

ESA report

Arnaud Masson, Science Lead, Heliophysics archives, SCI-SAA

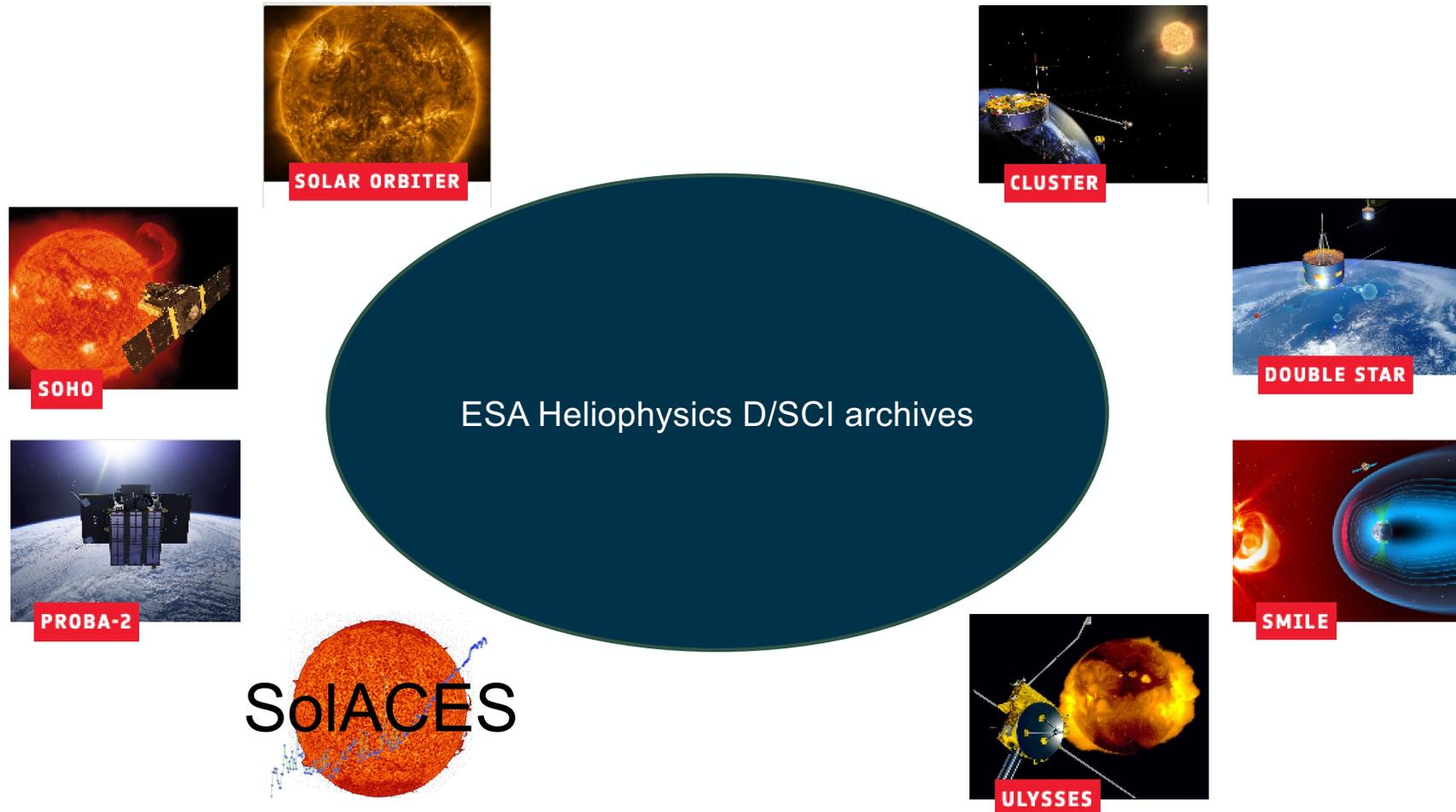
IHDEA 2024, 17/10/2024

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1. Introduction
2. Heliophysics archives: recent highlights
3. Development of upcoming mission archives and long term preservation
4. IHDEA related activities and ways forward

Heliophysics science archives



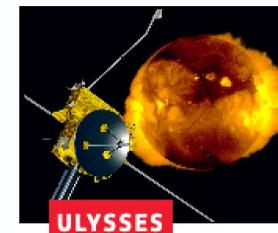
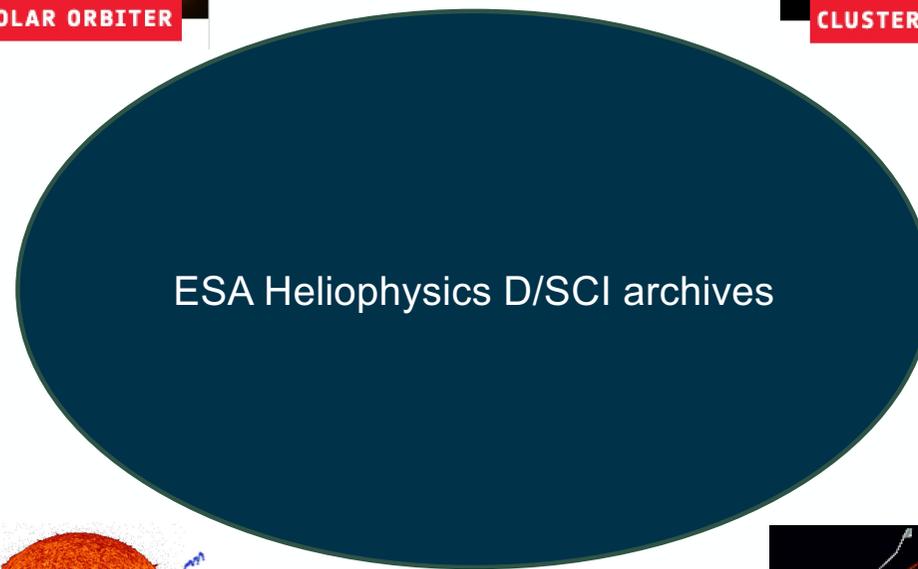
Heliophysics science archives: highlights

Solar Orbiter
Archive (SOAR)



Cluster Science
Archive (CSA)

SOHO
Science
Archive
(SSA)



2. Heliophysics science archives: highlights

- Solar Orbiter data can now be searched by Solar Orbiter Observing Plan, i.e., by data campaigns during remote sensing windows

<https://soar.esac.esa.int/>

2. Solar Orbiter ARchive (SOAR) highlights

- Solar Orbiter data can now be searched by Solar Orbiter Observing Plan, i.e., by data campaigns during remote sensing windows
- High resolution data from several instruments up to a few days, often amounting up to 15,000 files
- Can be downloaded in one click
- Possible up to 50 GB
- Data are packaged, zipped and an email sent when ready to collect them

