

Open data, data products, and tools at MEDOC

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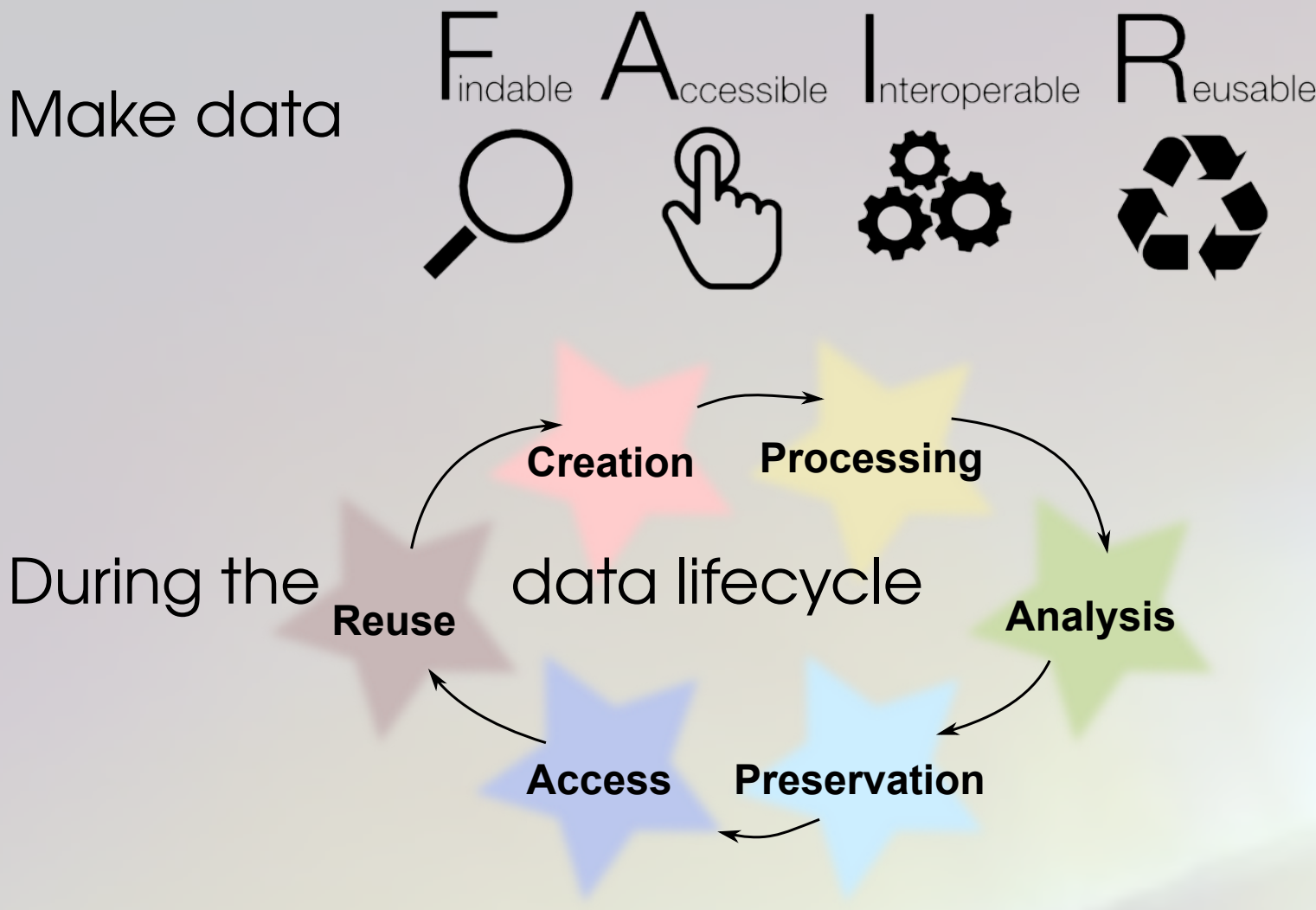
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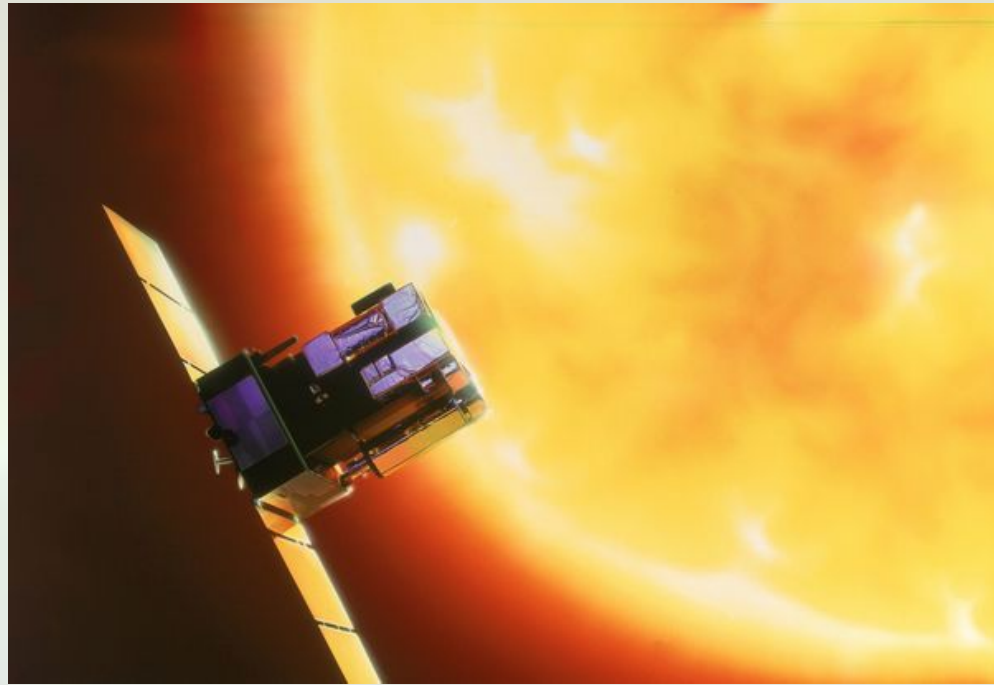
MEDOC (Multi-Experiment Data and Operation Centre), initially created as a European data and operation centre for the SoHO mission, has grown with data from other solar physics space missions, from STEREO to SDO, and now Solar Orbiter. In addition to observational data, MEDOC also provides datasets derived from observations (maps, catalogues...), tools for data analysis and interpretation, and numerical simulation results.

