



Heliophysics Digital Resource Library (HDRL): Unlocking the Power of Heliodata

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HDRL Organizational Chart

HP Data and Model Consortium / HDMC

Brian Thomas (PS), Tressa Helvey-Kasulke, Rebecca Ringuette
Overall Management of the HDRL.

Registries, Metadata and DOIs for all digital resources; SPASE Data Model. Python and other software integration (PyHC). Analysis and visualization services: (Py)SPEDAS, Autoplot. Cross-cutting Services (HelioData, HEK space physics) Cloud initiative with data and shared software environments

Data Integration and Services for Heliophysics (DISH)

Space Physics Data Facility / SPDF

Robert Candey (PS), Lan Jian (DPS)

Final Active Archive of non-solar or space physics data for NASA heliophysics (& other) missions. CDAWeb data browsing and access; Web Service access. OMNIWeb data production and serving. SSCWeb and 4-D spacecraft orbit viewer. Common Data Format (CDF). ISTEP metadata standards.

Solar Data Analysis Center / SDAC

Jack Ireland (PS)

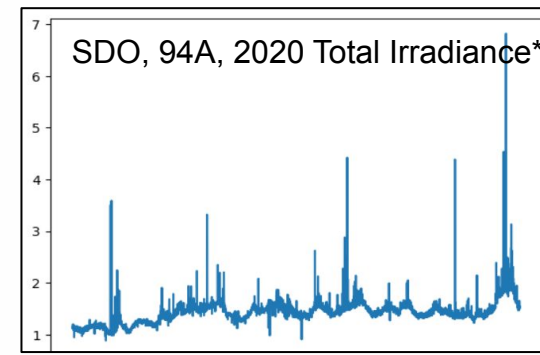
Final Active Archive of solar data for Solar Dynamics Observatory (SDO) and other NASA missions. Virtual Solar Observatory data access. Helioviewer. SolarSoft. SunPy. High Performance Computing for NASA HP.

Data Integration & Services for Heliophysics (DISH)

DISH fills gaps in HDRL needs which help unite shared aspects of solar and space physics resources. Deals with cross-cutting issues.

HelioCloud.org democratizes HEC

A user can access 'bursting' compute and cloud-based data to process 1 year of 94 Å SDO data (~2 TB) in 27 mins vs 2+ weeks with a traditional approach!



Source: Antunes et al. 2023

Research Community of ~180 Scientists (~60 'active')

Uploaded "High Value" datasets: ~1.2 PB and growing.

A member of IHDEA

Leading New Standards for Heliophysics

Coordinates, Units, Events, Software Environments, Standards for Services & APIs (HAPI), Semantics, SPASE 3.0