Item Id	Level	Descriptor	Begin Time	End Time	Instrument	Sensor	File Size	Archived On
solo_L2_eui-hrilya1216-image_20220322T081910265	L2	eui-hrilya1216-image	2022-03-22T08:19:10.265	2022-03-22T08:19:13.265	EUI	HRI1216	1 MB	2023-05-24T05:47:22.83
solo_L2_eui-hrilya1216-image_20220322T082010265	L2	eui-hrilya1216-image	2022-03-22T08:20:10.265	2022-03-22T08:20:13.265	EUI	HRI1216	1 MB	2023-05-24T05:47:42.848
solo_L2_eui-hrilya1216-image_20220322T082110272	L2	eui-hrilya1216-image	2022-03-22T08:21:10.272	2022-03-22T08:21:13.272	EUI	HRI1216	1 MB	2023-05-24T05:47:41.834
solo_L2_eui-hrilya1216-image_20220322T082210373	L2	eui-hrilya1216-image	2022-03-22T08:22:10.373	2022-03-22T08:22:13.373	EUI	HRI1216	1 MB	2023-05-24T05:47:40.887
solo_L2_eui-hrilya1216-image_20220322T082310265	L2	eui-hrilya1216-image	2022-03-22T08:23:10.265	2022-03-22T08:23:13.265	EUI	HRI1216	1 MB	2023-05-24T05:47:39.856
solo_L2_eui-hrilya1216-image_20220322T082410265	L2	eui-hrilya1216-image	2022-03-22T08:24:10.265	2022-03-22T08:24:13.265	EUI	HRI1216	1 MB	2023-05-24T05:47:38.826
solo_L2_eui-hrilya1216-image_20220322T082510275	L2	eui-hrilya1216-image	2022-03-22T08:25:10.275	2022-03-22T08:25:13.275	EUI	HRI1216	1 MB	2023-05-24T05:47:37.873
solo_L2_eui-hrilya1216-image_20220322T082610300	L2	eui-hrilya1216-image	2022-03-22T08:26:10.300	2022-03-22T08:26:13.300	EUI	HRI1216	1 MB	2023-05-24T05:47:36.814

<https://soar.esac.esa.int/>

2. SOAR highlights

- Search by solar distance

e.g., allows to get all MAG data measured at a distance below 0.5 AU (turbulence, switchbacks...)

- Available through SunPy, TAP (command line) and SOAR GUI

The screenshot shows the Solar Orbiter Archive interface. At the top, it says 'Solar Orbiter Archive' and 'SOAR 1.14.0'. Below that, there are search filters and a table of results. A dialog box is open in the center, asking for confirmation to download all files. The table has columns for Item Id, Level, Descriptor, Begin Time, End Time, Instrument, Sensor, File Size, and Archived On. The results show multiple entries for 'eui-hrly1216-image' at L2 level, with various timestamps and file sizes.

Item Id	Level	Descriptor	Begin Time	End Time	Instrument	Sensor	File Size	Archived On
solo_L2_eui-hrly1216-image_20220322T081910265	L2	eui-hrly1216-image	2022-03-22T08:19:10.265	2022-03-22T08:19:13.265	EUI	HR1216	1 MB	2023-05-24T05:47:22.83
solo_L2_eui-hrly1216-image_20220322T082010265	L2	eui-hrly1216-image	2022-03-22T08:20:10.265	2022-03-22T08:20:13.265	EUI	HR1216	1 MB	2023-05-24T05:47:42.848
solo_L2_eui-hrly1216-image_20220322T082110272	L2	eui-hrly1216-image	2022-03-22T08:21:10.272	2022-03-22T08:21:13.272	EUI	HR1216	1 MB	2023-05-24T05:47:41.834
solo_L2_eui-hrly1216-image_20220322T082210373	L2	eui-hrly1216-image	2022-03-22T08:22:10.373	2022-03-22T08:22:13.373	EUI	HR1216	1 MB	2023-05-24T05:47:40.887
solo_L2_eui-hrly1216-image_20220322T082310265	L2	eui-hrly1216-image	2022-03-22T08:23:10.265	2022-03-22T08:23:13.265	EUI	HR1216	1 MB	2023-05-24T05:47:39.856
solo_L2_eui-hrly1216-image_20220322T082410265	L2	eui-hrly1216-image	2022-03-22T08:24:10.265	2022-03-22T08:24:13.265	EUI	HR1216	1 MB	2023-05-24T05:47:38.826
solo_L2_eui-hrly1216-image_20220322T082510275	L2	eui-hrly1216-image	2022-03-22T08:25:10.275	2022-03-22T08:25:13.275	EUI	HR1216	1 MB	2023-05-24T05:47:37.873
solo_L2_eui-hrly1216-image_20220322T082610300	L2	eui-hrly1216-image	2022-03-22T08:26:10.300	2022-03-22T08:26:13.300	EUI	HR1216	1 MB	2023-05-24T05:47:36.814

<https://soar.esac.esa.int/>

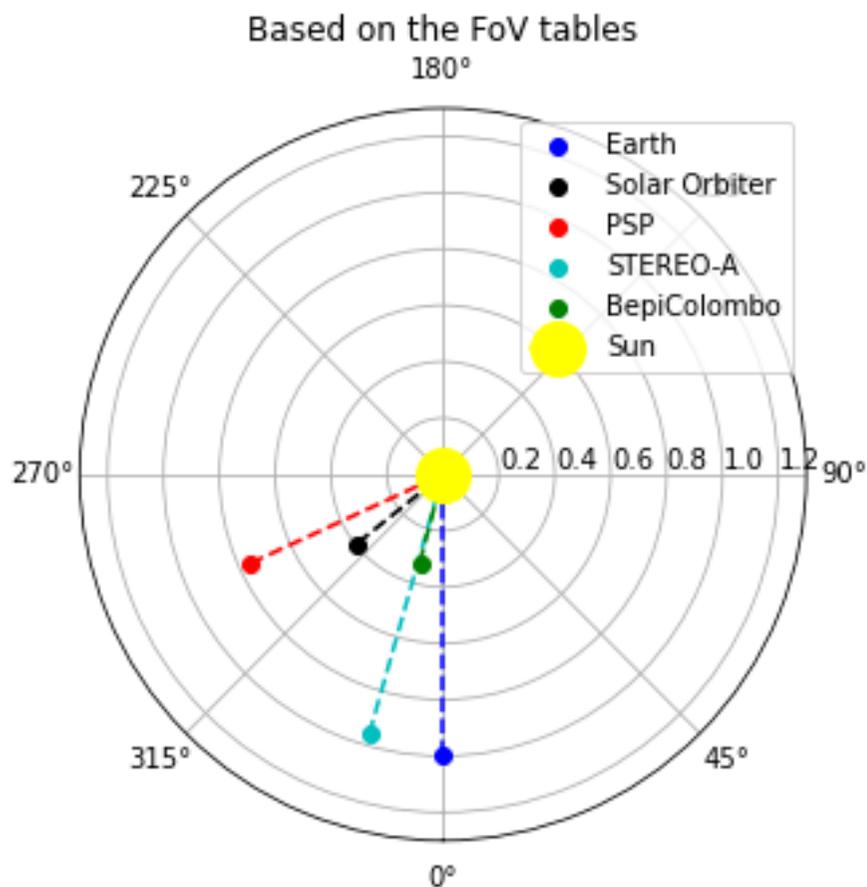
2. Field of Views tables (HRI, HRT, SPICE)

eui_hri_table

Filename,
 Descriptor,
 start_time,
 end_time,
 Processing Level,
 version,
 SOOP name,
 crota,
 'Rotation Angle',
 crota,
 'FoV
 bottom left (Tx,Ty) in arcsec',
 FoV_Solo_bot_left_arcsec_Tx,
 FoV_Solo_bot_left_arcsec_Ty,
 'FoV top right (Tx,Ty) in arcsec',
 FoV_Solo_top_right_arcsec_Tx,
 FoV_Solo_top_right_arcsec_Ty,
 'from_Solar_Orbiter', 'Helioprojective_cartesian',
 'FoV bottom left (Tx,Ty) in arcsec',
 FoV_Earth_bot_left_arcsec_Tx,
 FoV_Earth_bot_left_arcsec_Ty, 'FoV top
 right (Tx,Ty) in arcsec',
 FoV_Earth_top_right_arcsec_Tx,
 FoV_Earth_top_right_arcsec_Ty,
 'from_Earth',
 'Helioprojective_cartesian',