Why science data centers?



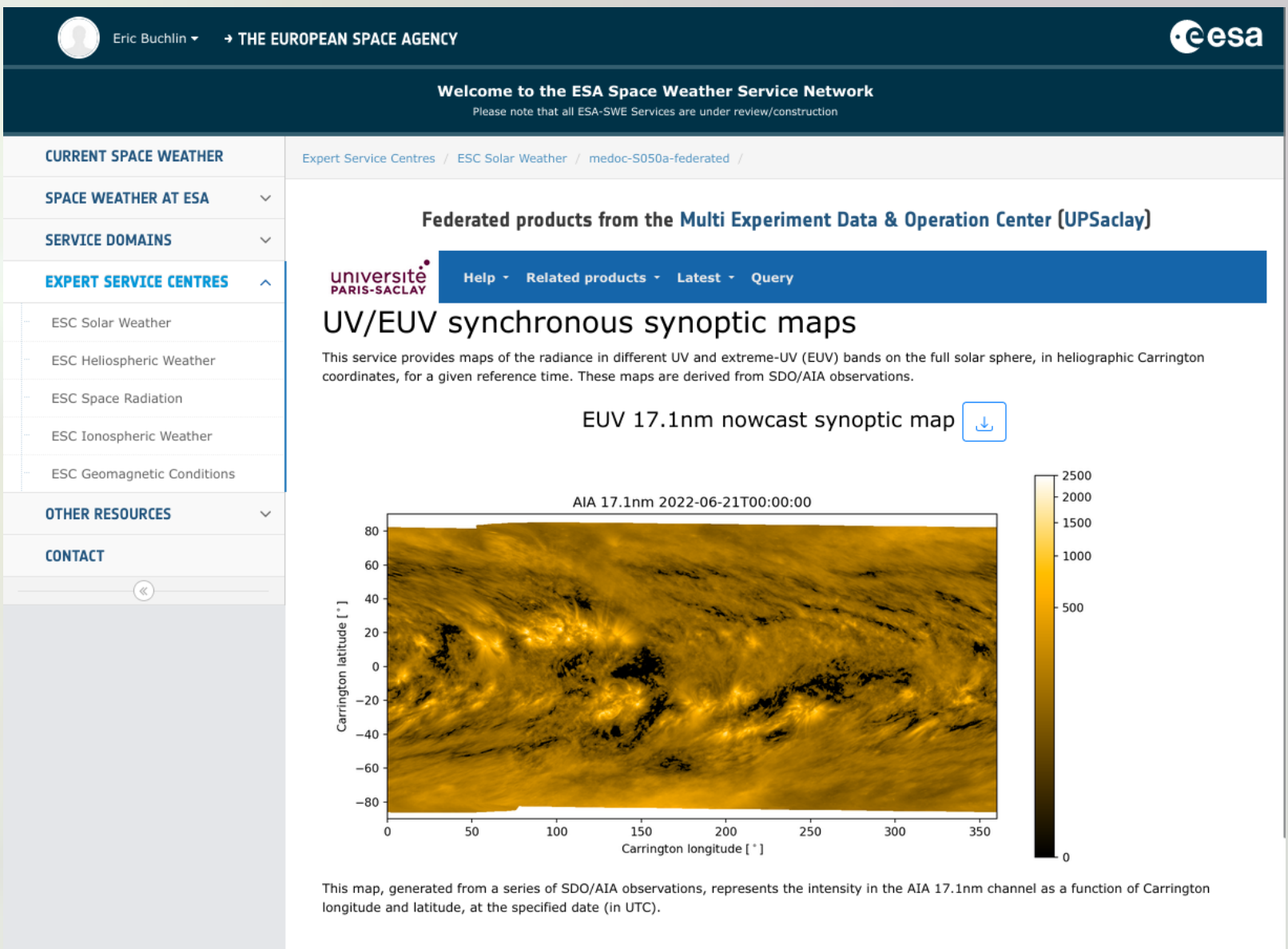
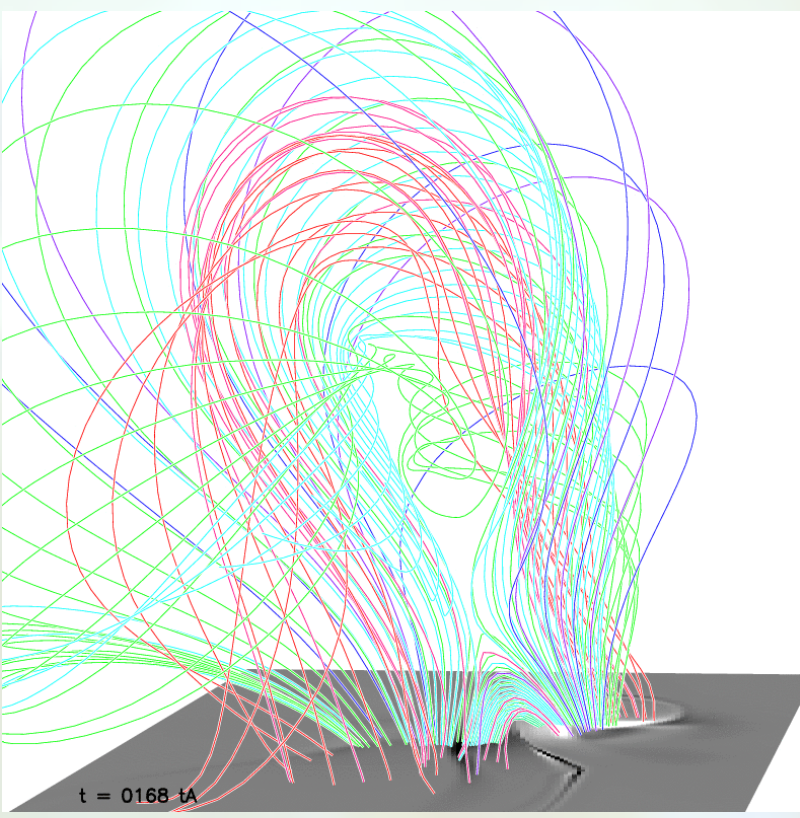
Observation data

- At MEDOC: SOHO, STEREO, SDO... (>800TB); now also Solar Orbiter
- From SOHO (1995), almost all solar physics space data from space missions are open



