

UV/EUV solar spectral imaging data for space weather

Datasets and tools at MEDOC

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with:

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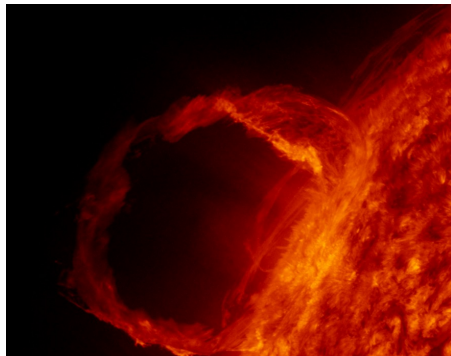
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Solar UV data for space weather

- ▶ UV solar data is *relevant for space weather*
 - Space weather-generating solar dynamic *events* are *visible in UV*: flares, filament eruptions, CMEs...
 - *UV flux is a component of space weather*: ionosphere conductivity, upper atmosphere heating and chemistry...
- ▶ *Continuous coverage* by space UV imagers and spectrographs, data publicly accessible, possibly with *short delays*.



SDO/AIA 30.4nm, 30 Mar 2010

Data at MEDOC and redistribution tools

- 1. Solar UV data for space weather*
- 2. Data at MEDOC and redistribution tools*
- 3. Processed and value-added data*
- 4. Visualization and analysis tools*
- 5. Conclusion*

Data currently available at MEDOC

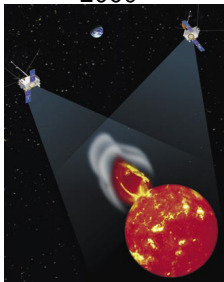
Focus on *UV and EUV* from space instruments: images, spectroscopy (+some visible, magnetometry, and particle data):

SOHO
1995–



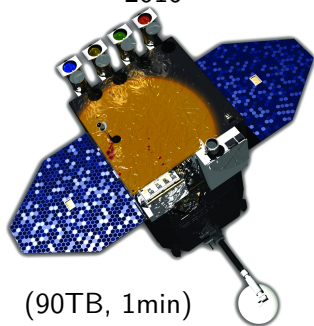
(all instruments)

STEREO/SECCHI
2006–



(40TB)

SDO/AIA
2010–



(90TB, 1min)

and also TRACE, CORONAS-F/SPIRIT.

Data redistribution by web interfaces

Reliable, ergonomic, and responsive web interfaces based on the CNES SiTools framework. **Try it at the fair!**

The screenshot displays the SiTools web interface with several components:

- Build your query:** A form with 'DATES' (2013-10-29 00:00:00 to 2013-11-08 15:44:43), 'WAVELENGTHS' (a list including 94, 131, 171, 193, 211, 304, 330, 1900, 1700), and 'CADENCE' (1 h).
- Quick Start:** A numbered list of instructions for selecting dates, wavelengths, and cadences.
- Results:** A table with columns for 'date', 'wavelength', 'exptime', 'metafile', and 'helpviewer'. It shows a list of data records for various dates and wavelengths.
- Plot:** A line plot titled 'Data plot: IAS_300_dataset'. The Y-axis is labeled 'exptime' and ranges from 0.00 to 2.50. The X-axis is labeled 'date_obs' and shows dates from 2013-10-29 to 2013-11-08. The plot shows a series of data points connected by lines, with a vertical line at 2.0001.
- Plot settings:** A panel with options for 'Plot title', 'Draw lines', 'Point tags', 'X Axis', 'X Date Format', 'X axis label', 'Color', and 'Y Axis'.

On the right side of the interface, there are logos for 'PARIS SLD', 'CIRS', 'cnes', 'IAS', and 'MEDOC'. At the bottom, there is a navigation bar with a question mark icon and a 'Display: 300 records from 1 to 300' indicator.

Data redistribution by web services

- ▶ SiTools has integrated *web services*
- ▶ IDL and Python *clients for these web services* have been developed for advanced uses

```
1 from sitools2.clients.sdo_client_medoc import *
2 d1 = datetime (2012, 11, 21, 0, 0, 0)
3 d2 = d1 + timedelta (days=1)
4 sdo_data_list = search (DATES=[d1,d2], WAVES=['335'], CADENCE=['6 h'])
5 for item in sdo_data_list:
6     sdo_metadata = item.metadata_search (KEYWORDS=['quality', 'cdelt1', 'crval1'])
7     if (my_meta_search['quality'] == 0):
8         item.get_file (TARGET_DIR='data/')
9
```