'Solar Orbiter position (lon,lat,radius) in (deg,deg,AU)',
 solo_pos_lon_deg,
 solo_pos_lat_deg,
 solo_pos_radius_AU,
 'Earth position (lon,lat,radius) in
 (deg,deg,AU)',
 earth_pos_lon_deg,
 earth_pos_lat_deg,
 earth_pos_radius_AU,
 'Mercury position (lon,lat,radius) in (deg,deg,AU)',
 mercury_pos_lon_deg,
 mercury_pos_lat_deg,
 mercury_pos_radius_AU,
 'BepiColombo position
 (lon,lat,radius) in (deg,deg,AU)',
 bepi_pos_lon_deg,
 bepi_pos_lat_deg,
 bepi_pos_radius_AU,
 'PSP position (lon,lat,radius) in (deg,deg,AU)',
 psp_pos_lon_deg,
 psp_pos_lat_deg,
 psp_pos_radius_AU, '
 Stereo-A position(lon,lat,radius) in (deg,deg,AU)',
 stereoA_pos_lon_deg,
 stereoA_pos_lat_deg,
 stereoA_pos_radius_AU,
 'Heliographic_Stonyhurst'

2. What can be done with Field of Views tables?

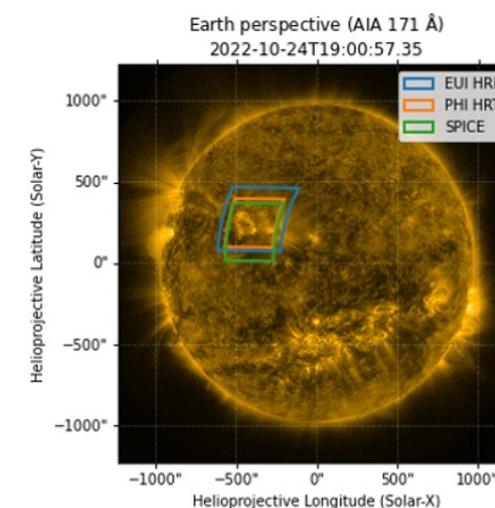
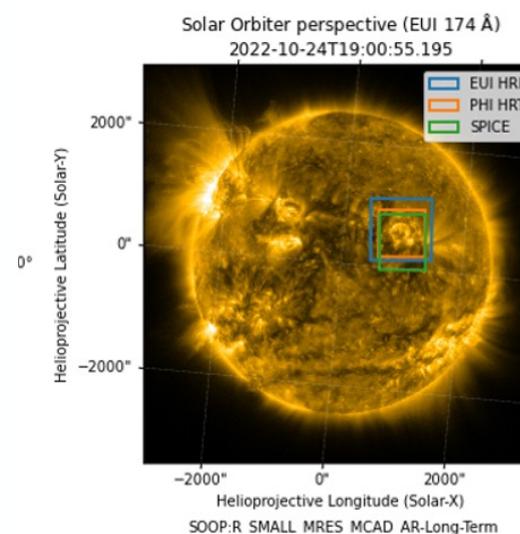


```
'Solar Orbiter position (lon,lat,radius) in (deg,deg,AU)',
solo_pos_lon_deg,
solo_pos_lat_deg,
solo_pos_radius_AU,
'Earth position (lon,lat,radius) in
(deg,deg,AU)',
earth_pos_lon_deg,
earth_pos_lat_deg,
earth_pos_radius_AU,
'Mercury position (lon,lat,radius) in (deg,deg,AU)',
mercury_pos_lon_deg,
mercury_pos_lat_deg,
mercury_pos_radius_AU,
'BepiColombo position
(lon,lat,radius) in (deg,deg,AU)',
bepi_pos_lon_deg,
bepi_pos_lat_deg,
bepi_pos_radius_AU,
'PSP position (lon,lat,radius) in (deg,deg,AU)',
psp_pos_lon_deg,
psp_pos_lat_deg,
psp_pos_radius_AU,
'Stereo-A position(lon,lat,radius) in (deg,deg,AU)',
stereoA_pos_lon_deg,
stereoA_pos_lat_deg,
stereoA_pos_radius_AU,
'Heliographic_Stonyhurst'
```

2. Field of Views tables (HRI, HRT, SPICE)

eui_hri_table

Filename,
 Descriptor,
 start_time,
 end_time,
 Processing Level,
 version,
 SOOP name,
 crota,
 'Rotation Angle',
 crota,
 'FoV
 bottom left (Tx,Ty) in arcsec',
 FoV_Solo_bot_left_arcsec_Tx,
 FoV_Solo_bot_left_arcsec_Ty,
 'FoV top right (Tx,Ty) in arcsec',
 FoV_Solo_top_right_arcsec_Tx,
 FoV_Solo_top_right_arcsec_Ty,
 'from_Solar_Orbiter', 'Helioprojective_cartesian',
 'FoV bottom left (Tx,Ty) in arcsec',
 FoV_Earth_bot_left_arcsec_Tx,
 FoV_Earth_bot_left_arcsec_Ty, 'FoV top
 right (Tx,Ty) in arcsec',
 FoV_Earth_top_right_arcsec_Tx,
 FoV_Earth_top_right_arcsec_Ty,
 'from_Earth',
 'Helioprojective_cartesian',



2. Field of Views tables available through TOPCAT

TOPCAT

Table List
1: TAP_1_soar_v_eui_hri_fov

Current Table Properties
Label: TAP_1_soar_v_eui_hri_fov
Location: TAP_1_soar_v_eui_hri_fov
Name: sync
Rows: 9
Columns: 34
Sort Order:
Row Subset: All

Activation Actions: 0 / 0

SAMP
Messages: Clients:

45 / 8192 M

TOPCAT(1): Table Browser

bepl_pos_la...	bepl_pos_lon...	bepl_pos_ra...	crota	descriptor	earth_pos_la...	earth_pos_lon...	earth_pos_r...	end_time	filename	fov_earth_bot...	
1	-4.15143	-3.98459	1.00473	6.33132	eui-hruew174-image	-2.91645	0.	1.01035	2020-05-12T12:50:16.704	solo_L2_eui-hruew174-image_20200512T1250...	-278.27909
2	-3.49543	-4.67442	0.99379	6.18388	eui-hruew174-image	-1.95964	0.	1.01215	2020-05-20T21:20:35.317	solo_L2_eui-hruew174-image_20200520T2120...	-109.02307
3	-3.42984	-4.73673	0.99252	6.02605	eui-hruew174-image	-1.86755	0.	1.0123	2020-05-21T16:12:10.371	solo_L2_eui-hruew174-image_20200521T1612...	-85.3178
4	0.12087	-16.62151	0.34425	-8.14568	eui-hruew174-image	-6.68411	0.	0.98712	2024-02-12T12:59:53.887	solo_L2_eui-hruew174-image_20240212T1259...	-835.55316
5	-4.09406	-3.98288	1.00392	6.4825	eui-hrilya1216-image	-2.83014	0.	1.01053	2020-05-13T07:20:14.818	solo_L2_eui-hrilya1216-image_20200513T0720...	-210.09475
6	-4.09237	-3.98515	1.00389	6.58248	eui-hrilya1216-image	-2.8276	0.	1.01053	2020-05-13T07:52:45.571	solo_L2_eui-hrilya1216-image_20200513T0752...	-222.326
7	-4.09133	-3.98655	1.00388	6.5824	eui-hrilya1216-image	-2.82604	0.	1.01053	2020-05-13T08:12:44.452	solo_L2_eui-hrilya1216-image_20200513T0812...	-221.98614
8	5.38251	11.27882	0.71793	-6.55129	eui-hrilya1216-image	6.12518	0.	1.01431	2020-08-05T16:59:02.003	solo_L2_eui-hrilya1216-image_20200805T1659...	896.0829
9	3.25177	-79.23504	0.31446	-8.09188	eui-hrilya1216-image	-5.93137	0.	0.98515	2024-01-31T10:12:22.22	solo_L2_eui-hrilya1216-image_20240131T1012...	-844.20192