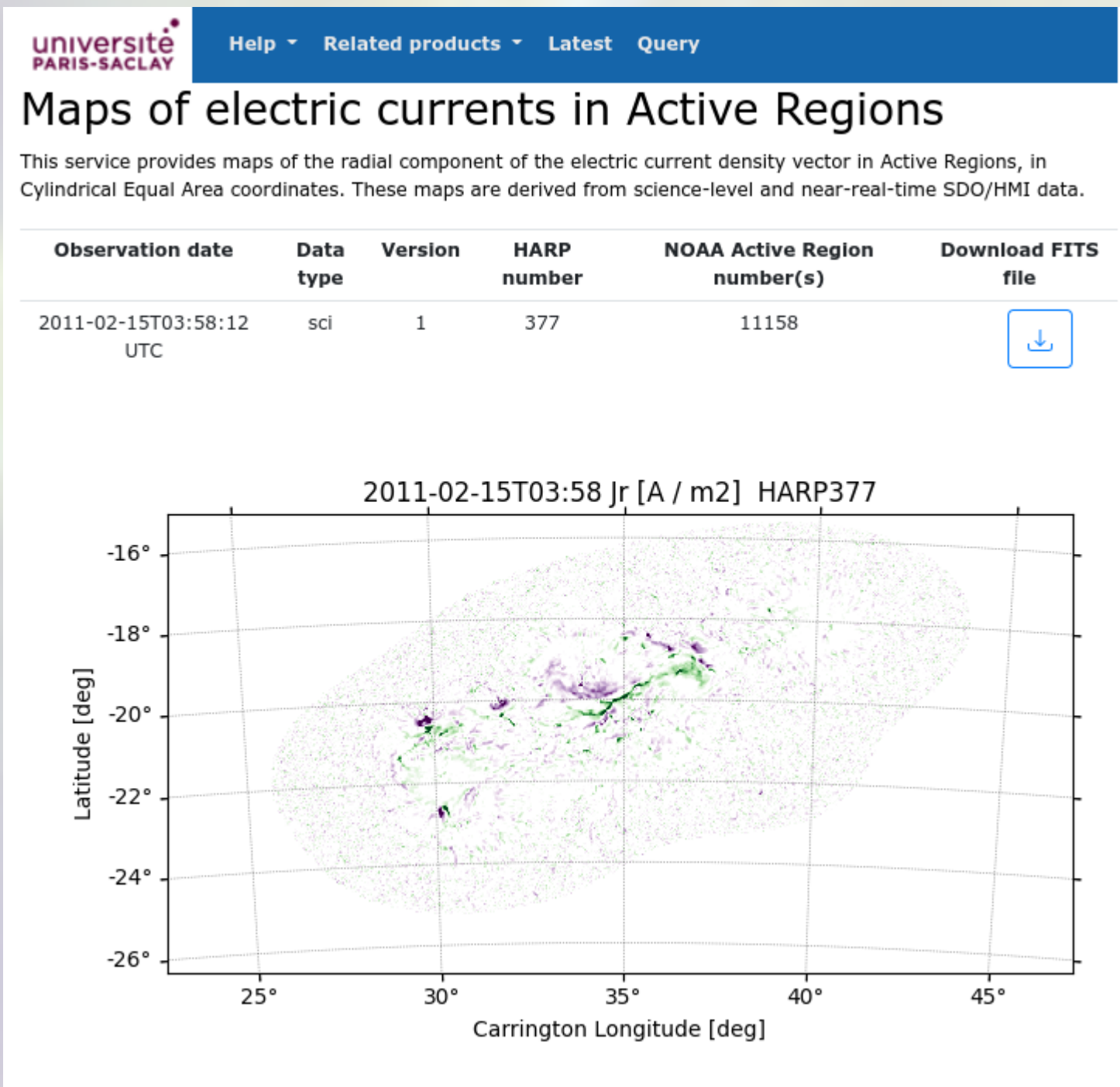