Processed and value-added data

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Processed and value-added data

► SOHO/EIT and combined SOHO+STEREO UV imagers movies

- Database of solar wind model profiles (Grappin et al.)
- (EM, T) maps computed from SDO/AIA (Guennou et al. 2012)

EIT MPEG Movies Archive [new](#) [Mission-long movies](#) [latest movies](#) [help](#)

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

previous **Jul 2001** next

Monthly Movies

171	195	284	304
			
256 (697kB) 512 (1.4MB)	256 (18.4MB) 512 (36.8MB)	256 (697kB) 512 (1.4MB)	256 (916kB) 512 (1.8MB)
			
256 (692kB) 512 (1.4MB)	256 (18.4MB) 512 (36.8MB)	256 (692kB) 512 (1.4MB)	256 (911kB) 512 (1.8MB)


Daily Movies

171	195	284	304
12 Jul 2001	15 Jul 2001	17 Jul 2001	19 Jul 2001
			
256 (27kB) 512 (54kB)	256 (27kB) 512 (54kB)	256 (27kB) 512 (54kB)	256 (27kB) 512 (54kB)
			
256 (27kB) 512 (54kB)	256 (27kB) 512 (54kB)	256 (27kB) 512 (54kB)	256 (27kB) 512 (54kB)

Processed and value-added data

- ▶ SOHO/EIT and combined SOHO+STEREO UV imagers movies
- ▶ *Database of solar wind model profiles (Grappin et al.)*

▶ *Fast and simple solar wind model profiles (AIA) (Guennou et al. 2012)*


(Updated: May 23 2013 12:26 UT)

DataBase of 1D Solar Wind model calculations by VP code

The VP database provides access to numerical results obtained via a 1D Solar Wind hydrodynamic density, bulk speed, ion and electron temperatures and pressures, as well as the wave pressure, photosphere at $T=6000\text{K}$ up to 30 solar radii for fast calculations, but can be extended to larger distances and the mechanical heat flux and the magnetic field expansion rate. A graphic calculator for the stand. This page provides the ability to plot or retrieve calculation results listed below in the drop-down list. Runs on demand are also proposed. ([see details](#))

NB 1: JavaScript must be enabled on your browser !
NB 2: Connection will fail if you are behind a firewall not allowing access through port 7778 (e.g. corporate networks)

Select action
 Plot data
 Get data
 Show parameters

Choose RUN to show parameters

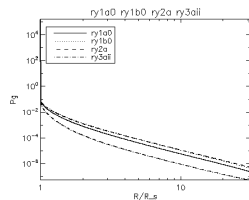
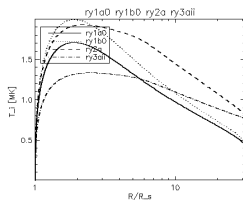
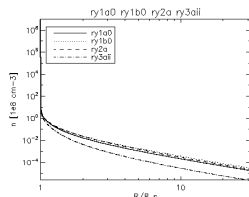
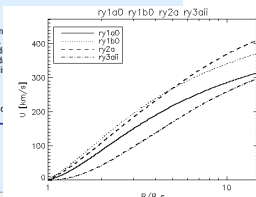
Choose up to four RUNS for plots ^{2,3}

Run 1: ry1a0: F_MH0=4.e5 H=1. nu=2. fig1 Pintoetal2009
 Run 2: ry1b0: F_MH0=8.e5 H=1. nu=2. fig1 Pintoetal2009
 Run 3: ry2a: F_Mu0=8e5 mu=3./2. nu=2. fig2 Pintoetal2009
 Run 4: ry3aii: F_Mu0=1e5 mu=3./2. nu=2. fig3 Pintoetal2009

Choose fields for plots ¹

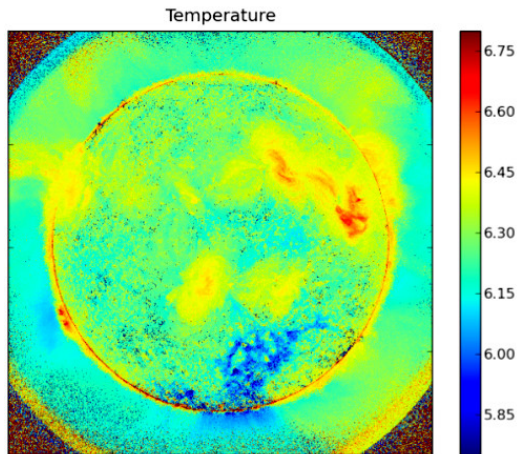
Plot 1: U: Flow speed [km/s]	Y-axis Scale: <input type="checkbox"/> Log(10)	min v
Plot 2: n: Density [$1e8 \text{ cm}^{-3}$]	Y-axis Scale: <input checked="" type="checkbox"/> Log(10)	min v
Plot 3: T_e: Temperature [MK]	Y-axis Scale: <input type="checkbox"/> Log(10)	min v
Plot 4: Pg: total gas pressure [cgs]	Y-axis Scale: <input checked="" type="checkbox"/> Log(10)	min v