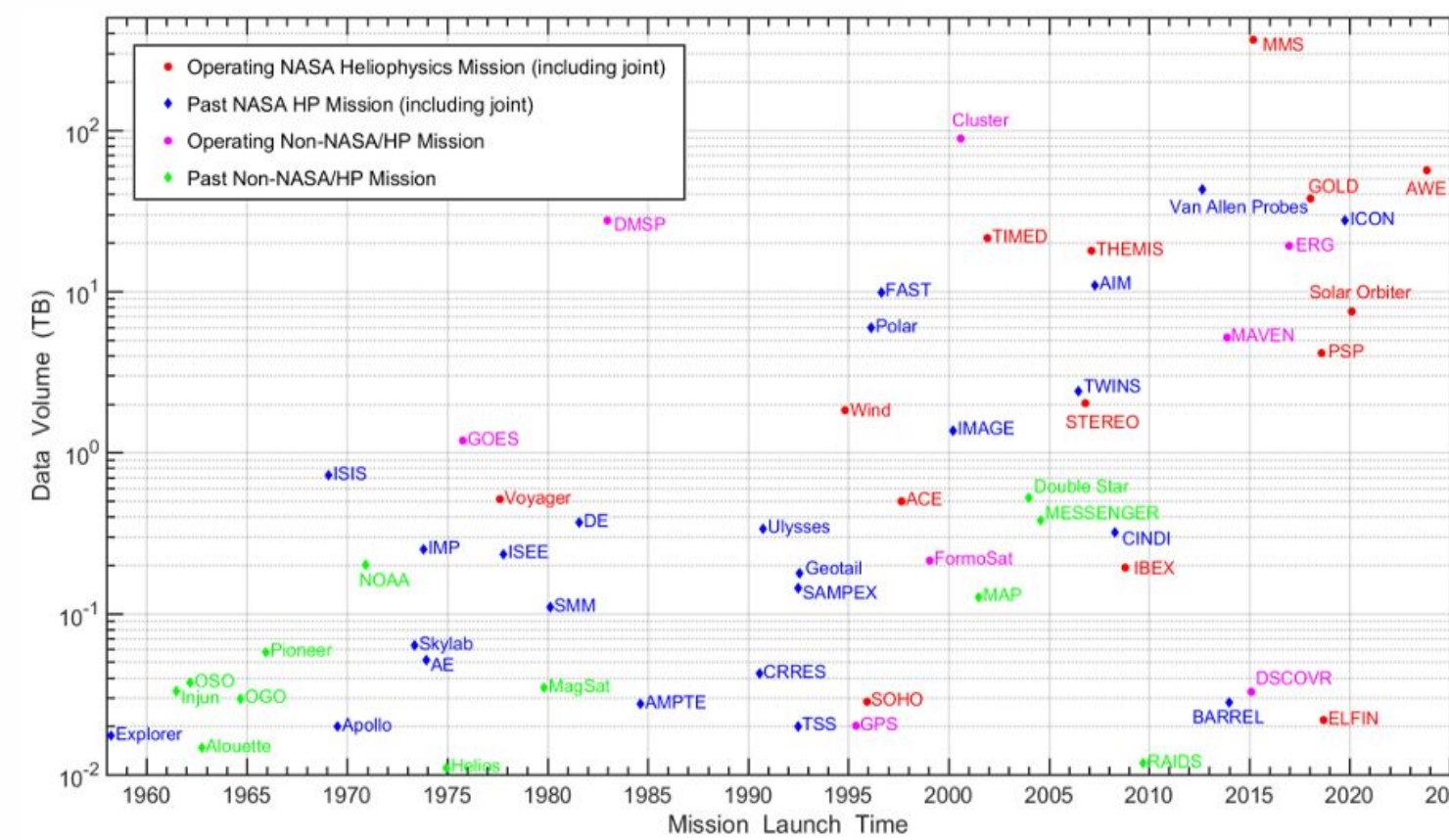
Heliophysics Research Repository on Zenodo

A specialized automatically curated community on Zenodo for NASA-funded Heliophysics research. Discoverable on the website.

Coming soon!



Space Physics Data Facility (SPDF)

