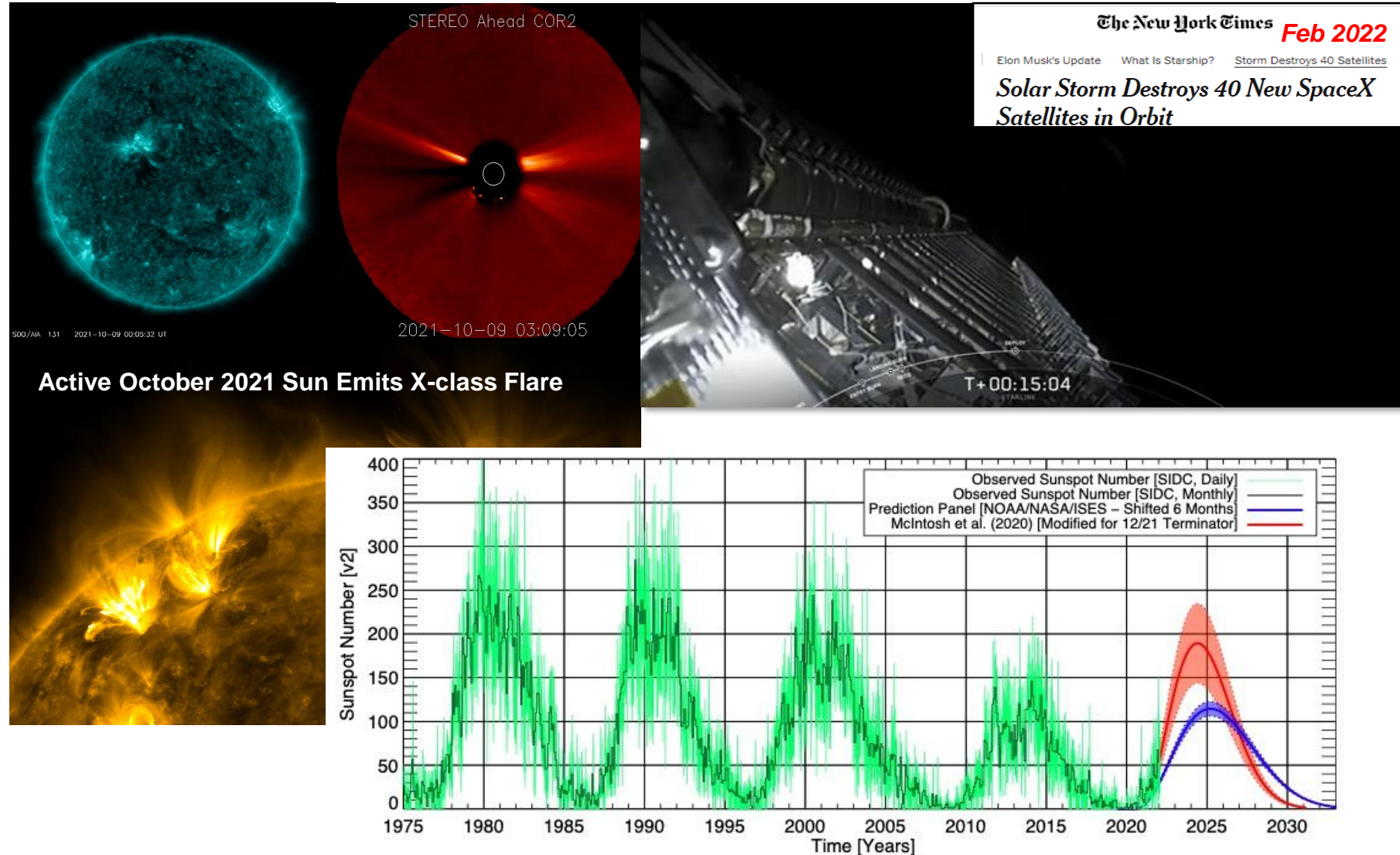
OPERATING & FUTURE

The Sun Wakes Up: Solar Cycle 25 Is Here

December 2019 marked the beginning of Solar Cycle 25, and the Sun's activity will once again ramp up until solar maximum, predicted for 2025.

This new solar cycle, and anticipated increase in space weather events, will impact our lives and technology on Earth, as well as astronauts in space.

This is the first solar cycle that many new commercial and government stakeholders will navigate.