 X-axis Scale:



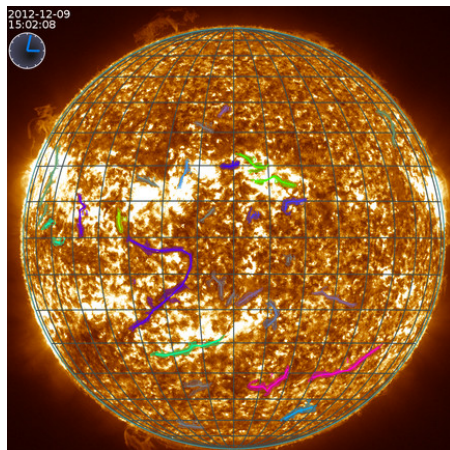
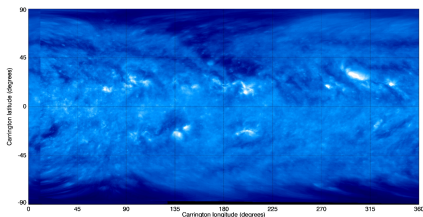
Processed and value-added data

- ▶ SOHO/EIT and combined SOHO+STEREO UV imagers movies
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- ▶ *(EM, T) maps computed from SDO/AIA (Guennou et al. 2012)*



Processed and value-added data: *coming soon*

- ▶ SDO/AIA synoptic maps, and on-demand movies
- ▶ Database of automatically-detected filaments



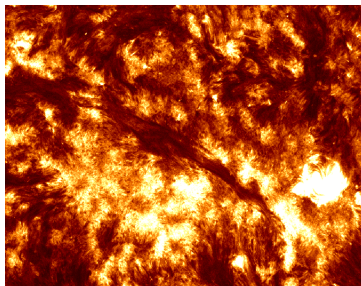
Filament detections in HeII 30.4 nm

- ▶ Filament material can be ejected \rightarrow CME \rightarrow space weather
- ▶ Need to *predict* or at least *detect* eruptions in real-time
- ▶ *30.4nm* vs. H α : more challenging, but perfect data availability!

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\rightarrow Development of the FILEAS filament detection code

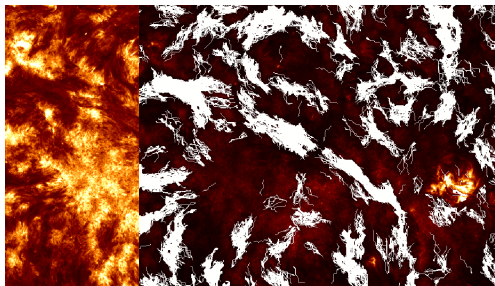


1. SDO/AIA

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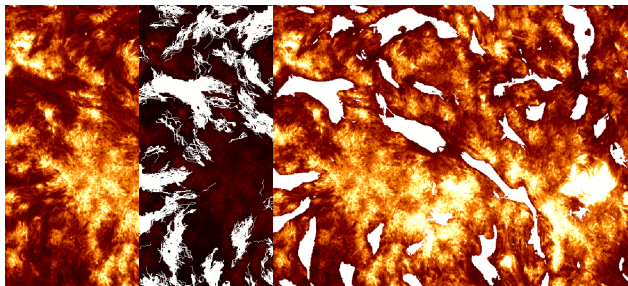


1. SDO/AIA 2. Image processing

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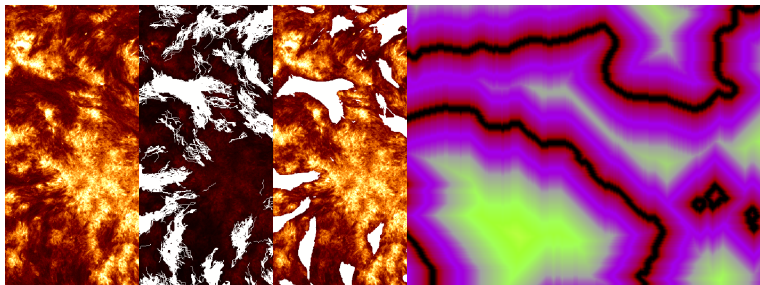