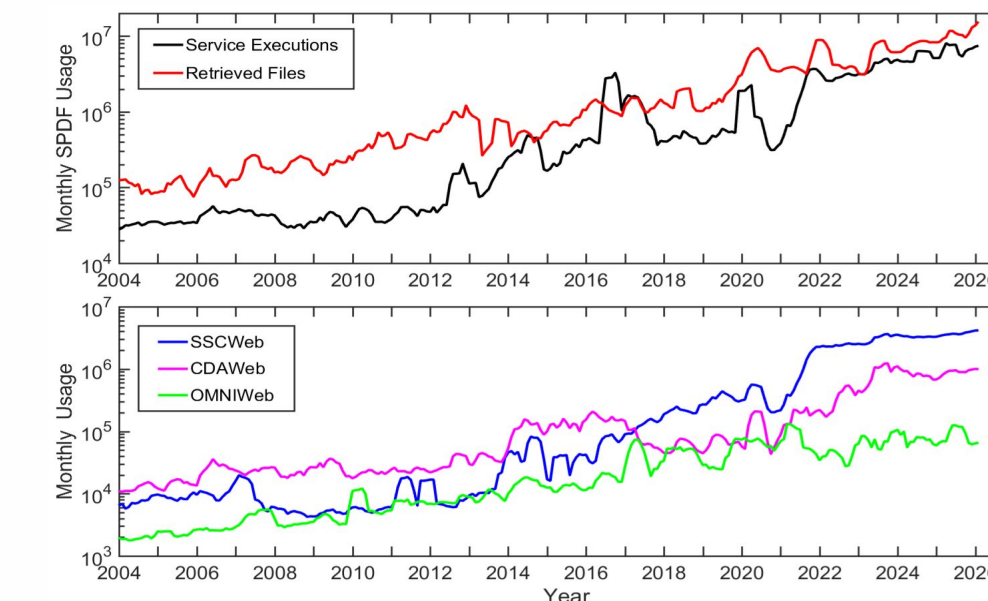


SPDF holds ~ 110 M files, 800 TB, 9000 datasets from >100 missions. They cover from the Sun to the local interstellar medium including magnetosphere – ionosphere – thermosphere – mesosphere (M-ITM) of applicable planets.

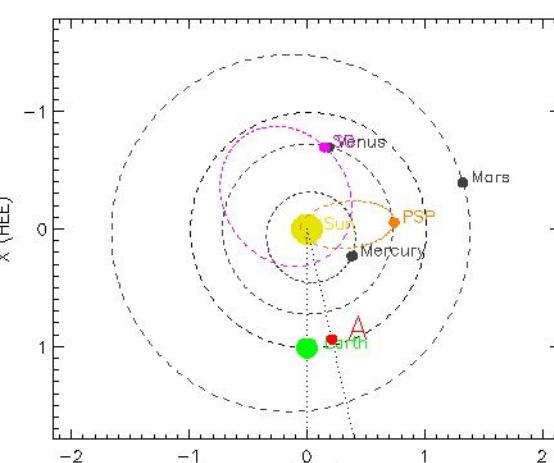
Main science-enabling services: Coordinated Data Analysis Web (CDAWeb), Satellite Situation Center (SSC), OMNI Web

For Space Weather, SPDF

- Archives and serves
 - Low-latency data from **IMAP**, Solar Orbiter, STEREO, Wind, ACE, and other missions
 - Radiation data from BioSentinel, Mars Science Laboratory, and others
- Is going to serve **SOLAR-1** science data per the mission's request
- Makes **OMNI** and summary data (plasma, mag, energetic particles) of deep-space missions: useful for space weather model input and validation.
- Makes s/c orbit plots using real (nominal) solar wind parameters when OMNI data are (un)available and serve them at Plot Wall



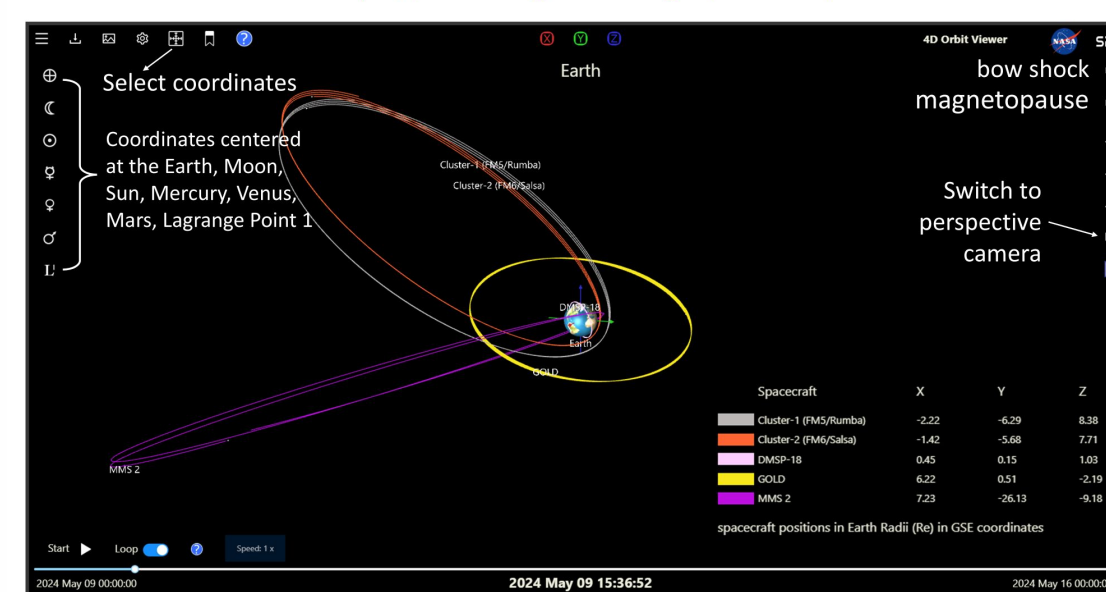
~45% of JGR-Space Physics and 57% of Space Weather papers in 2025 acknowledged SPDF services and data