Heliophysics Division Snapshot

- Advance 3 missions in development: **Solar Cruiser, EZIE, EUVST** (coordination w/ JAXA)
- Continue support for 8 in implementation: **IMAP, PUNCH, SunRISE, ESCAPADE, GLIDE, HERMES, TRACERS, AWE**
- Support recently selected **GDC** teams
- Support 2 recent MDEX-19 selections: **HelioSwarm and MUSE**
- Release SMEX-22 AO (draft coming soon; final version 23 AUG; target due date 21 NOV 2022).
- Support 2023 Decadal Survey kickoff in coordination with NASEM
- Maintain healthy Research and Analysis (R&A) Program
- Invest in modernization of data archives and open science initiatives
- Continue implementing IDEA initiatives
- Engage public through “Heliophysics Big Year”

Recent ITM Highlights from Operating Missions

Dec 7, 2021

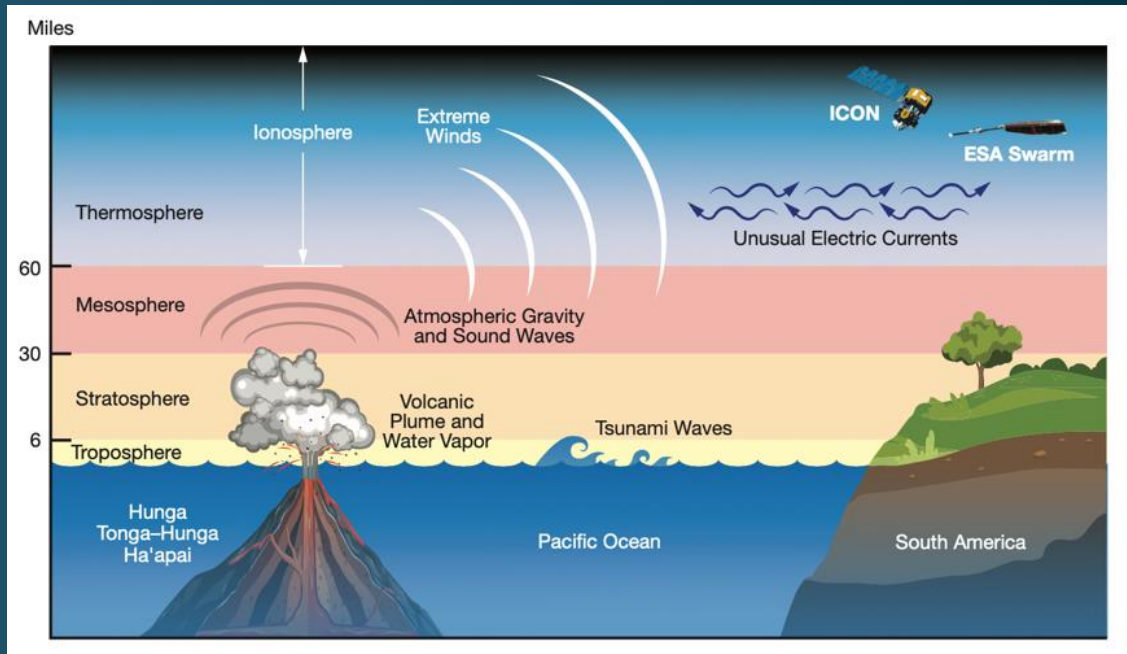
How TIMED Flies: NASA Mission Celebrates 20th Anniversary

Jun 30, 2021

NASA Satellites See Upper Atmosphere Cooling and Contracting Due to Climate Change



ICON Mission Finds Tonga Volcanic Eruption Effects Reached Space



Credit: NASA's Goddard Space Flight Center/Mary Pat Hrybyk-Keith

GOLD Observes Large-scale Thermospheric Heating during Moderate Geomagnetic Storms