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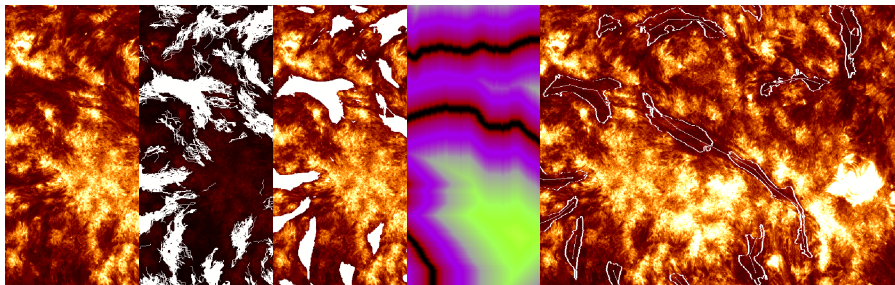


1. SDO/AIA 2. Image processing 3. SDO/HMI PIL

Filament detections in HeII 30.4 nm

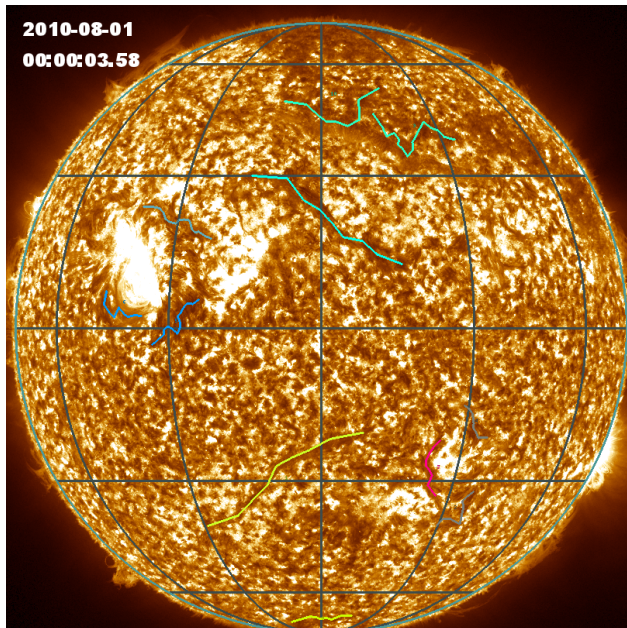
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1. SDO/AIA 2. Image processing 3. SDO/HMI PIL 4. Filaments

Result of filament detections and tracking

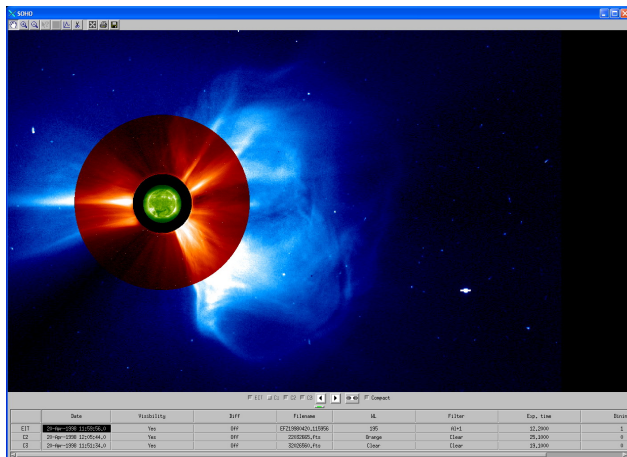


Visualization and analysis tools

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Tools for data visualization and analysis

- ▶ FESTIVAL: multi-instrument visualization and data analysis



- ▶ Coming soon: a Helioviewer server (for redundancy / load balancing)

Conclusion

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Conclusion

- ▶ *UV data* are not only useful for science, they are also *strategic for space weather*, and *continuous observations should be made perennial*
- ▶ Data are *available to space weather users* (and sometimes with short enough delays — not always...)
- ▶ The MEDOC data and redistribution system are a *valuable asset* for the scientific community and space weather users, thanks to
 - *long-term commitment* between all partners (CNES, INSU/CNRS and Univ. Paris-Sud).
 - *technical mutualization* with IDOC at IAS (CoRoT, Mars Express, Planck, Herschel...)

Visit us at our fair stand on Wednesday
and at
<https://idoc.ias.u-psud.fr/MEDOC>