Coordinated radio diagnostics of CMEs and solar flares (CROCS)

4-D Orbit Viewer (160+ Spacecraft)

https://sscweb.gsfc.nasa.gov/4dorbit/



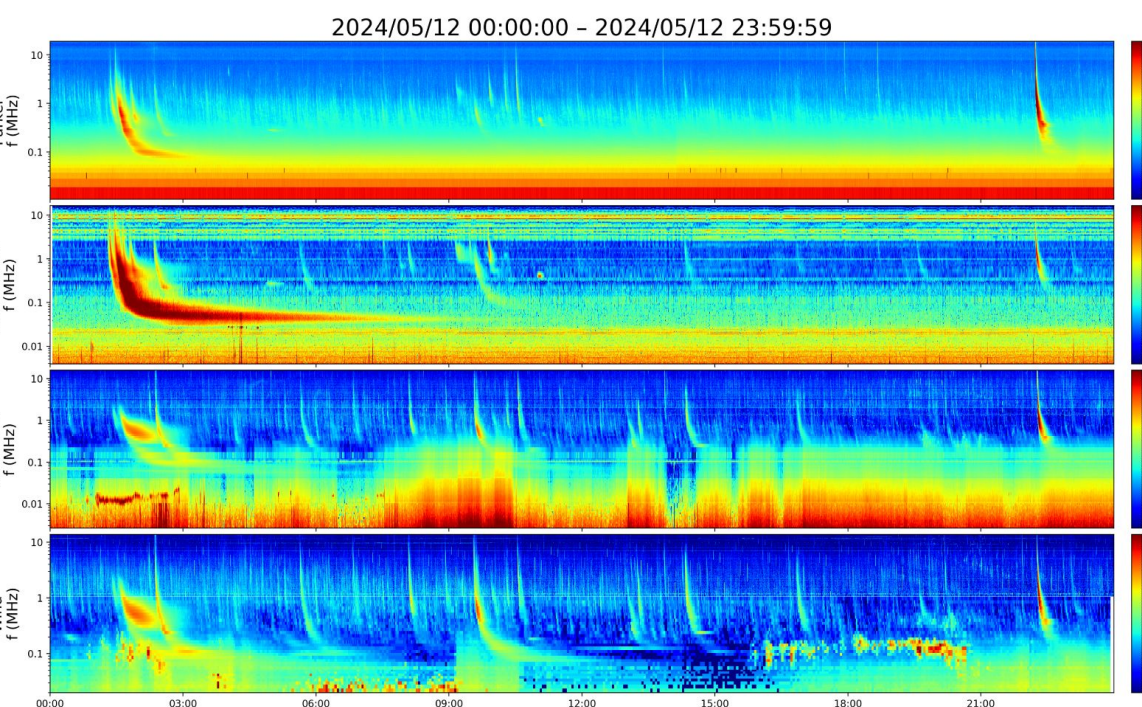
Example Parameter Displays in CDAWeb

More at <https://cdaweb.gsfc.nasa.gov/about.html>

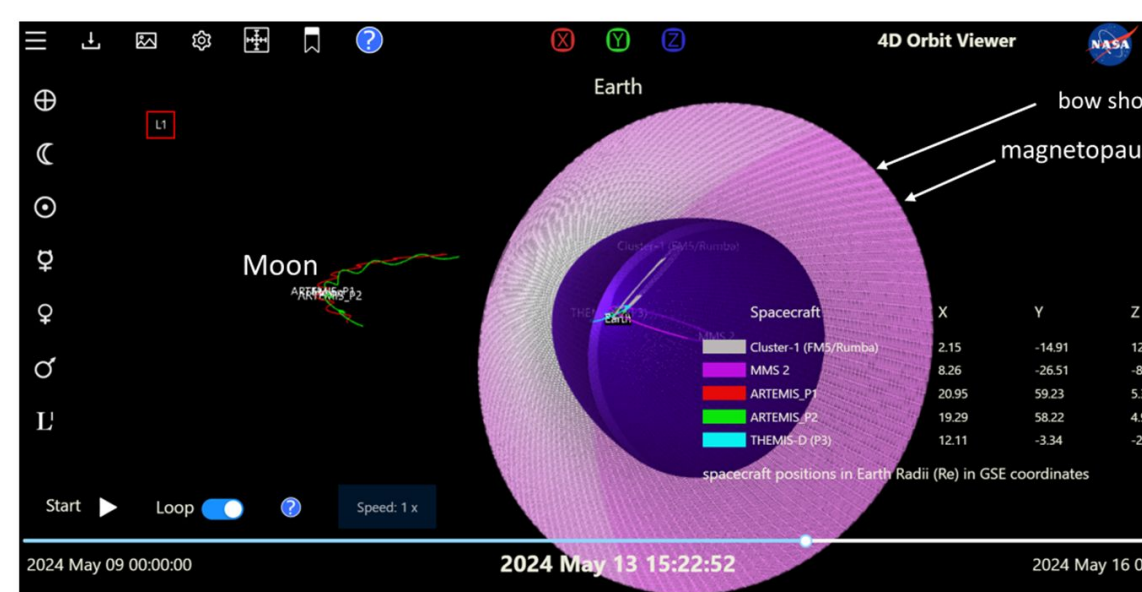
Inventory Plot for Mission Datasets

https://cdaweb.gsfc.nasa.gov/sc_inventory_plots/

Plot Walk for pre-generated summary or quick-look plots from ~30 missions (~17 million plots)