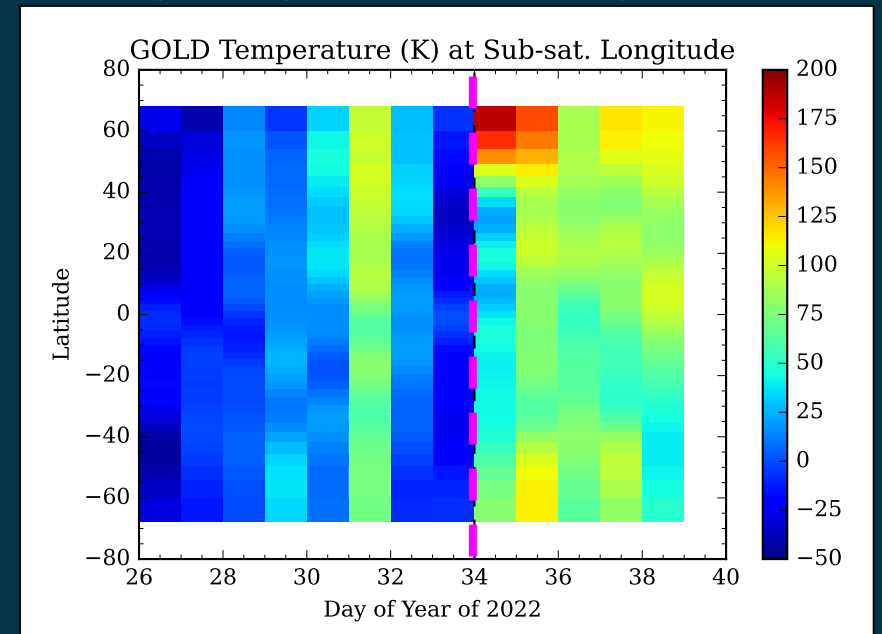
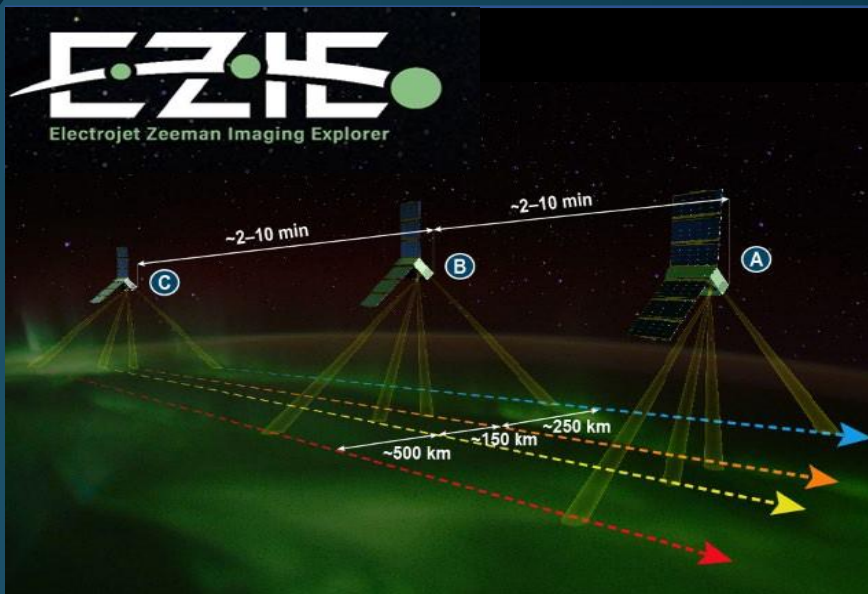


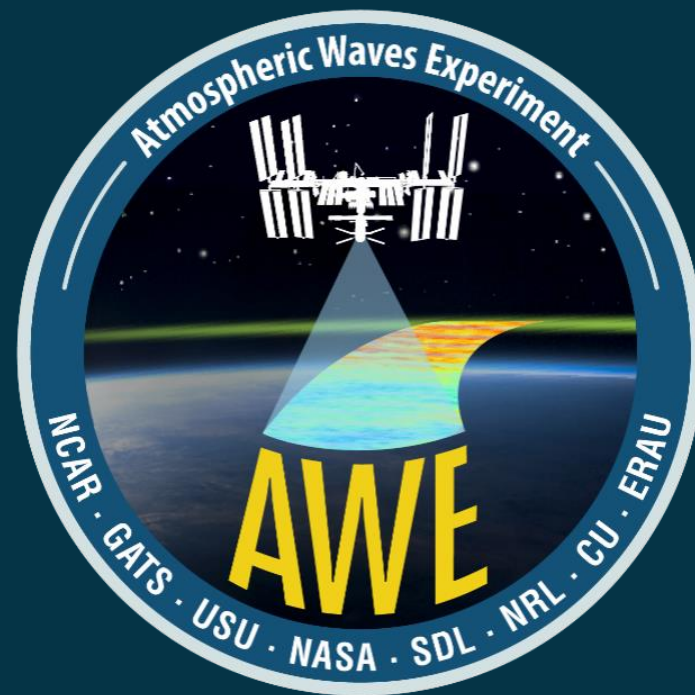
Image courtesy of F. Laskar and GOLD team

Upcoming ITM Missions



EZIE is a 3 CubeSat mission in a pearls-on-a-string configuration measuring O₂ emissions from MLT with compact multi-beam instruments to capture auroral electrojet structure and evolution at altitudes of ~100–130 km.