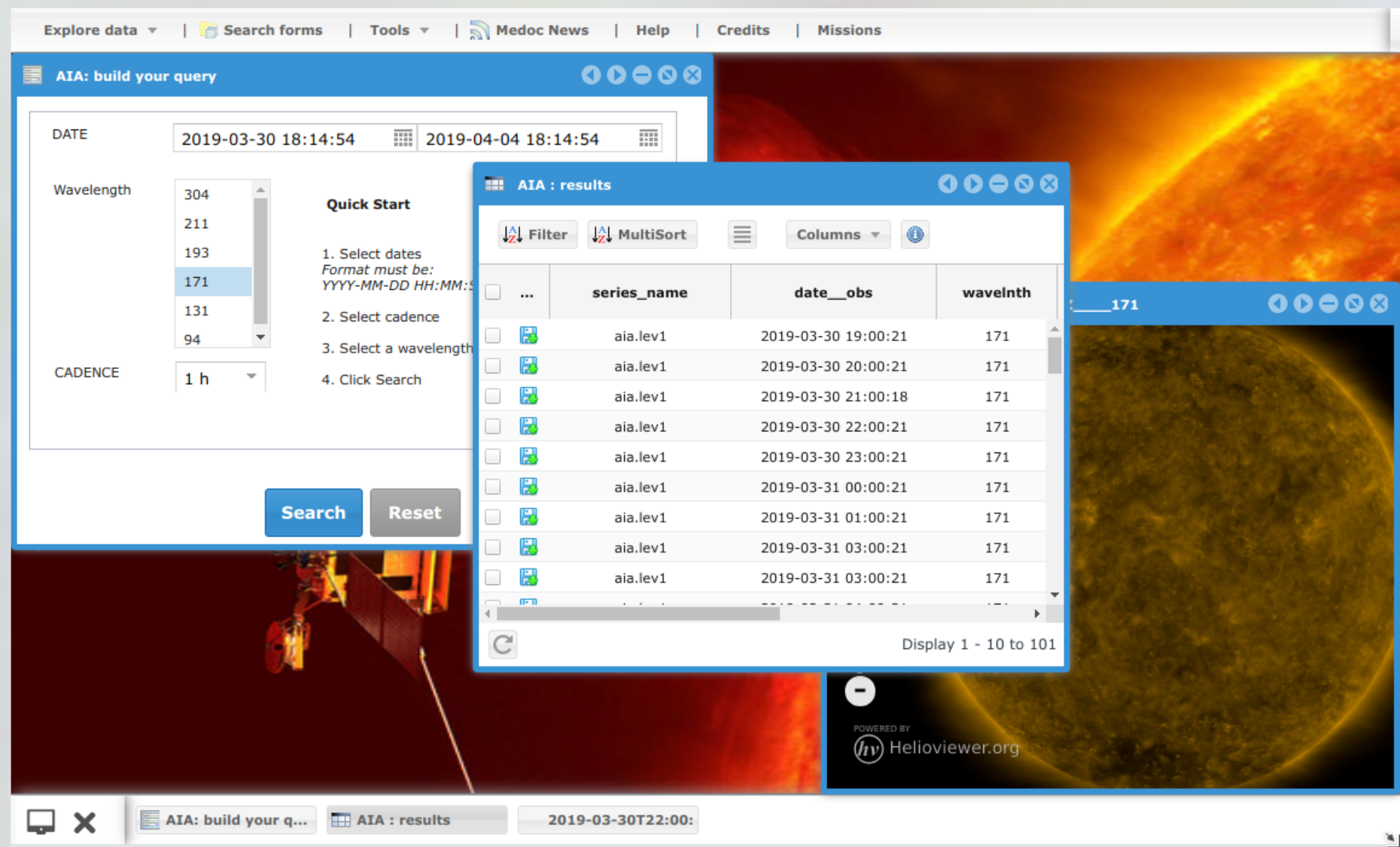
Processed and value-added data