4-D Orbit Viewer: Rotation of Coordinates



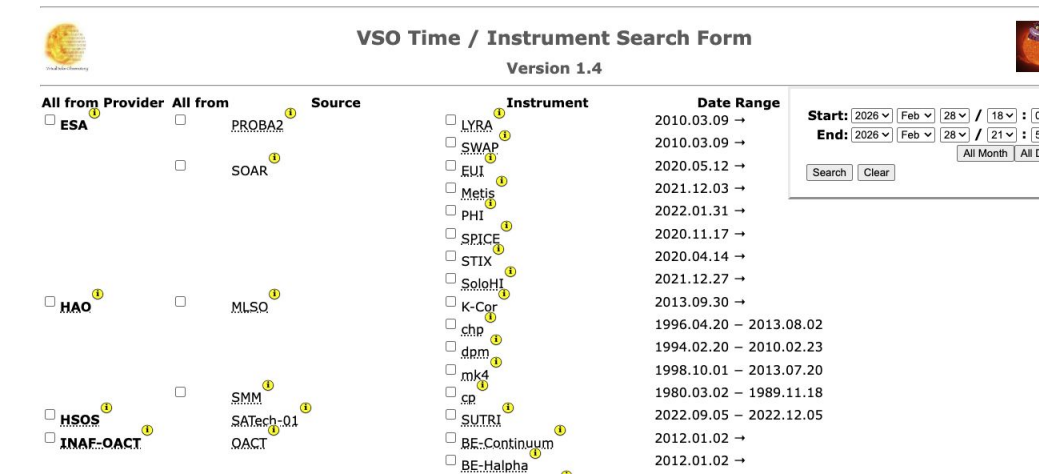
