Enhancing Access to Solar Orbiter Data: Recent Updates to Solar Orbiter ARchive (SOAR)

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The ESAC Science Data Centre (ESDC) based at ESAC (European Space Astronomy Centre) in Madrid, plays a crucial role in preserving and providing long-term access to data from all ESA space science missions. Recent enhancements to the Solar Orbiter ARchive (SOAR) and its inclusion in the new HelioPhysics Archive (HPA) aim to provide researchers with more intuitive and powerful tools for data access. These updates include the ability to search data by solar distance and utilise Field of View (FoV) tables. The contents of the Solar Orbiter mission orbit file have been ingested and is available via our standard TAP interface. This allows users to search a rich set of metadata based on distance and latitude with ADQL requests. Integration with commonly used tools like SunPy, Autoplot, TOPCAT and soon the NASA Virtual Solar Observatory (VSO) has further streamlined data access and interoperability. Other upcoming features are presented.

SOAR Search Features: https://soar.esac.esa.int/soar/

Home
Search (this page)
Results (of all searches)
Help
Contact us

links to Documentation, Solar Orbiter Observing Plan (SOOP) info Inventories

Science data
Auxiliary: Orbit file, ANC, CAL and SPICE kernels
Sign in for asynchronous downloads

Search criteria:
Time, start and end
Instrument (multi)
Processing level (multi)
Filename (text, with assumed * at each end)
SOOP name or type (single)
Solar distance
Include low latency and/or inactive (withdrawn) data

Search with these search criteria
Start again

SOAR Results Features

Previous search results tab
Current search results tab
Search criteria (hover over tab)
Table of basic file metadata
Sign in for asynchronous downloads or private files

Total number found
Blue data_item_id for FITS and CDF - click for metadata information
Tick boxes to select files

Metadata view:
Preview of postcard
Internal FITS (or CDF) metadata
File versions held in the archive
FITS Extensions info
World Coordinate System data

More pages of results
Icon indicates preview and postcards (.png) available
Download selected files
Download all files asynchronously (50GB max)

SOAR User Help: https://www.cosmos.esa.int/web/soar/home

The SOAR User Guide pages include assistance on accessing data on the web interface and via scripts (see bottom left), but also resources like documentation, tutorials, calibration files, inventory plots, and ways to register and contact us for any issues or assistance.

GETTING TO DATA
Open access and registration
Web interface user guide
Advanced search
- Telescope / sensor / Cadence
- Product with specific unit
- Solar Distance
- Solar Orbiter Observing Plan (SOOP)
Programmatic access - guide to using TAP
- Access to metadata, data, inventory info
Inventory plots
Field of View plots tool

RESOURCES
Data tutorials
- Jupyter notebooks tutorials
- Getting data with sunpy-soar
- IDL data tutorials
Community resources
- SOLAR-MACH: a multi-spacecraft plotter
- Magnetic Connectivity tool
- Combined in-situ quicklook plots
- Solar Energetic particle analysis tools
Instrument teams' resources
- Latest data
- Movie gallery
- Quicklook plots
- Data analysis tools

DOCUMENTATION
Trajectory / Orbit information
Instrument documentation
Calibration files and monthly reports
SOOPs detailed information
SOAR release notes

CONTACT US

HPA Tree View

Select files by group
Download selected files
Download all files asynchronously (50GB max)
Sign in for asynchronous downloads or private files

Search criteria:
Time, start and end
Instrument (multi)
Processing level (multi)
Filename (text, with assumed * at each end)
SOOP name or type (single)
Include inactive (withdrawn) data

Total number found by remote sensing, instrument, type of data and same for in-situ

Remote sensing instruments (987)
- EUI (240)
- Meta (399)
  - Visible (352)
  - UV Lyman-alpha (47)
- PHI (4)
- SOLOHI (180)
- SPICE (112)
- STIX (52)
In-situ instruments (288)
- EPD (108)
- MAG (39)

NOT YET PUBLICLY AVAILABLE: EXPECTED BY END-JUNE

Search with these search criteria
Start again
Tooltip help

Introducing... The HelioPhysics Archive (HPA):
brings together all ESA's heliophysics missions in operations and legacy. Released on 7 April 2025, currently allows access to each individual archive web interfaces but also the Fields of View interface, shown to the right. The alternative file search with results in a tree view, rather than listed files (above) is shown to the left.