Total: 9 Visible: 9 Selected: 0

TABLE ACCESS PROTOCOL (TAP) QUERY

Select Service Use Service Resume Job Running Jobs

Metadata

Find: fov

Service Columns

Name	Type	Unit	Indexed	Description	UCD	Utype
end_time	char		<input type="checkbox"/>	End time		
filename	char		<input type="checkbox"/>	Filename		
fov_earth_bot_left_arcsec_tx	double		<input type="checkbox"/>	Fov bottom left Tx in arcsec as seen from Earth in Helioprojective cartesian reference frame		
fov_earth_bot_left_arcsec_ty	double		<input type="checkbox"/>	Fov bottom left Ty in arcsec as seen from Earth in Helioprojective cartesian reference frame		
fov_earth_top_right_arcsec_tx	double		<input type="checkbox"/>	Fov top right Tx in arcsec as seen from Earth in Helioprojective cartesian reference frame		
fov_earth_top_right_arcsec_ty	double		<input type="checkbox"/>	Fov top right Ty in arcsec as seen from Earth in Helioprojective cartesian reference frame		
fov_solo_bot_left_arcsec_tx	double		<input type="checkbox"/>	Fov bottom left Tx in arcsec as seen from Solar Orbiter in Helioprojective cartesian reference frame		
fov_solo_bot_left_arcsec_ty	double		<input type="checkbox"/>	Fov bottom left Ty in arcsec as seen from Solar Orbiter in Helioprojective cartesian reference frame		
fov_solo_top_right_arcsec_tx	double		<input type="checkbox"/>	Fov top right Tx in arcsec as seen from Solar Orbiter in Helioprojective cartesian reference frame		
fov_solo_top_right_arcsec_ty	double		<input type="checkbox"/>	Fov top right Ty in arcsec as seen from Solar Orbiter in Helioprojective cartesian reference frame		
mercury_pos_lat_deg	double		<input type="checkbox"/>	Mercury position longitude in degrees (deg), Stonyhurst heliographic coordinate system		

Service Capabilities

Query Language: ADQL-2.0 Max Rows: Uploads: unavailable

ADQL Text

Mode: Synchronous

1

SELECT * FROM soar_v_eui_hri_fov

Run Query



Start time

(YYYY-MM-ddThh:mm:ss)

2022-10-24T19:00:00

End time

(YYYY-MM-ddThh:mm:ss)

2022-10-24T19:30:00

EUI/HRI

PHI/HRT

SPICE

CLEAR

SUBMIT

Previous

-30 mn

-1 day

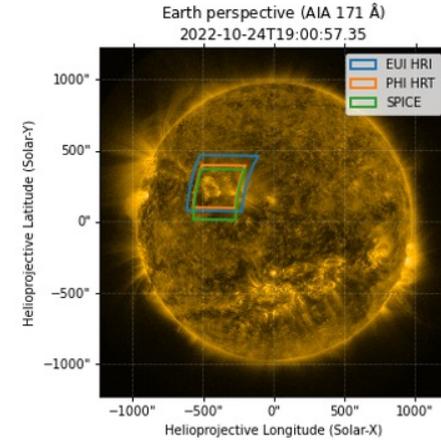
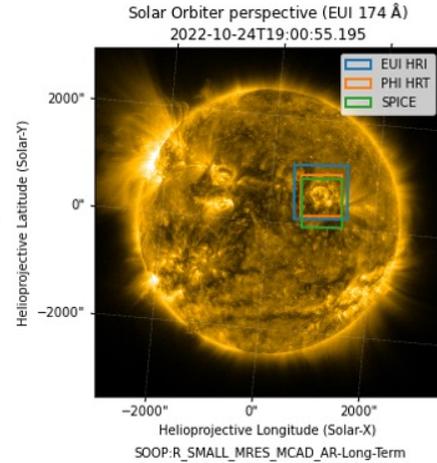
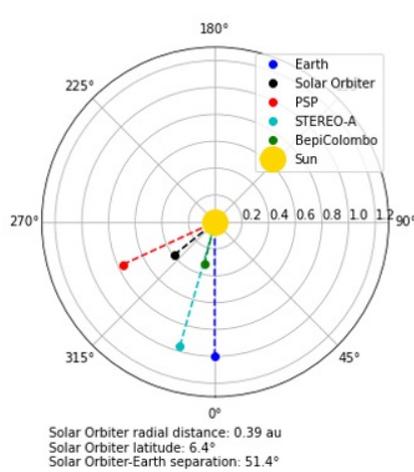
First

Next

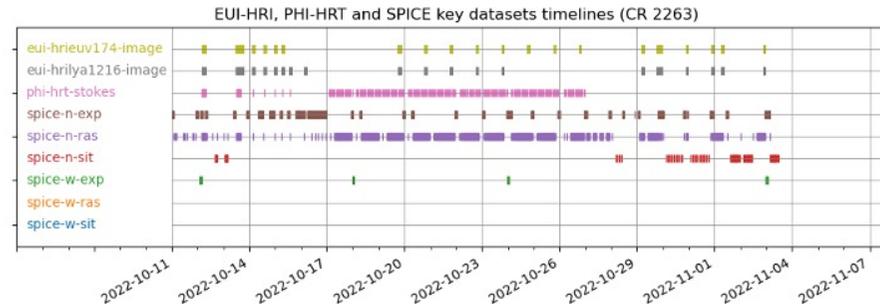
+30 mn

+1 day

Last



Experiment	Sensor	Time	SOOP name	X/Y location from Solar Orbiter	from Earth
EUI	HRI_EUV	2022-10-13 14:21:39.196-14:21:40.846	R_SMALL_HRES_HCAD_RS-burst	-954°/-875°	-714°/-227°



DOWNLOAD ALL FILES

DOWNLOAD ALL FoVs



4. SPASE and CDAWEB

Registering ESA solar orbiter in-situ datasets in the SPASE metadata registry

To make these datasets findable by tools based on registry, they need to be described following the SPASE data model, including CDF ISTP standards for CDF files.

We have prepared the SPASE description for all MAG datasets and get those description validated by the SPASE group at UCLA, reviewed by the MAG team.