Launch NET Dec 2024



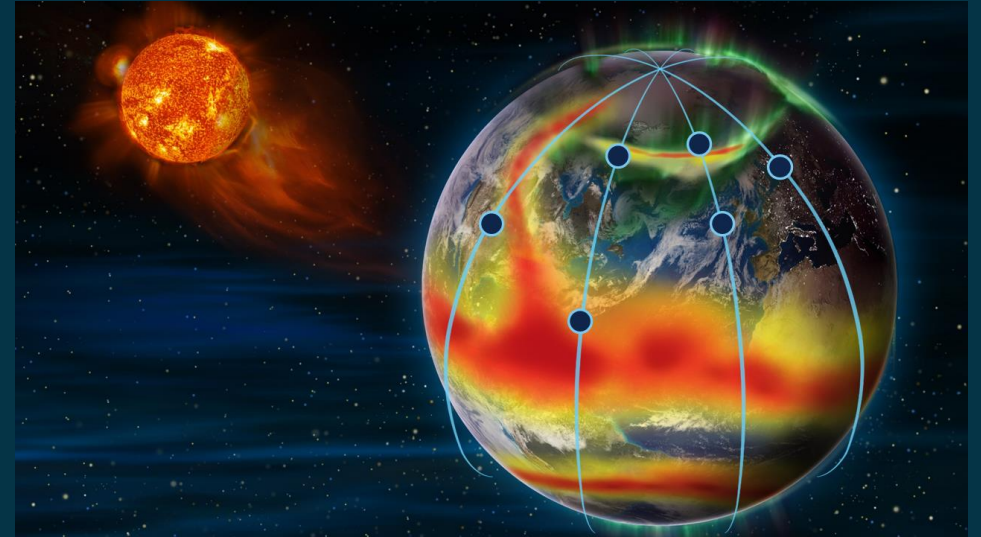
AWE on the ISS will measure nighttime OH airglow emissions from the mesopause region to quantify gravity wave forcing of the ionosphere-thermosphere system.

Launch NET July 2023.

*Additional CubeSats: LAICE, SPORT, WindCUBE, LLITED, petitSat (in development);
DAILI, SORTIE (on orbit)*

Geospace Dynamics Constellation (GDC) Selections

- NASA is thrilled to announce the start of the GDC mission science team!
 - Interdisciplinary Scientists (selected Nov 2021)
 - Dr. Rebecca Bishop (The Aerospace Corp.)
 - Prof. Yue Deng (Univ. Texas, Arlington)
 - Prof. Jeffrey Thayer (CU Boulder)
 - Investigations, delivering science instruments (selected Apr 2022)
 - *MoSAIC*: Dr. Mehdi Benna (UMBC)
 - *CAPE*: Dr. Daniel Gershman (GSFC)
 - *AETHER*: Dr. Laila Andersson (CU Boulder)
- NASA has selected a competitive Phase A (down select circa Nov/Dec 2022)
 - *MAG*: Dr. Guan Le (GSFC)
 - *NEMISIS*: Prof. Mark Moldwin (Univ. Mich)
 - *MAG*: Prof. David Miles (Univ. Iowa)
 - *TPS*: Prof. Phil Anderson (Univ. Texas, Dallas)
 - *3DI*: Dr. Keiichi Ogasawra (SwRI)



- Out-year budget reductions may delay implementation of GDC
- To support current & planned PI-led projects within the Heliophysics portfolio, the FY23 President's budget does not include funding for DYNAMIC.
- DYNAMIC AO has been delayed, not cancelled. For more info see Science Office for Mission Assessment website: <https://soma.larc.nasa.gov>

Research and Analysis Update

Overall

- Maintaining DRIVE initiative – Phase 2 selections made March 2022
- Supporting robust suborbital program
- Establishing ECIP cadence every 2 years
- Engaging in efforts to increase diversity in research
- Cross-Divisional programs