- Emission measure and temperature maps (SDO/AIA)
- Synchronous synoptic maps (SOHO/EIT; SDO/AIA+HMI)
- Radial electric currents in Active Regions (SDO/HMI)
- These ones (above) computed once per day or more often, just a few hours after the observation.
- PLUTO/WindPredict simulation results, in new Galactica node; soon migration of other simulations datasets (OHM; VP)
- ICME catalogs



Web interfaces

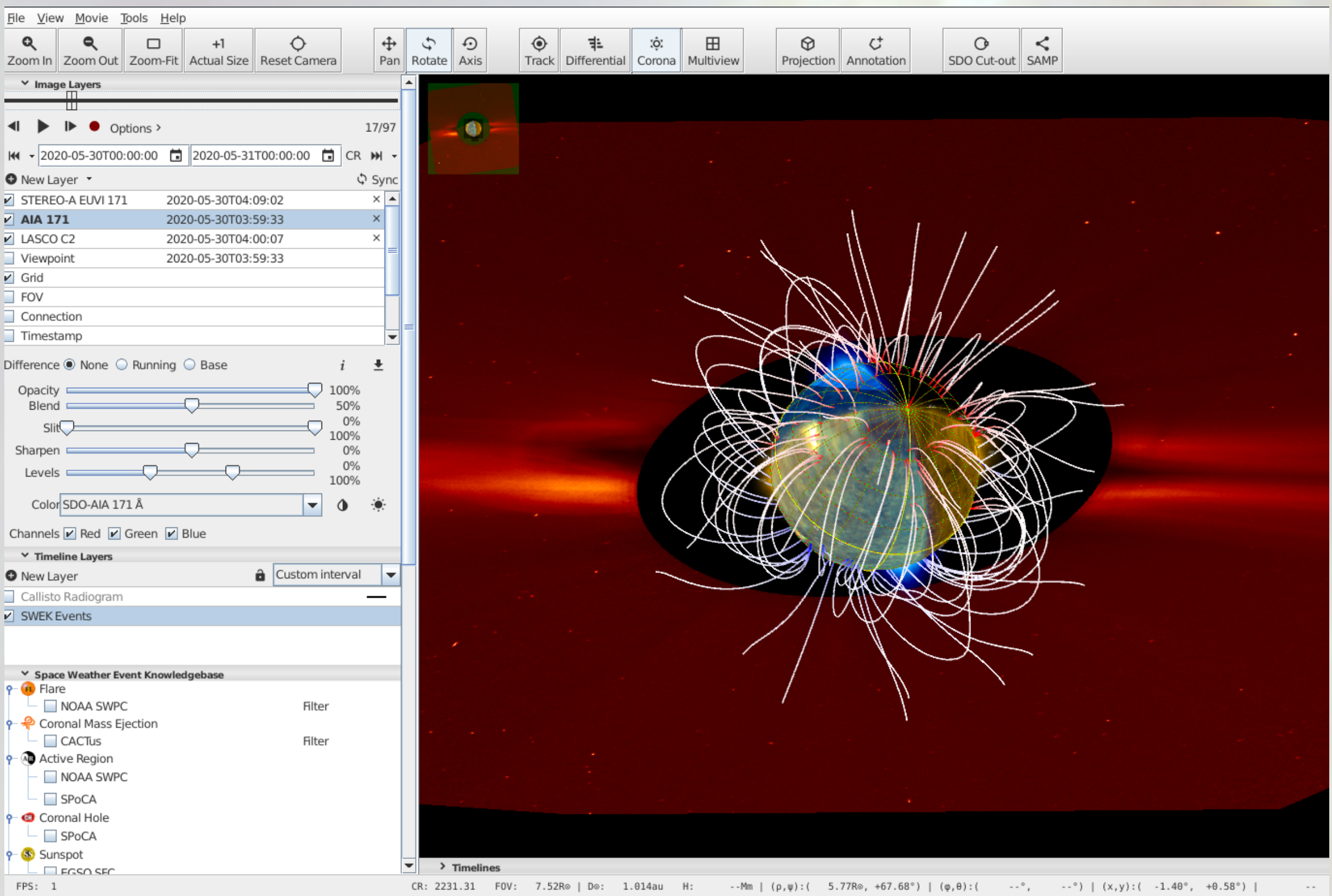
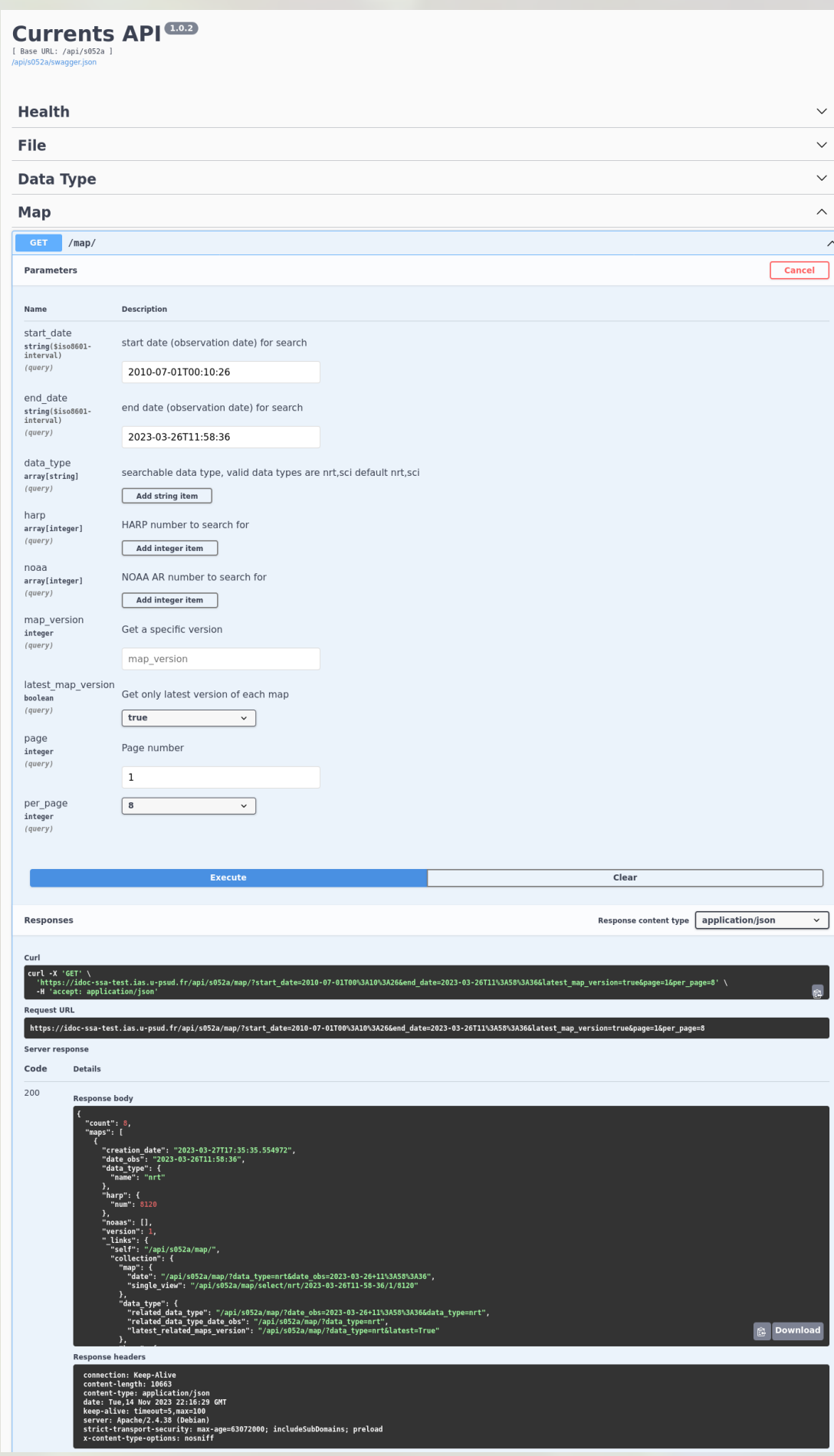
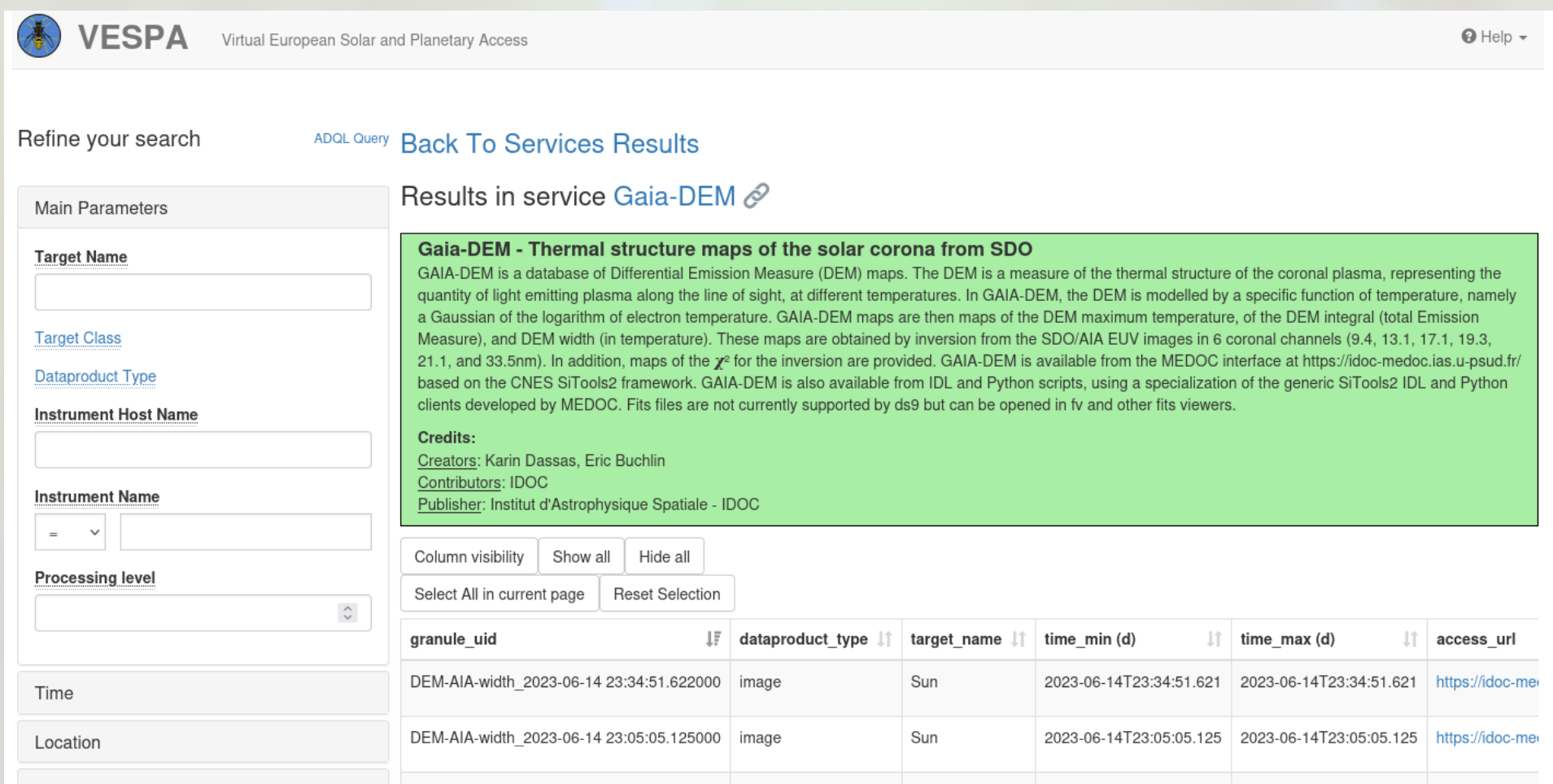
- Reliable, ergonomic, and responsive web interfaces for multiple datasets, based on CNES frameworks: SiTools, and now REGARDS (open source with free license)
- Also, custom pages for some datasets (e.g. products for the ESA Space Weather portal, built with Python/Flask)