Work on-going for the SWA thermal plasma particle detectors (EAS, PAS, HIS)

See talk by Joanna Oliveira



3. Cluster Science Archive (CSA) recent highlights

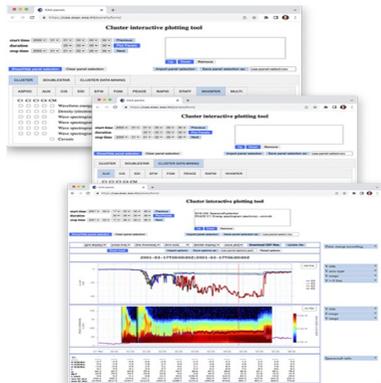


Cluster Science Archive

CSA 3.4.0

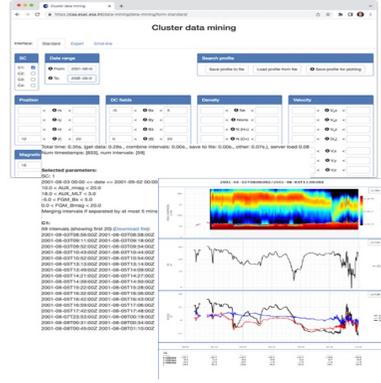
INTERACTIVE PLOTTING

Fully customisable plots for all plots available through Key Graphical Products tab of the CSA web interface, plus all 86 parameters available from Data Mining 1 minute resolution database



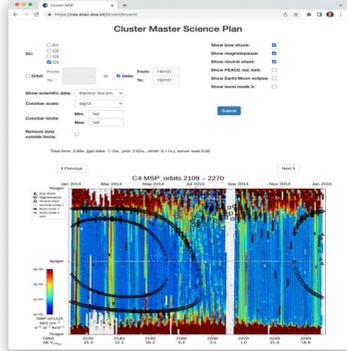
DATA MINING

Choose min and max for any of 86 parameters averaged at 1 minute resolution, including measurements and position, then this tool provides all time intervals that match the criteria given. E.g., 56 current sheet crossings identified:



BRYANT PLOTS

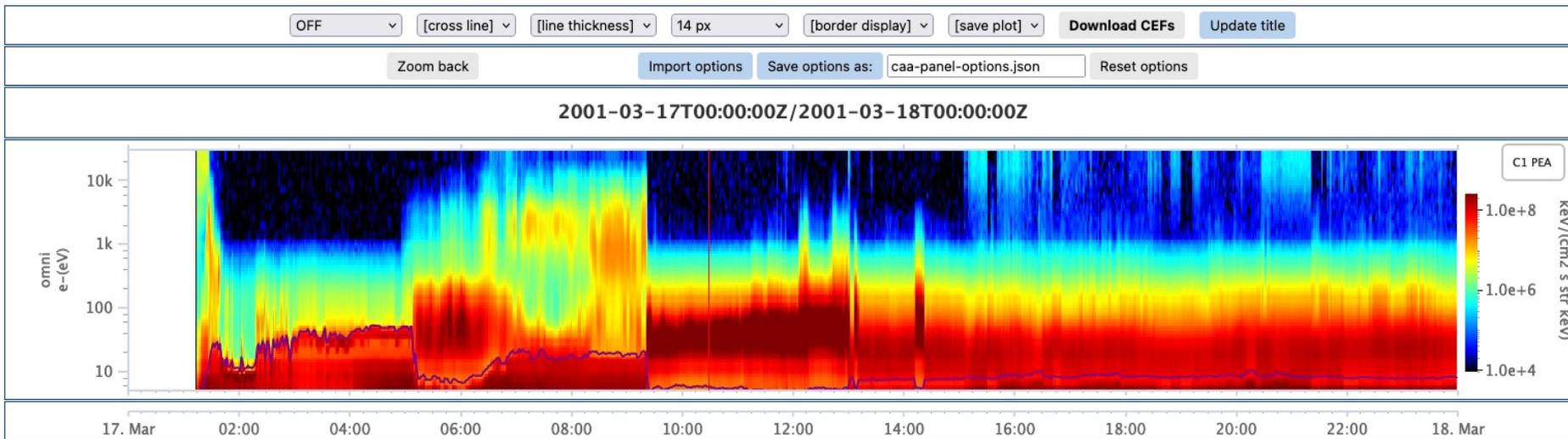
Bryant plots display the chosen parameter (using the 1 min averages from the Data Mining database), from the bottom to the top representing one orbit. Select a range of orbits or time range, select boundaries/regions markers to overplot, and set colour scale and limits. For example, the plot below shows one year of electron flux measured by Cluster 4, overplot with the box shock, magnetopause and neutral sheet.



<https://csa.esac.esa.int/csa-web/#tools/>



3a. Advanced interactive plotting



Time stamp recording ▼

Y title ▲

omni
e-(eV)

update

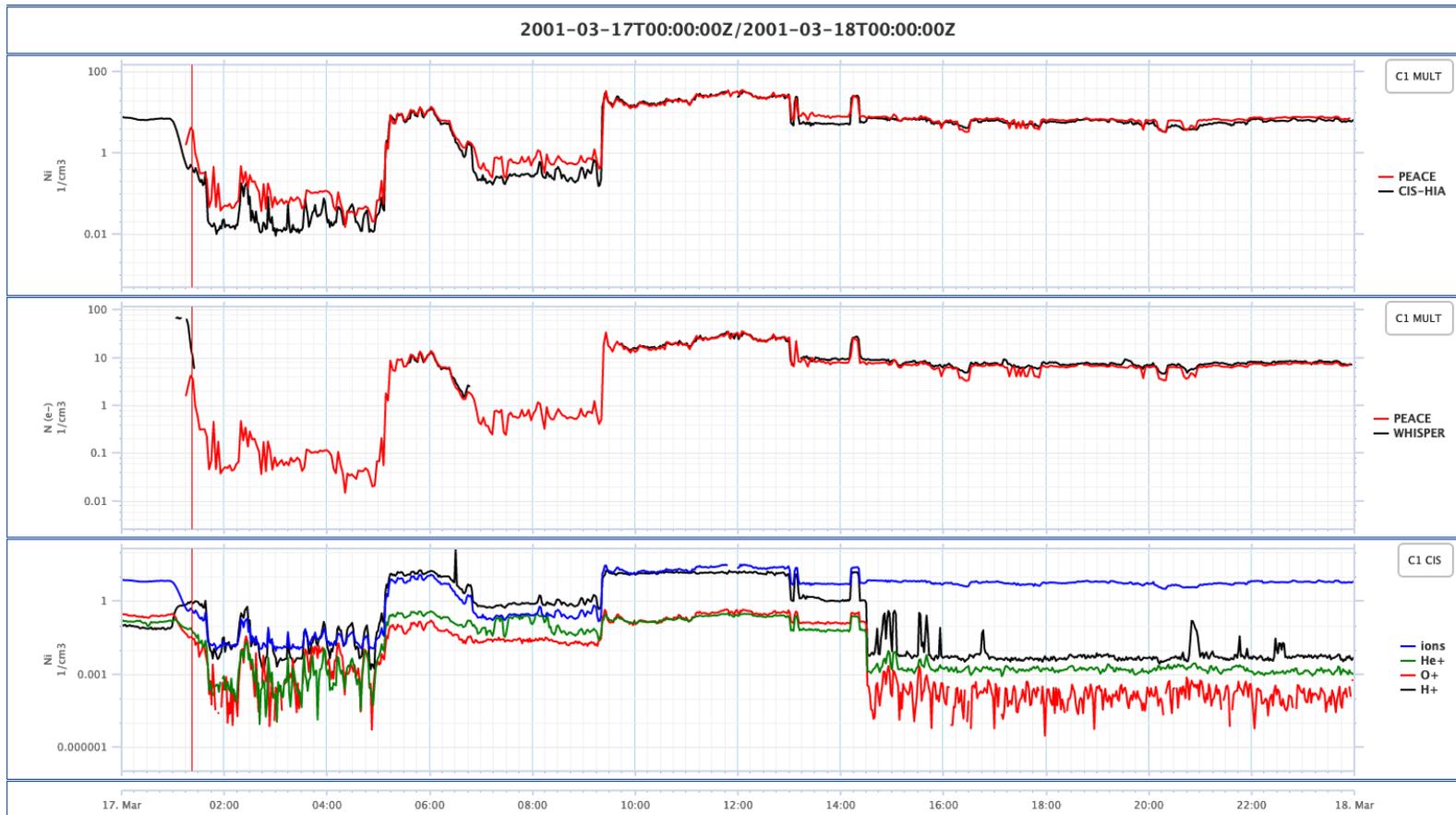
Z range ▼

Y range ▼

Help generating paper quality level plots



3a. Advanced plotting: multi-instruments densities



Unique feature: display of the same physical quantity measured by different instruments