Citizen Science

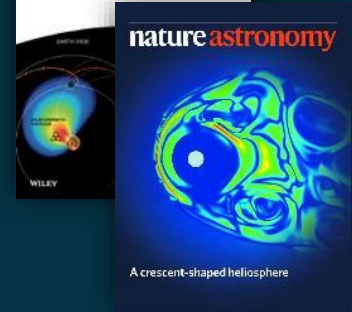
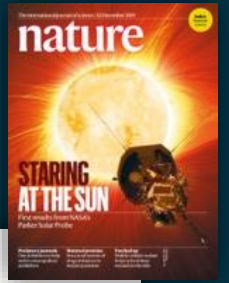
- **Mission:** Building portfolio combining natural phenomena, mission opportunities, and diverse viewpoints to fuel collective innovation
- 4 selections in 2021 from Citizen Science Seed Funding, 1 selection in SWO2R
- **Heliophysics “Big Year”**

ROSES-2020

- Selected 186 out of 565 proposals **for a success rate of 33%**
- This is up from 30% in ROSES 2019
- 104 new PIs in the 2020 programs
- ROSES-21 selections still ongoing

ROSES-22

- AI/ML – strong emphasis in H-TMS
- New ROSES elements responding to Open Data and Open Source Science initiatives
- Eclipse 2024 element
- Space Weather Centers of Excellence (IDEA emphasis included)



DRIVE Science Center Selections

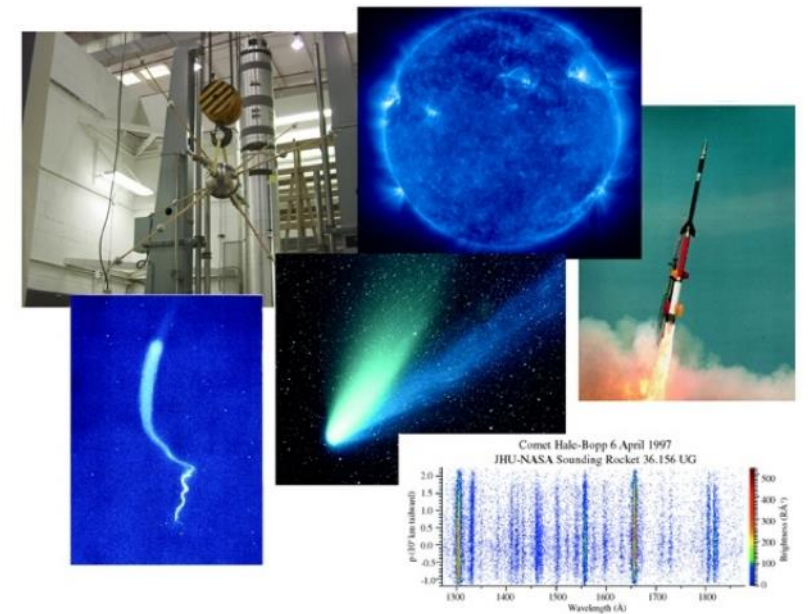
DRIVE Science Centers, implemented as a NASA-NSF partnership, are part of an integrated multi-agency initiative, DRIVE (Diversity, Realize, Integrate, Venture, Educate), put forward as a high priority recommendation of the 2013 Solar and Space Physics Decadal Survey. DRIVE Science Centers are focused on grand challenge goals that are both ambitious and focused enough to be achievable within the lifetime of the center.

On March 17th, NASA selected three DRIVE Centers:

Title, Pls, and Institutions

- Consequences of Flows and Fields in the Interior and Exterior of the Sun (COFFIES)
 - Hoeksema / Stanford
- **Center for Geospace Storms (CGS)**
 - **Merkin / JHU/APL**
- Our Heliospheric Shield
 - Opher / Boston University





Inaugural NASA Sounding Rocket Symposium – Registration Open!