Virtual observatory services and APIs

- Derived data products specific to MEDOC are served through EPN-TAP (Table Access Protocol), using DaCHS.
- Then available through Virtual Observatories: VESPA and Solar VO (also planned: VSO).
- Other APIs:
 - From SiTools and REGARDS (with Python clients)
 - From HelioViewer (now including HAPI: Heliophysics API)
 - Custom API for products in ESA Space Weather portal

Instrument	SPICE	Date-obs	Scientific objective	Observation mode	X-center [arcsec]	Y-center [arcsec]	Data type
Solar Orbiter	SPICE	15/12/2021 11:19:11	L_FULL_LRES_MCAD_Cor...	CAL_SPECTRAL-RESPON...	-79.700035	66.704124	SCI
Solar Orbiter	SPICE	01/03/2022 13:34:35	None	CAL_SPECTRAL-RESPON...	44.505917	-73.63908	SCI
Solar Orbiter	SPICE	12/01/2022 17:42:58	None	CAL_SPECTRAL-RESPON...	-30.632143	-70.33096	SCI
Solar Orbiter	SPICE	12/01/2022 17:23:33	None	CAL_SPECTRAL-RESPON...	13.301798	-73.59341	SCI
Solar Orbiter	SPICE	17/11/2020 08:17:45	None	CAL_FOCUS-COLD_TS_SL...	-85.20438	-77.45922	SCI
Solar Orbiter	SPICE	06/03/2022 22:38:31	R_BOTH_LRES_HCAD_Na...	SCI_HIGH-CAD_SS_SL04...	-755.7152	-530.342	SCI
Solar Orbiter	SPICE	18/11/2020 15:03:07	None	SCI_DYN-QS-MEDIUM-1A...	-84.17502	-77.36724	SCI



Tools for analysis and interpretation

- Helioviewer server and web application (visualization, on-demand movies), with full data mirror from GSFC; connected from the CDPP Propagation Tool. Now MEDOC is the default server for JHelioViewer.
- Non-LTE radiative transfer codes
- Coherent structures tracking code
- All free and open source; codes have DOIs.

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