3b. Data mining



Cluster data mining

Interface: **Standard** Expert Cmd-line

SC

C1:

C2:

C3:

C4:

Date range

From:

To:

Search profile

Save profile to file Load profile from file Save profile for plotting

Position

1 < rx < 10

< ry <

< rz <

< |r| <

DC fields

< Bx <

< By <

< Bz <

< |B| <

< Ex <

< Ey <

< Ez <

< |E| < 50

Density

< Ne <

< Nions <

< N (H+) <

< N (O+) <

< SC pot. <

Temperature

< T_{e,par} <

< T_{e,perp} <

< T_e <

< T_{i,par} <

< T_{i,perp} <

< T_i <

Velocity

< V_{oX} <

< V_{oY} <

< V_{oZ} <

< |V_o| <

< V_{iX} <

< V_{iY} <

< V_{iZ} <

< |V_i| <

< V_x (H+) <

< V_y (H+) <

< V_z (H+) <

< |V (H+)| <

Magnetic sector

< MLT <

< lLat <

< lVal <

Constellation

< size <

< elong. <

< plan. <

<https://caa.esac.esa.int/data-mining/data-mining/>

We have generated 1 minute average for tens of key parameters (86!): measurements of course but also position, magnetic sector, constellation elongation

Gives you all time intervals among the 150 TB of Cluster data fitting the parameters range

This interface moves away from selecting individual experiment measurements to select, instead, plasma parameters from one or several experiments

These "survey" datasets are constantly updated and also downloadable



3b. Data mining



Cluster data mining

Interface: Standard Expert Cmd-line

SC
C1:
C2:
C3:
C4:

Date range
From:
To:

Search profile
Save profile to file Load profile from file **Save profile for plotting**

Position
1 < rx < 10
ry <
rz <
|r| <

DC fields
Bx <
By <
Bz <
|B| <
Ex <
Ey <
Ez <
|E| < 50

Density
Ne <
Nions <
N (H+) <
N (O+) <
SC pot. <

Temperature
T_{e,par} <
T_{e,perp} <
T_e <
T_{i,par} <
T_{i,perp} <
T_i <

Velocity
V_{eX} <
V_{eY} <
V_{eZ} <
|V_e| <
V_{iX} <
V_{iY} <
V_{iZ} <
|V_i| <
V_x (H+) <
V_y (H+) <
V_z (H+) <
|V (H+)| <

Magnetic sector
MLT <
lLat <
lVal <

Constellation
size <
elong. <
plan. <

<https://caa.esac.esa.int/data-mining/data-mining/>

Here we select

Only 1 spacecraft
When positioned below 10 Earth radii
with the DC electric field below 50 mV/m
For the whole mission duration

This list of parameters can be saved for the advanced plotting tool



4. SOHO Science Archive (SSA) recent highlights



- **Filtering of the data between Science and Engineering modes** (work with PI to tag the data)
- Connection to the HEK database
- EIT calibrated files!

The screenshot shows the SOHO Science Archive (SSA) interface. On the left, there are search filters for 'General', 'Date Range', 'Instrument', and 'Processing level'. The 'EIT Extreme UV Imaging Telescope' filter is expanded, showing 'Modes' with 'Science only' selected and 'Engineering modes only' unselected. Below this, 'Wavelength' options are listed: 171 Angstrom, 195 Angstrom, 284 Angstrom, and 304 Angstrom. The main table displays search results with columns for Instrument, Detector, Observation Type, Processing Level, Start, End, and Campaign. The table shows 15 rows of data, all for EIT instruments, with observation types like FULL SUN 304, 195, 284, and 171. The bottom of the table indicates '537976 items'.

	Instrument	Detector	Observation Type	Processing Level	Start	End	Campaign
<input type="checkbox"/>	EIT	EIT	FULL SUN 304	L0_RawData	2023-03-06 13:19:51	2023-03-06 13:20:23	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 195	L0_RawData	2023-03-06 13:13:54	2023-03-06 13:14:06	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 284	L0_RawData	2023-03-06 13:06:11	2023-03-06 13:08:13	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 171	L0_RawData	2023-03-06 13:00:13	2023-03-06 13:00:26	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 304	L0_RawData	2023-03-06 01:19:49	2023-03-06 01:20:22	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 195	L0_RawData	2023-03-06 01:13:54	2023-03-06 01:14:07	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 284	L0_RawData	2023-03-06 01:06:11	2023-03-06 01:08:14	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 171	L0_RawData	2023-03-06 01:00:14	2023-03-06 01:00:26	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 304	L0_RawData	2023-03-05 13:19:49	2023-03-05 13:20:23	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 195	L0_RawData	2023-03-05 13:13:55	2023-03-05 13:14:07	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 284	L0_RawData	2023-03-05 13:06:11	2023-03-05 13:08:14	Synoptic Data for all Instruments
<input type="checkbox"/>	EIT	EIT	FULL SUN 171	L0_RawData	2023-03-05 13:00:14	2023-03-05 13:00:26	Synoptic Data for all Instruments



4. SOHO Science Archive (SSA) recent highlights



- Filtering of the data between Science and Engineering modes (work with PI to tag the data)
- **Connection to the HEK database**
- EIT calibrated files!

The screenshot shows the SOHO Science Archive interface. On the left, there are search filters for General, Date Range (1/11/2021 - 5/11/2021), Instrument (EIT), and Processing Level. A modal window is open, displaying a solar image from 2021-11-02 13:00. The modal includes a table of HEK events:

Index	Type
4	AR
5	AR
6	AR
7	AR
8	AR
9	CH
10	CH

Below the table, there are download options: "Download: 512x512" and "Download: 1024x1024". A "HEK Events" checkbox is checked. The modal also has a "CLOSE" button.



4. SOHO Science Archive (SSA) recent highlights



- Filtering of the data between Science and Engineering modes (work with PI to tag the data)
- Connection to the HEK database
- **EIT calibrated files!**

The screenshot displays the SOHO Science Archive (SSA) interface. On the left, the 'Main Search' panel includes filters for 'Date Range' (dd/MM/yyyy - dd/MM/yyyy), 'Instrument' (EIT (Extreme UV Imaging Telescope)), and 'Processing level' (L1_Calibrated). Below these are buttons for 'CLEAR' and 'SUBMIT'. The main area shows a table of search results with columns for 'Instrume...', 'Detector', 'Observation Type', 'Processing Level', 'Start', and 'End'. The table contains 15 rows of data, all with 'EIT' as the instrument and 'L1_Calibrated' as the processing level. A 'DOWNLOAD ALL' button is visible above the table. At the bottom of the interface, the text '537194 items' is displayed.