This 2.5-day event welcomes new and experienced scientists and engineers interested and involved in sounding rockets across all disciplines — Astrophysics, Solar, and Geospace — to come together and share ideas and experiences focused on this unique research platform

See: <https://sites.wff.nasa.gov/code810/Symposium/Sounding-Rocket-Symposium.html> for important dates and information, to register for this event, and to submit your abstract

Foreign National Registration Deadline:	July 1, 2022
Abstract Submission Deadline:	July 15, 2022
US Citizen Registration Deadline (in-person):	August 1, 2022
Virtual-only Registration Deadline:	August 15, 2022

Contacts:

Sabrina Savage, MSFC, Symposium Organizer
(sabrina.savage@nasa.gov);
Rob Pfaff, GSFC, SR Project Scientist
(robert.f.pfaff@nasa.gov)

Planning for the 2024 Decadal Survey

- Decadal Survey process has officially started!
 - Statement of Task and Study Approach define scope and identify agency-specific guidance
 - <https://www.nationalacademies.org/our-work/decadal-survey-for-solar-and-space-physics-heliophysics-2024-2033>
 - Schedule
 - Call for Nominations, Committee and panels (closed May 3)
 - Call for White Papers (to be released)
 - Kick-off meeting (to be announced)
- Don't wait for formal calls to write white papers! *Start now!*
- Additional resources
 - Strategic Missions info:
https://science.nasa.gov/heliophysics/2024_decadal_survey/heliophysics-strategic-mission-programs
 - Draft WP guidelines are at
<https://nationalacademies.org/docs/DC459497C1AAFFB841F8221165878AE1DA04F96C5805>

Inclusion, Diversity, Equity, and Accessibility (IDEA) in Heliophysics

Funded Ongoing and Exploratory Efforts

- Newly selected mission teams are expanding communications and outreach plans to reach wider population and increase diversity of future Heliophysicists
 - PUNCH and IMAP student collaborations
 - EZIE extended outreach program
- Establishing a community-wide early- and mid-career support network pilot in partnership with other SMD Divisions, professional and scientific societies
- Developing targeted and innovative R&A solicitations with an IDEA emphasis for FY22 (e.g., HITS)
- “Deepening the Pool”: RockOn and RockSat programs
- Employ best practices for IDEA recruitment efforts, including hiring panels, reviewer panels and advisory boards
- More inclusive R&A practices (e.g., code of conduct, dual-anonymous reviews)
- Continue listening sessions with early career students and faculty to identify barriers for underrepresented groups & implement lessons learned.



DRIVE Science Centers include initiatives to increase diversity and inclusion, helping to develop the future STEM workforce while conducting breakthrough research

HPD IDEA Working Group Co-chairs:
Kelly Korreck and Denise Hill

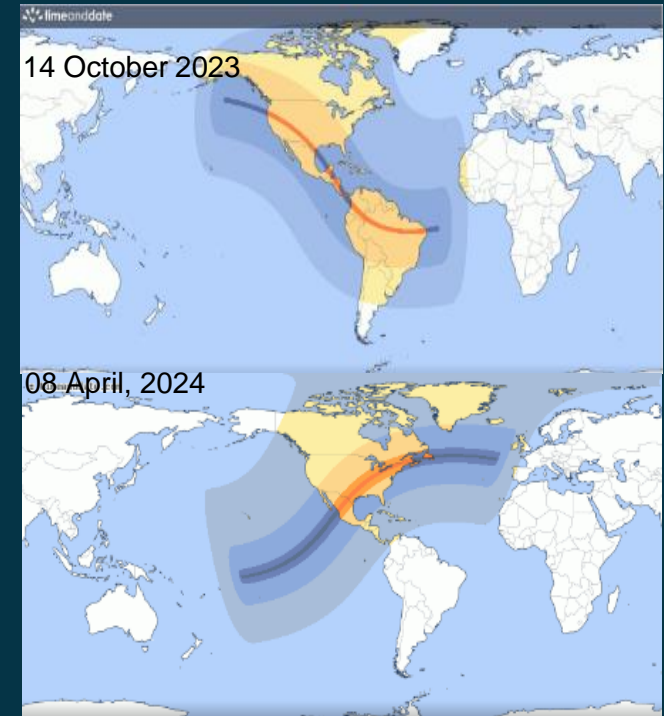
Heliophysics Big Year

“Big Year” is a birding term for maximizing number of species observed.

- NASA is using three remarkable events to highlight and engage the public’s interest in solar system science
 - Two Solar Eclipses cross N. America (14 Oct 2023 and 8 April 2024)
 - The rising phase of the Solar Cycle 25 with Solar Maximum predicted to occur in 2025
- Look out for opportunities to be part of our Big Year
<https://science.nasa.gov/heliophysics/programs/citizen-science>



Totality during the solar eclipse in Australia's Tropical North Queensland on November 14, 2012. Getty Images.