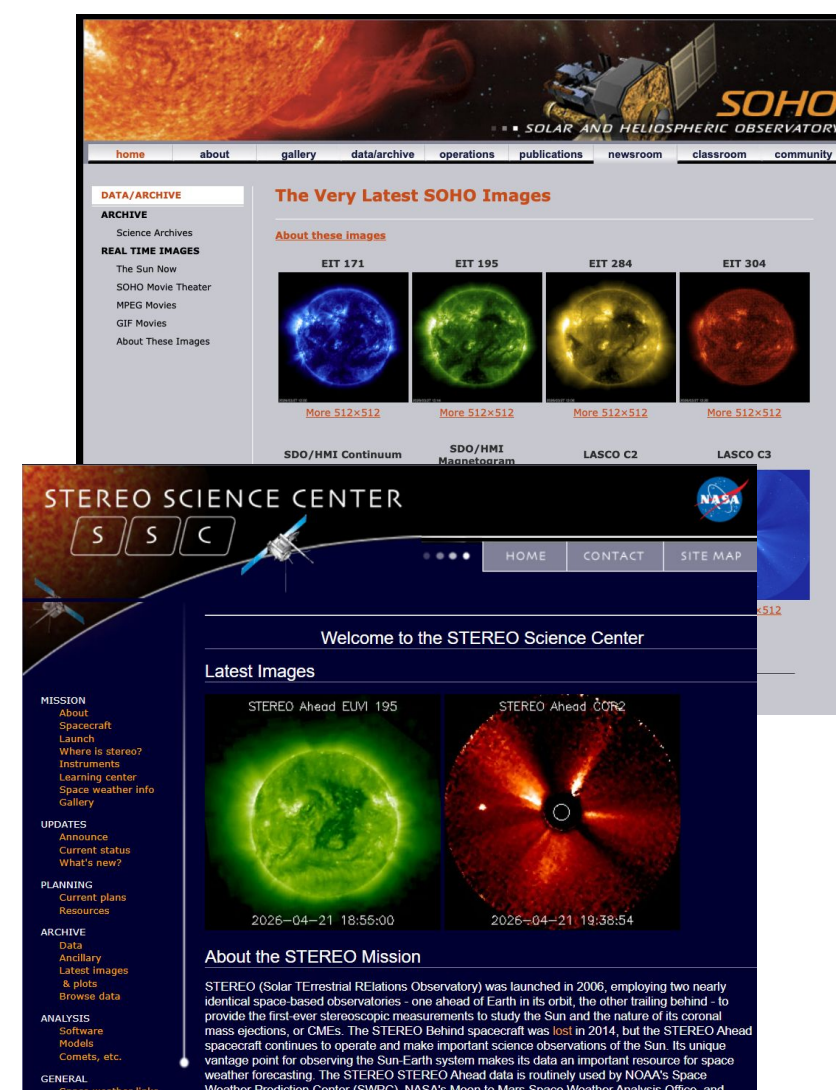
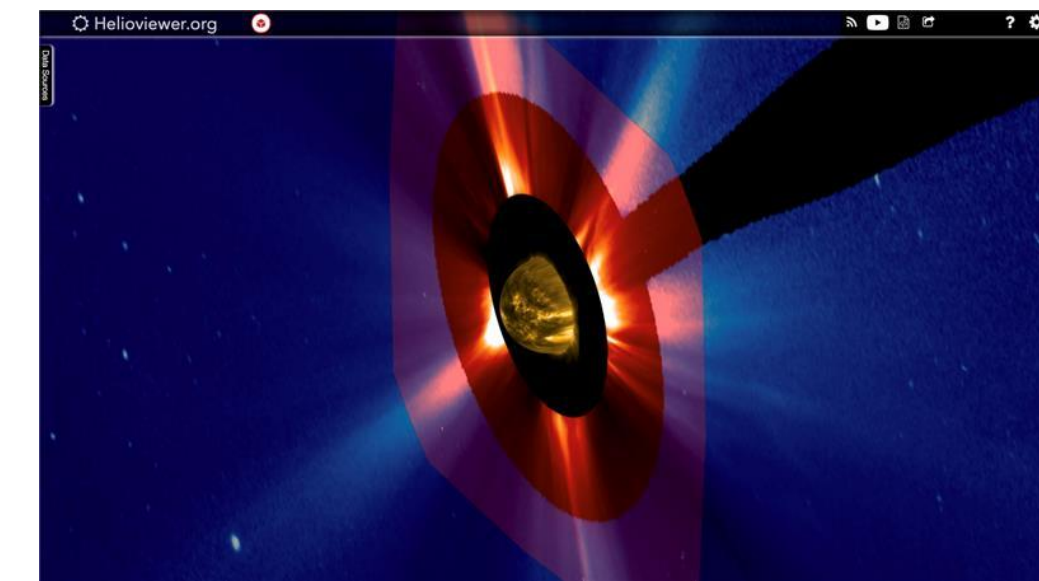
Solar Data Analysis Center (SDAC)