	Instrume...	Detector	Observation Type	Processing Level	Start	End
<input type="checkbox"/>	EIT	EIT	FULL SUN 304	L1_Calibrated	2022-12-31 13:19:49	2022-12-31 13:20:23
<input type="checkbox"/>	EIT	EIT	FULL SUN 195	L1_Calibrated	2022-12-31 13:13:56	2022-12-31 13:14:08
<input type="checkbox"/>	EIT	EIT	FULL SUN 284	L1_Calibrated	2022-12-31 13:06:13	2022-12-31 13:08:16
<input type="checkbox"/>	EIT	EIT	FULL SUN 171	L1_Calibrated	2022-12-31 13:00:16	2022-12-31 13:00:29
<input type="checkbox"/>	EIT	EIT	FULL SUN 304	L1_Calibrated	2022-12-31 01:19:28	2022-12-31 01:20:01
<input type="checkbox"/>	EIT	EIT	FULL SUN 195	L1_Calibrated	2022-12-31 01:13:35	2022-12-31 01:13:47
<input type="checkbox"/>	EIT	EIT	FULL SUN 284	L1_Calibrated	2022-12-31 01:05:51	2022-12-31 01:07:54
<input type="checkbox"/>	EIT	EIT	FULL SUN 171	L1_Calibrated	2022-12-31 00:59:54	2022-12-31 01:00:07
<input type="checkbox"/>	EIT	EIT	FULL SUN 304	L1_Calibrated	2022-12-30 13:17:40	2022-12-30 13:18:12
<input type="checkbox"/>	EIT	EIT	FULL SUN 195	L1_Calibrated	2022-12-30 13:11:51	2022-12-30 13:12:04
<input type="checkbox"/>	EIT	EIT	FULL SUN 284	L1_Calibrated	2022-12-30 13:04:16	2022-12-30 13:06:19





SOHO



SOLAR ORBITER



CLUSTER



DOUBLE STAR

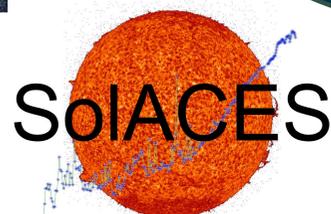


PROBA-2

ESA Heliophysics D/SCI archives
are composed of 7 independent
software systems



SMILE



ULYSSES

Heliophysics science archives: long term preservation



Long term perservation requires regular update of all components of each archive hardware/software system

Missions (8)	Heliophysics Archives	Graphical User Interface
SMILE	in development	in development
Solar Orbiter	Solar Orbiter ARchive	Requires upgrade over the coming years
Cluster and Double Star	Cluster Science Archive	Requires upgrade over the coming years
Proba-2	Proba-2 Science Archive	Requires upgrade over the coming years
ISS-Solaces	ISS-SolACES archive	Requires upgrade over the coming years
SOHO	SOHO science archive	Up-to-date
Ulysses	Ulysses final archive	Requires upgrade ASAP



Heliophysics science archives: a need for a multi-missions archive



SOHO



SOLAR ORBITER



CLUSTER



DOUBLE STAR

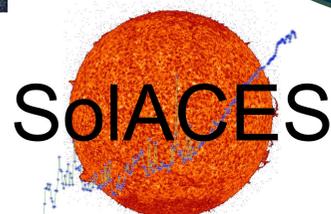


PROBA-2

For scientific synergies and long term preservation, the ESA Heliophysics Archives User Group recommended in 2023 to transition all these archives to one single archive