The paths of totality for total solar eclipses during the HBY.

Get Involved and Stay Informed!

We are continuing to work hard to grow the Heliophysics community. Stay in touch and help us find new ways to highlight your work and keep you in the loop!

Check out our “Nicky Notes” email!

- Sign up for it at <https://bit.ly/2R1w8HT>

Stay up to date with what’s happening at Headquarters through Virtual Town Halls:

<https://science.nasa.gov/researchers/virtual-townhall>

Let us know what you’ve been working on:

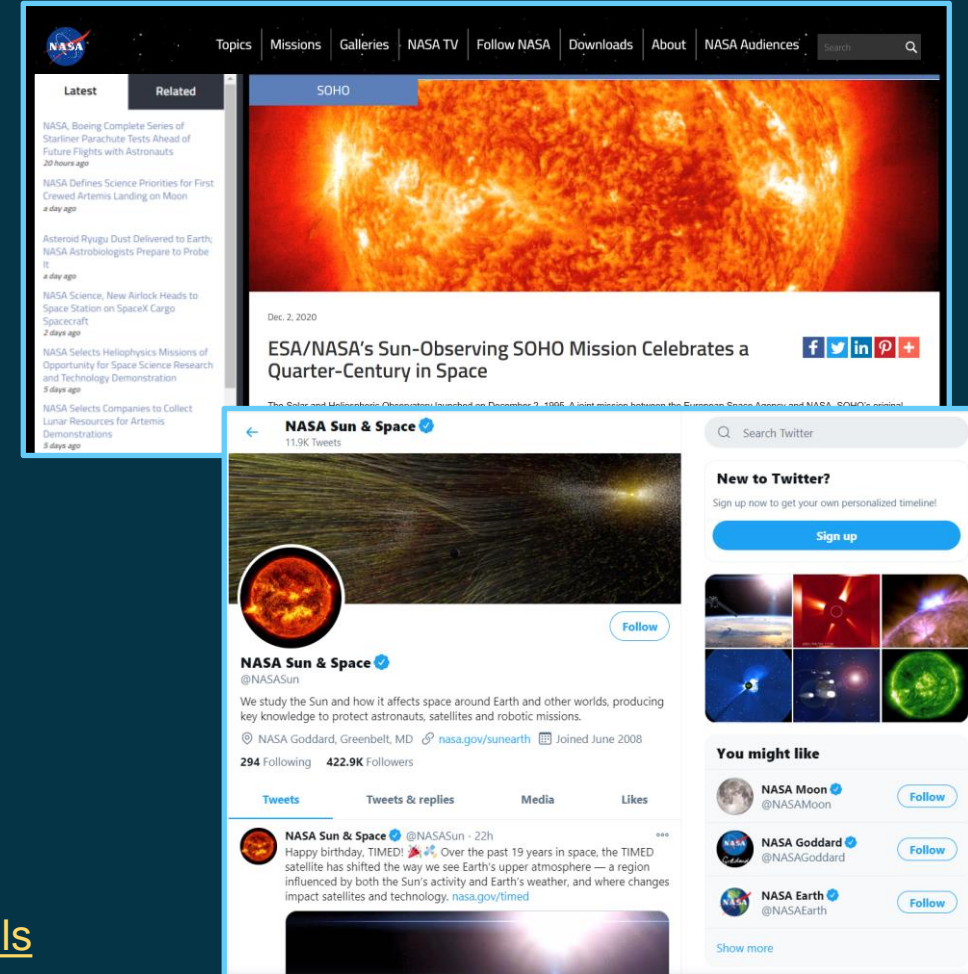
- <https://bit.ly/SubmitHelioScience>
- <https://lwstrt.gsfc.nasa.gov> (LWS Research Highlights)

Web and social media:

- [NASA.gov/sunearth](https://www.nasa.gov/sunearth)
- blogs.nasa.gov/sunspot
- [@NASASun](https://twitter.com/NASASun)
- facebook.com/NASASunScience

Volunteer for a panel:

- <https://science.nasa.gov/researchers/volunteer-review-panels>

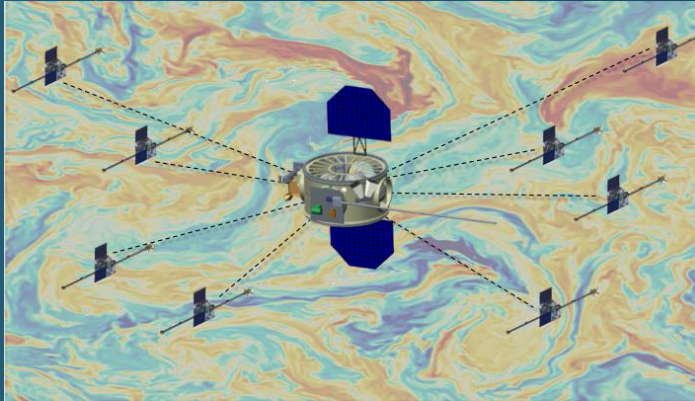


**Town Hall Today at 1230 Onyx Ballroom
ESA/NASA Lower Thermosphere-
Ionosphere Science (ENLoTIS)
Working Group**

#HelioRocks!

**Job opportunity for program scientists
will be opening mid-July. Applications
from CEDAR community members are
encouraged!**

FY23 President's Budget Features



What's the Same

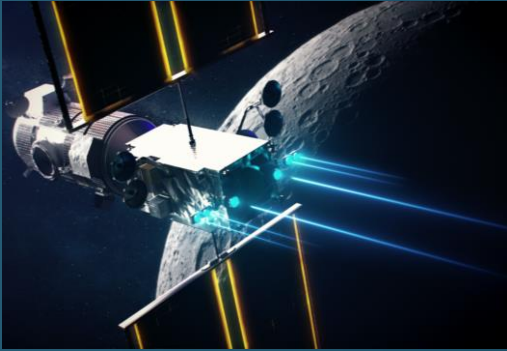
- Support for 20 operating science missions
- Support for EUVST, EZIE, TRACERS, Solar Cruiser (Phase B) and AWE (Phase C)
- Robust research program, including the DRIVE initiative
- Investments in data facilities and archives, including mission operations services

What's Changed

- MIDEX-19 selections in early 2022: MUSE and HelioSwarm
- Creation of new Space Weather Program; includes contribution to HERMES
- Investments in Orbital Debris detection technology
- Support for additional selection of DRIVE Science Center (3 total)
- Adjusted profiles for successfully confirmed missions: IMAP, PUNCH, GLIDE, SunRISE, and HERMES
- Confirmation of ESCAPADE
- Out year reductions potentially delay implementation of Geospace Dynamics Constellation (GDC)
- In order to support current & planned Heliophysics portfolio, the budget does not fund future DYNAMIC mission or FY23 contributions to the ESA L-5 mission

NASA Space Weather

Recent Accomplishments



- Established Space Weather Council; first meeting held March 2022
- HERMES passed KDP C in early 2022 and interdisciplinary scientists selected
- Developed a NOAA and DoD Framework to transition NASA research, techniques and technology relevant to space weather operations
- Supported the Research to Operations to Research (R2O2R) grant solicitation via Transition-Step for efforts that show promise to use in an operational space weather environment at NOAA or DoD
 - Made selections for ROSES-21 (6 selections)
- Space Weather Centers of Excellence solicitation (ROSES-22)
- Four Space Weather CubeSats selected: CubIXXS/SwRI; DYNAGLO/UCBoulder; WindCube/UCAR; SunCET/APL



Looking Ahead

- PROSWIFT: continue with actions already underway to support interagency efforts, space weather observations, research, modeling, operational forecasting, and applications (SOHO, SWFO-L1, R2O2R)
- Develop space weather instrument pipeline for future opportunities
- Engage international partners on future collaborations: Vigil, **ENLoTIS (ESA)**, AOM (CSA), SNIPE (KASI)



MIDEX Announcements

On Feb. 10, NASA selected two new science missions to help improve our understanding of the dynamics of the Sun & the Sun-Earth connection:

Multi-slit Solar Explorer (MUSE)

- Multi-slit spectrometer to observe the Sun's extreme ultraviolet radiation
- Obtain highest resolution images ever captured of the solar transition region and the corona.
- Mission PI: Bart DePontieu of the Lockheed Martin Advanced Technology Center Mission.

HelioSWARM

- Constellation of nine spacecraft that will capture first multiscale measurements of magnetic field fluctuations and motions of the solar wind known as solar wind turbulence.
- Consists of one hub spacecraft and eight co-orbiting small satellites.
- Mission PI: Harlan Spence, University of New Hampshire.