The mission of the SDAC is to support the scientific analysis of solar physics data.

SDAC develops and maintains scientific data analysis and research infrastructure that supports the big questions and focus areas of NASA's Heliophysics Science Division.

Core Capabilities

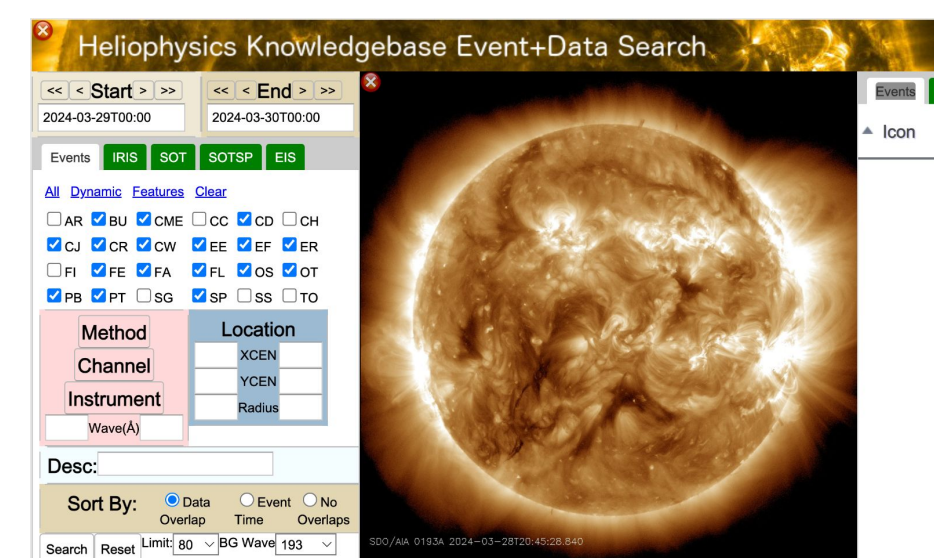
- Data Analysis and Processing Software
 - Solarsoft: mission data processing and scientists
- Data Visualization
 - Helioviewer.org
 - JHelioviewer
 - >400k movies and ~4.8M screenshots in 2025
- Operating Mission Science Data Hosting
 - SOHO
 - STEREO



- Data Search and Access
 - Virtual Solar Observatory
 - SDAC + national/international archives
 - Interfaces with SDO data system
 - Over 5M queries in 2025
 - Supported solar features and events efforts - CDAW, HEK

- SOHO Science Instrument Operations
 - LASCO
 - EIT
 - Other instruments onboard SOHO as needed

- Data Archiving
 - All operating NASA-funded solar physics missions
 - PUNCH
 - PADRE
 - Data from previously operating rockets, cubesats, missions



https://helio.data.nasa.gov

HDRL resources are now more discoverable from the view point of early-career researchers and the public

SPASE inside

Search For Data

HelioData Provides Pathways to Heliophysics Data

HelioData: Solar Atmosphere

Sub-Categories: Photosphere, Chromosphere

Data Collection	First Available Date	Last Available Date	Dataset Count
Solar Dynamics Observatory (SDO)	2010-04-08	1 Feb 2025	52
Solar Terrestrial Relations Observatory (STEREO)	1989-12-02	1 Feb 2025	15
ScreenShot	2025-04-01	5 Feb 2025	11