https://hpa.esa.int/

SOLAR ORBITER | CLUSTER | ULYSSES | PROBA-2 | DOUBLE STAR | SOHO
SEARCH →

Fields of View Displays

Navigation through plots:
Previous -30 min -1 day First
Positions of Sun, Earth & spacecraft
Help
EUI FSI 174 Å image + fields of view for available instruments from Solar Orbiter
SDO AIA 171 Å image + fields of view for available instruments from Earth

Search criteria:
start time
end time
EUI/HRI
PHI/HRT
SPICE
link to Solar Orbiter Observing Plan (SOOP) info

Navigation:
Next
+30 min
+1 day
Last

Metadata:
Experiment, Sensor, Time, SOOP, x/y location from SolO, x/y location from Earth

- Right-click to download images
- Inventory adapts: Carrington Rotation, year, or mission based on time range of search

Download all data files for search criteria
Inventory of relevant files
Download all metadata for search criteria

TAP and ADQL
Table Access Protocol (TAP) allows Astronomical Data Query Language (ADQL) queries to the archive database, which enables much more powerful searches than the web.

- The database is made up of tables
- The contents of these tables can be investigated with e.g., TOPCAT
- ADQL queries can find the data matching the criteria (in red below)
- Queries can be launched in several ways: e.g., a URL in a browser, wget, curl, TOPCAT or Python, IDL, MatLab, etc.
- Full help and extensive examples in Help Pages (see top right)
- Also, SunPy allows easy access to many data sources for easy plotting, manipulation and comparisons and has a dedicated SOAR package (sunpy-soar)

Example ADQL queries:
`SELECT TOP 10 * FROM v_sc_data_item WHERE instrument='EUI' AND level='L2' AND insertion_time>'2024-05-01'`

`SELECT data_item_id FROM v_sc_data_item WHERE instrument='MAG' AND begin_time>='2023-03-03T00:00:00' AND end_time<='2023-04-03T00:00:00'`

begin_time	data_item_id	data_item_oid	data_type	descriptor	end_time	file_format	filename	filesize	generation_time	icon
object	object	int64	object	object	object	object	object	int64	object	object
2022-04-03T00:00:00.0	solo_L1_epd-step-quicklook_20220403	625266	SCI	EPD-STEP-QUICKLOOK	2022-04-04T00:00:00.0	CDF	solo_L1_epd-step-quicklook_20220403_V03.cdf	1718973	2022-07-06T02:02:34.0	
2022-04-02T00:00:00.0	solo_L2_epd-het-sun-rates_20220403	625264	SCI	EPD-HET-SUN-RATES	2022-04-04T00:00:00.0	CDF	solo_L2_epd-het-sun-rates_20220403_V01.cdf	1164209	2022-07-04T02:20:02.0	
2022-04-02T00:00:00.0	solo_L2_epd-het-sun-aux_20220403	625263	SCI	EPD-STEP-AUX	2022-04-04T00:00:00.0	CDF	solo_L2_epd-het-sun-aux_20220403_V01.cdf	761695	2022-07-04T23:42:24.0	
2022-04-02T00:00:00.0	solo_L2_epd-sis-a-rates-fast_20220403	625262	SCI	EPD-SIS-A-RATES-FAST	2022-04-04T00:00:00.0	CDF	solo_L2_epd-sis-a-rates-fast_20220403_V01.cdf	1970803	2022-07-04T03:10:03.0	
2022-04-02T00:00:00.0	solo_L2_epd-sis-b-rates-fast_20220403	625261	SCI	EPD-SIS-B-RATES-FAST	2022-04-04T00:00:00.0	CDF	solo_L2_epd-sis-b-rates-fast_20220403_V01.cdf	464815	2022-07-04T03:10:01.0	
2022-04-02T00:00:00.0	solo_L2_epd-ept-asun-rates_20220403	625260	SCI	EPD-EPT-ASUN-RATES	2022-04-04T00:00:00.0	CDF	solo_L2_epd-ept-asun-rates_20220403_V01.cdf	12860550	2022-07-02T19:54.0	

Datalabs
Datalabs provides internet accessible Dockers where the volumes for archives can be mounted locally, allowing code to be brought to the data, rather than large amounts of data needing to be downloaded to a local machine.
Modules can be added to the local environment, and the personal workspace ensures that your work is kept safe.
Tutorials for each Solar Orbiter instrument are available through the Help Pages (top right)

Apply for an account: https://datalabs.esa.int

Contact us!
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or Service Desk: