NASA Heliophysics

Space Weather Council Kick Off

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Solve the **fundamental physics** mysteries of heliophysics: Explore and examine the physical processes in the space environment from the Sun to the Earth and throughout the solar system including the interface with the interstellar medium.

Build the **knowledge to forecast space weather** throughout the heliosphere: Develop the knowledge and capability to detect and predict extreme conditions in space to protect life and society and to safeguard human and robotic explorers beyond Earth.

Understand the **nature of our home in space**: Advance our understanding of the connections that link the sun, the Earth, planetary space environments, and the outer reaches of our solar system.
HELIOPHYSICS SYSTEM OBSERVATORY

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

OPERATING & FUTURE

CubeSats

In Development

- AEPEX
- AERO / VISTA
- CIRBE
- CURIE
- CuSP
- Dione
- GTOSat
- ICOVEX
- LAICE
- LLITED
- CubIXS
- petitSat
- SunCET
- REAL
- WindCube

On Orbit

- ELFIN
- DYNAGLO
- CuPID
- SunRISE
- DAI Li
- SPORT
- Padre

Hosted Payloads

In Development

- CODEX
- LARADO
- MinXSS-3
- OWLS
- STORIE

On Orbit

- MUSE
- HelioSwarm
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)**
- MUSE will utilize a multi-slit spectrometer to observe the Sun’s extreme ultraviolet radiation
- Obtain the highest resolution images ever captured of the solar transition region and the corona.
- Mission PI: Bart DePontieu of the Lockheed Martin Advanced Technology Center

**HelioSWARM**
- A constellation or “swarm” of nine spacecraft that will capture the first multiscale in-space measurements of fluctuations in the magnetic field and motions of the solar wind known as solar wind turbulence.
- Consists of one hub spacecraft and eight co-orbiting small satellites that range in distance from each other and the hub spacecraft.
- Mission PI: Harlan Spence, University of New Hampshire.
- Mission budget: $250 million.
Mission and Division Highlights

• Parker Solar Probe enters the Solar Atmosphere for the first time, bringing new discoveries
  • Three years after launch, Parker has now flown within the Sun’s inner corona, sampling particles and fields still bound to the Sun’s atmosphere

• Daily Atmospheric Ionospheric Limb Imager (DAILI) CubeSat successfully launched Dec. 21 on SpaceX CRS-24 from KSC. Deployed from the ISS on Jan. 27

• The Miniature X-Ray Solar Spectrometer 3, or MinXSS-3, successfully launched on the InspireSat-1 small satellite on Feb. 13, 2022. It will spend up to a year in LEO studying X-rays coming from flares on the Sun.

• Congratulations!!
  • GLIDE completed KDP C Jan. 13
  • HERMES completed KDP C Jan. 27

• Community announcement for the 2022 Small Explorer (SMEX) and Heliophysics Explorers (HEP) Programs was released on Dec. 22
Parker Solar Probe Captures Images of Venus

As Parker Solar Probe flew by Venus on its fourth flyby, its WISPR instrument captured these images, strung into a video, showing the nightside surface of the planet. Credits: NASA/APL/NRL
Late on Feb. 15th Solar Orbiter captured a massive solar prominence with its EUI instrument, pictured left. The prominence is estimated to be around 6 solar radii in size and will directly impact Parker Solar Probe. Data from PSP will be downlinked following its next solar encounter. SOHO’s LASCO instrument captured the video at right.
NASA was finally able to complete the mission by going at night.
Future Highlights

• On Feb. 25, Parker Solar Probe reached perihelion #11, with its closest approach to the Sun reaching 5.3 million miles.
  • Parker Solar Probe passed the Sun’s Earth-facing side. Many opportunities for Earth-bound missions and other spacecraft to give us multiple viewpoints of solar events
NASA Space Weather Strategy

Vision

• Advance the science of space weather to empower a technological society safely thriving on Earth and expanding into space.

Mission

• Establish a preeminent space weather capability that supports robotic and human space exploration and meets national, international, and societal needs by advancing measurement and analysis techniques, and by expanding knowledge and understanding for transitioning into improved operational space weather forecasts and nowcasts.
PROSWIFT allows NASA to focus on what NASA does best in space weather: Pushing the limits of our understanding the Sun-Earth system including space weather phenomena and leading the evolution of the space-based network of Heliophysics observatories – and the science behind them – through new missions, technology development, and cutting-edge research and modeling.

In this sense, NASA Heliophysics:

• **Pioneers new techniques, technology, observations,** and advances knowledge relevant to space weather.

• **Launches space investigations** that solve scientific questions to remove barriers to improved space weather forecasting.

• **Funds research** that uses observations and advances models to predict and understand the variability of the space environment.

• **Transitions techniques, technology, models, and knowledge** to operations.

• **Collaborates with other agencies and international partners** to advance space weather knowledge and operations to meet national and societal needs.
Ties together three major Heliophysics events in 2023-2025 (2 solar eclipses, solar maximum) to maximize participation in a coordinated incentivized citizen science campaign.

- NASA is developing a program to use these remarkable events to highlight and motivate 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

What is a “Big Year”? A big year is a birding term for maximizing a birder’s number of species.
Get Involved and Stay Informed!

We are continuing to work hard to grow the Heliophysics community, especially at a time where we find ourselves so separated. 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:
  • https://science.nasa.gov/researchers/virtual-townhall-2020

Let us know what you’ve been working on:
  • https://bit.ly/SubmitHelioScience

  • Web and social media:
  • NASA.gov/sunearth
  • blogs.nasa.gov/sunspot
  • @NASASun
  • facebook.com/NASASunScience

Volunteer for a panel:
  • https://science.nasa.gov/researchers/volunteer-review-panels