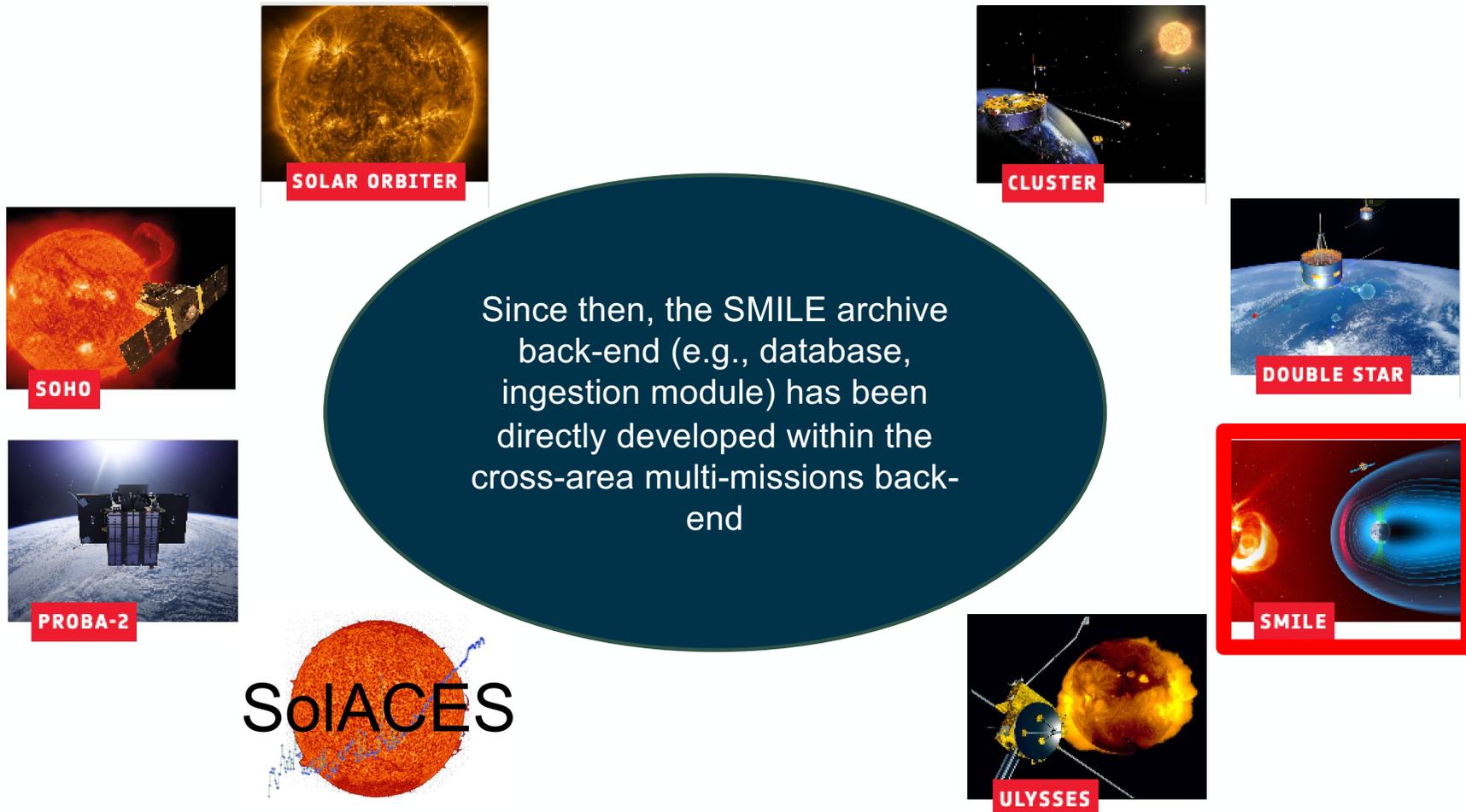
SMILE



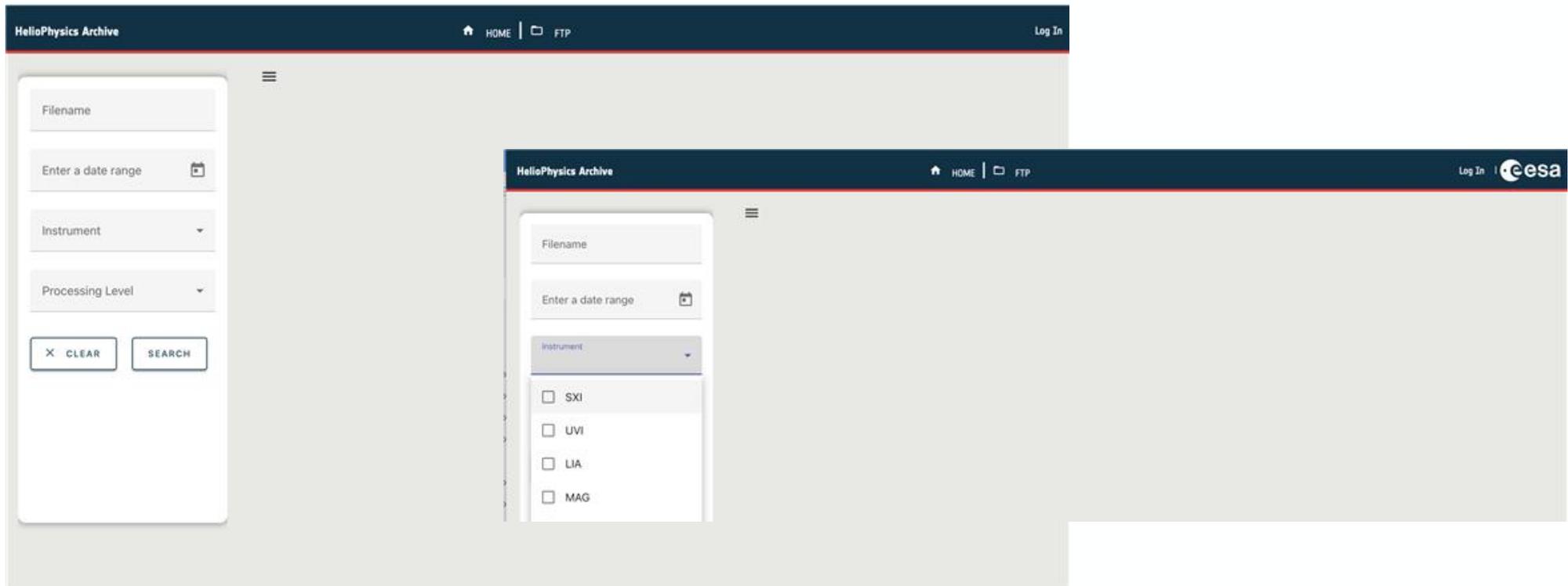
ULYSSES



Heliophysics science archives: a need for a multi-missions archive?



ESA SMILE Archive front-end within HPA



SMILE archive front-end directly incorporated within the in the upcoming
ESA HelioPhysics Archive or HPA (not yet public)

HelioPhysics Archive (internal version, design only)



HelioPhysics Archive

HOME | SEARCH | FTP

Log In |

HPA

← HeliPhysics Archive →



SOLAR ORBITER

SEARCH →



CLUSTER

SEARCH →



SMILE

SEARCH →



ULYSSES

SEARCH →



PROBA-2

SEARCH →



DOUBLE STAR

SEARCH →



SOHO

SEARCH →

European Space Agency

Terms and Conditions of the Data Private Policy



SPASE, DOIs, HAPI, Science platforms and more

SPASE description of Solar Orbiter datasets started: MAG done, SWA on-going

- Good interaction with Goddard (S. Fung), UCLA (L. Bargatze) to help curating and helping describing these datasets
- Led to update of the SPASE model to include datasets with variable time resolution
- Help from SPASE group to describe Cluster datasets that ESA will review (J. Oliveira)

Decision to register DOIs for all ESA heliophysics datasets

HAPI server for CSA up, HAPI server for SOAR in progress, eventually HAPI for HPA

Active participation to IHDEA Science Platforms working group (J. Reerink)

Publication of ISWAT Information architecture and Innovative solutions overarching paper (50 pages long!): Heliophysics and space weather information architecture and innovative solutions: Current status and ways forward

<https://doi.org/10.1016/j.asr.2024.05.052>, with many IHDEA members

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ESA helio archives and the VSO



VSO now speaks with TAP!

- Proba-2 archive available in the VSO
- Solar Orbiter on-going, timeline?
- Would be great to see a link to SOAR



VSO Time / Instrument Search Form

Version 1.2



All from Provider	All from	Source	Instrument	Date Range
<input type="checkbox"/> ESA ¹		PROBA2 ¹	<input type="checkbox"/> LYRA ¹	2010.03.09 →
<input type="checkbox"/> HANET (unavailable) ¹	<input type="checkbox"/>	BBSO ¹	<input type="checkbox"/> SWAP ¹	2010.03.09 →
<input type="checkbox"/> HAO ¹	<input type="checkbox"/>	YNAO ¹	<input type="checkbox"/> BBSO ¹	2000.07.05 →
	<input type="checkbox"/>	MLSO ¹	<input type="checkbox"/> YNAO ¹	2000.11.27 →
			<input type="checkbox"/> K-Cor ¹	2013.09.30 →
	<input type="checkbox"/>	SMM ¹	<input type="checkbox"/> chp ¹	1996.04.20 – 2013.08.02
<input type="checkbox"/> HSOS ¹		SATech-01 ¹	<input type="checkbox"/> dpm ¹	1994.02.20 – 2010.02.23
<input type="checkbox"/> INAF-OACT ¹		OACT ¹	<input type="checkbox"/> mk4 ¹	1998.10.01 – 2013.07.20
			<input type="checkbox"/> cp ¹	1980.03.02 – 1989.11.18
			<input type="checkbox"/> SUTRI ¹	2022.09.05 – 2022.12.05
<input type="checkbox"/> JSOC ¹		SDO ¹	<input type="checkbox"/> BE-Continuum ¹	2012.01.02 →
			<input type="checkbox"/> BE-Halphi ¹	2012.01.02 →
<input type="checkbox"/> KIS (unavailable) ¹		ChroTel ¹	<input type="checkbox"/> Cook_Refractor ¹	2009.01.02 →
<input type="checkbox"/> KSO ¹		KSO ¹	<input type="checkbox"/> AIA ¹	2010.05.12 →
			<input type="checkbox"/> HMI ¹	2010.03.29 →
			<input type="checkbox"/> ChroTel ¹	2012.04.01 →
			<input type="checkbox"/> CAII ¹	2010.07.31 →
<input type="checkbox"/> LASP ¹	<input type="checkbox"/>	MINXSS1 ¹	<input type="checkbox"/> FILM ¹	1973.05.05 – 2000.03.10
	<input type="checkbox"/>	MINXSS2 ¹	<input type="checkbox"/> HA2 ¹	2008.06.01 →
			<input type="checkbox"/> KPDC ¹	2007.07.02 →
			<input type="checkbox"/> PHOKA ¹	1989.03.27 – 2007.06.13
			<input type="checkbox"/> TM-1001 ¹	1998.09.24 – 2005.07.12
			<input type="checkbox"/> TM-1010 ¹	2005.07.13 – 2010.09.22
			<input type="checkbox"/> X123 ¹	2016.04.27 – 2017.05.07
			<input type="checkbox"/> X123 ¹	2018.12.03 – 2019.01.06

Start: 2023 Sep 14 / 20 : 00

End: 2023 Sep 14 / 23 : 59

All Month All Day

Search Clear



Wrap-up



- The ESA Heliophysics Archive starts to be developed with SMILE archive directly in
- More scientifically oriented functionalities in the Solar Orbiter Archive, close link with SunPy
- SPASE description of helio datasets start to be implemented effectively
- Collective effort to produce a list of recommendations in an overarching paper on information architecture and innovative solutions as an input of the Space Weather decadal roadmap
- Progress in interoperability with NASA and among Python packages thanks to the Science platform working group



Few ideas

1. Agree on recommendations and distribute them including
 - Recommendation Letter to all publishers to acknowledge the use of data origin and tools with list of DOI from data providers and data analysis tools
 - Recommendation on a list of best calibrated datasets per instrument, per mission, reviewed by missions experts, capture this for the long term; especially important when copying over full archive by another data center but also setting up of HAPI servers with a scientific in the loop not to access everything to avoid confusion
2. Agree on an internal IHDEA process to agree/support data access protocols, data format etc... similar to IVOA?
3. Setup of new working groups, in a more flexible way?
4. What about CDF 3.0? Need of a working group
5. What can be done to be more inclusive with the Ground based community?

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