

SPACE WEATHER INTRODUCTORY COURSE



Collaboration of



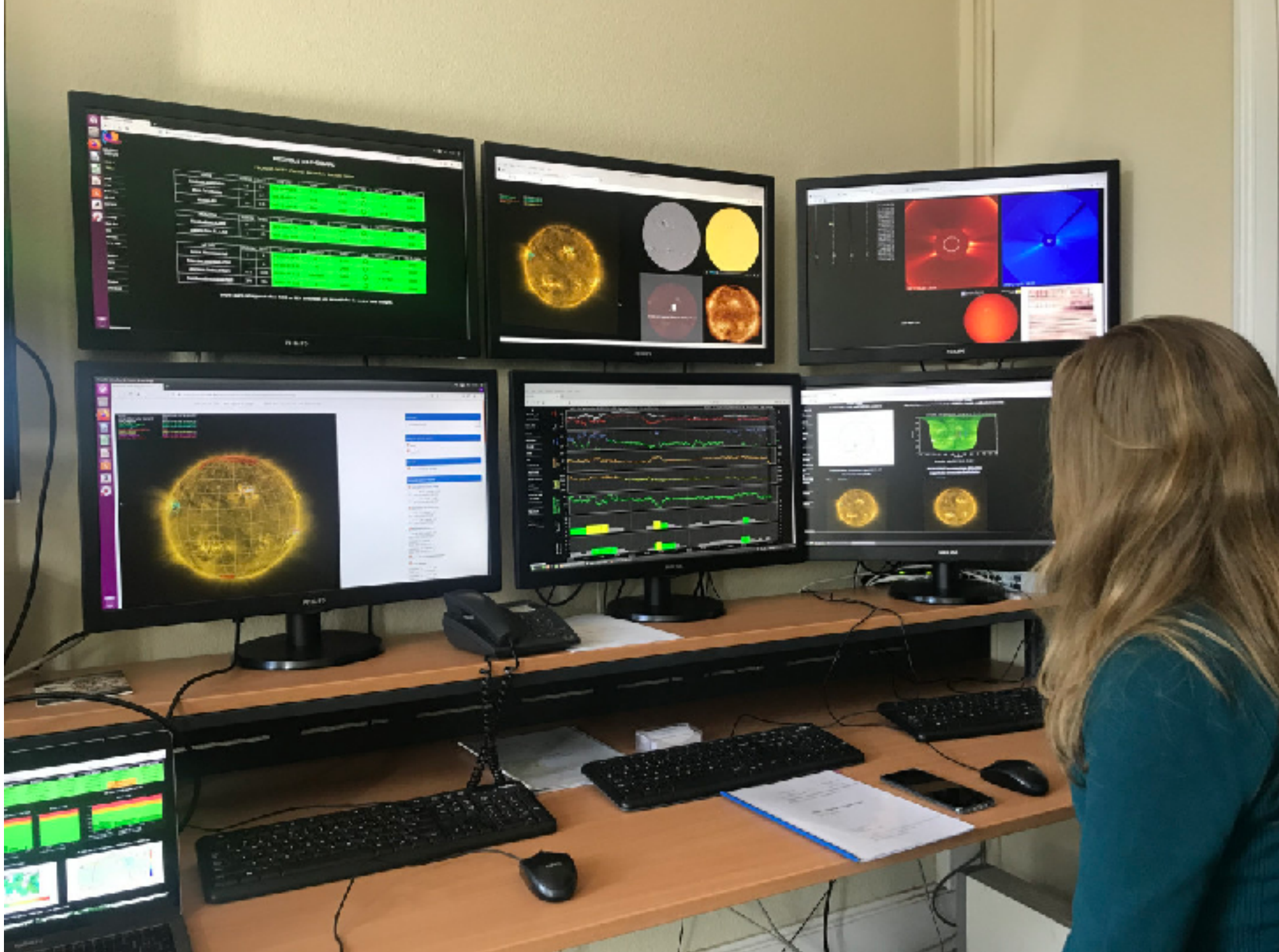
Solar-Terrestrial Centre of Excellence



Koninklijke luchtmacht



Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu



Space Weather Forecasting at the STCE

Elke D'Huys and the STCE team

SIDC Webpage

Space Weather Services

Detections

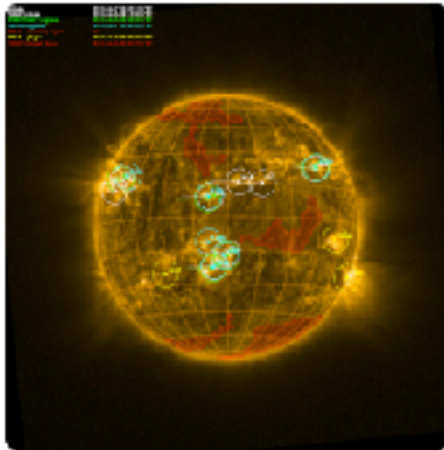
Solardemon

2023-04-27 02:51 B8 flare

CACTus

2023-04-21 18:12
844km/s

Solar Map



Latest Alerts

Presto 2023-04-24

The Corona Mass Ejection (CME) arrival first reported yesterday continues to cause a major geomagnetic storm. Although the solar wind velocity has now dropped to 500 km/s and the North-South component of the Interplanetary magnetic field (Bz) has now increased to -10 nT, the Kp Index has reached the severe level (Kp=8, G4). The geomagnetic conditions are expected

Forecasts

Flare:

Quiet conditions
(<50% C-class flares)

Protons:

Quiet

Geomagnetic:

Quiet
(A<20 and K<4)

All quiet:

False

Provisional SSN:

127

Solar Activity

URSIdgram 2023-04-26

Solar flaring activity was low and infrequent with two C1 flares detected during the past 24 hours. NOAA Active Region (AR) 3285 (Catania group 65) produced one of them, while a yet unnamed AR turning into Earth's view produced the second flare. More C-class flare activity is expected in the next 24 hours, most probably from the unnamed AR mentioned above. No Earth-directed Coronal Mass Ejections

Solar Wind

URSIdgram 2023-04-26

The Solar Wind (SW) conditions were stable during the last 24 hours. The SW speed ranged between 490 and 570 km/s in the last 24 hours. The total Interplanetary magnetic field (Bt) varied between 2 and 6 nT and its North-South component (Bz) ranged between -5 and 5 nT. The Interplanetary magnetic field phi angle was directed away from the Sun until yesterday 19:00 UT and has turned

Forecaster tasks

Forecasters

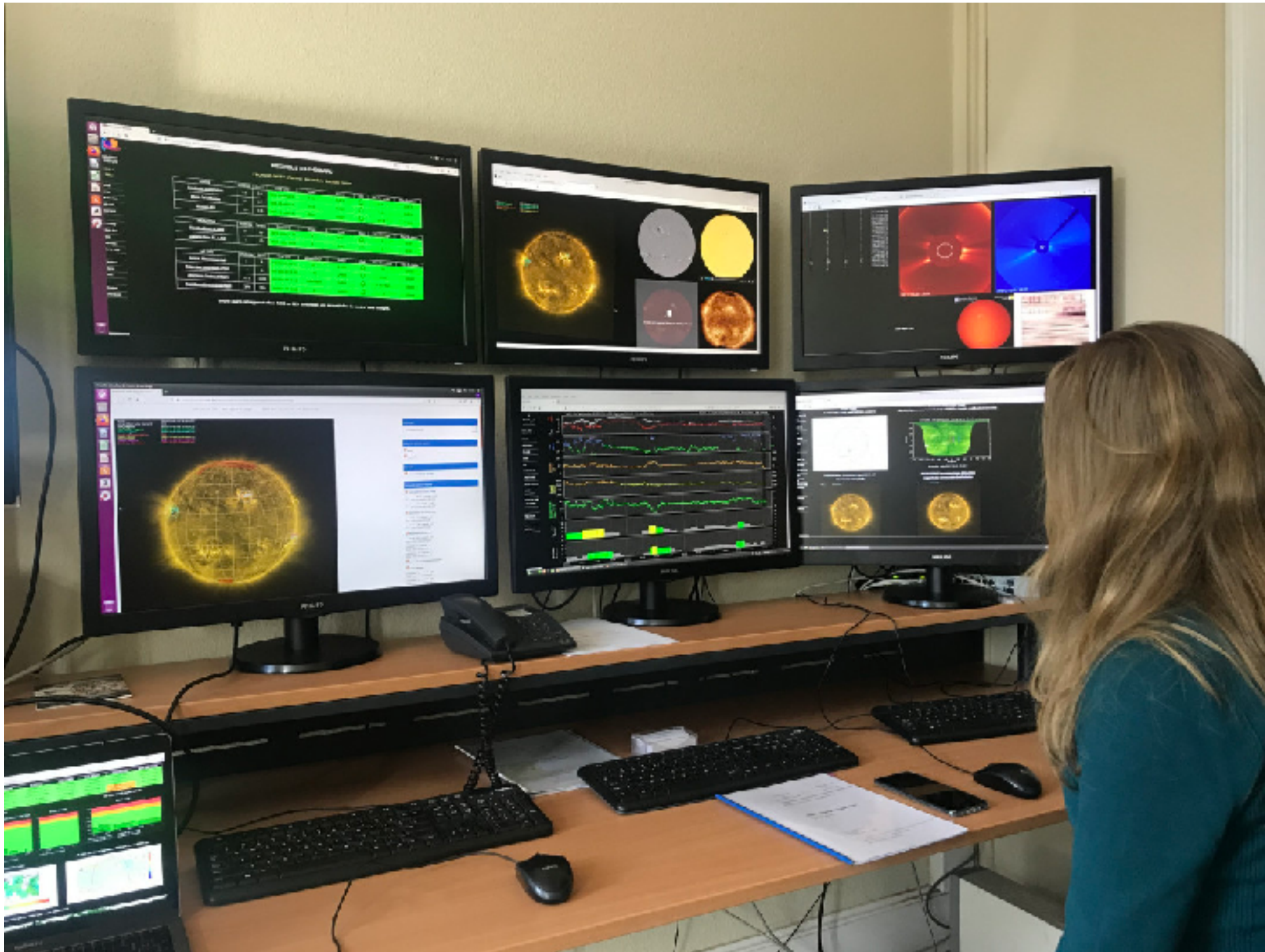
- One week duty cycle
- Daily ursigram
- Alerts when needed
- Briefing/handover on Monday
- 24/7 with automated alerts
- PECASUS operator during day (9-17h)
- Tailored bulletins (BepiColombo, Mars Express)

PECASUS Operator

- 17h-9h (except weekends)
- Night shifts
- On call with support from MeteoWing
- ICAO Advisories when needed + follow-up



Forecaster tasks: monitoring



Previweb - Forecaster page

[Forecast](#) [Weekly](#) [Presto](#) [Cactus](#) [All quiet](#) [CME arrival](#) [Monthly bulletin](#) [Quarterly](#) [Links](#)

UTC time: 10:02:16 Date: 2023-05-05 Forecast status : Busy Forecaster: de Patoul Judith

Login : elked **Warning : you are not the forecaster :** [Make me forecaster](#) [Logout](#)

Catania needs update [Click here](#)

Forecast regions

Forecast 10cm flux

Forecast K

Forecast helio

Finish forecast



Solar Flares - Regions

Forecast regions
Forecast 100m flux
Forecast: K
Forecast: helio
Finish forecast

Catalaia info (Last update: 2023-Apr-26)

HCAA info (Last update: 2023-Apr-27)

Probabilities for:

Number	area	reports	Zenith	Longitude	Latitude	Number	Macintosh	Mag. type	Longitude	Latitude	C flare	A flare	K flare	Proton
65	20	5	C	-18.0	-17.0	3285	Gae	Beta	-1.0	-17.0	10	1	1	1
						3286	Just	Alpha	-10.0	-18.0	5	1	1	1
67	15	11	B	-21.0	-31.0	3288	Bae	Beta	-10.0	-19.0	40	1	1	1
49	7	6	D	-78.0	19.0	3289	Bae	Beta	-81.0	20.0	20	10	1	1
66	4	6	D	34.0	14.0	3290	Bae	Beta	45.0	24.0	30	1	1	1
48	1	3	B	-23.0	8.0	3291	Bae	Beta	-10.0	9.0	15	1	1	1

Total flare forecast (computed range of probabilities, depending on the above filled out info)

Flare level	Total flares Catalaia (Last update: 2023-Apr-26)	Total flares HCAA (Last update: 2023-Apr-27)	Predictions
C	16	96	
B	13	14	
X	8	5	

Flare forecast (computed range of probabilities, depending on the above filled out info)

Proton forecast

Solar activity info

Image
SOL regions
IMAP/IBCT regions
HCAA regions
HAA regions
HCAA regions
GONG Coronal Holes

Links

Solar images and features

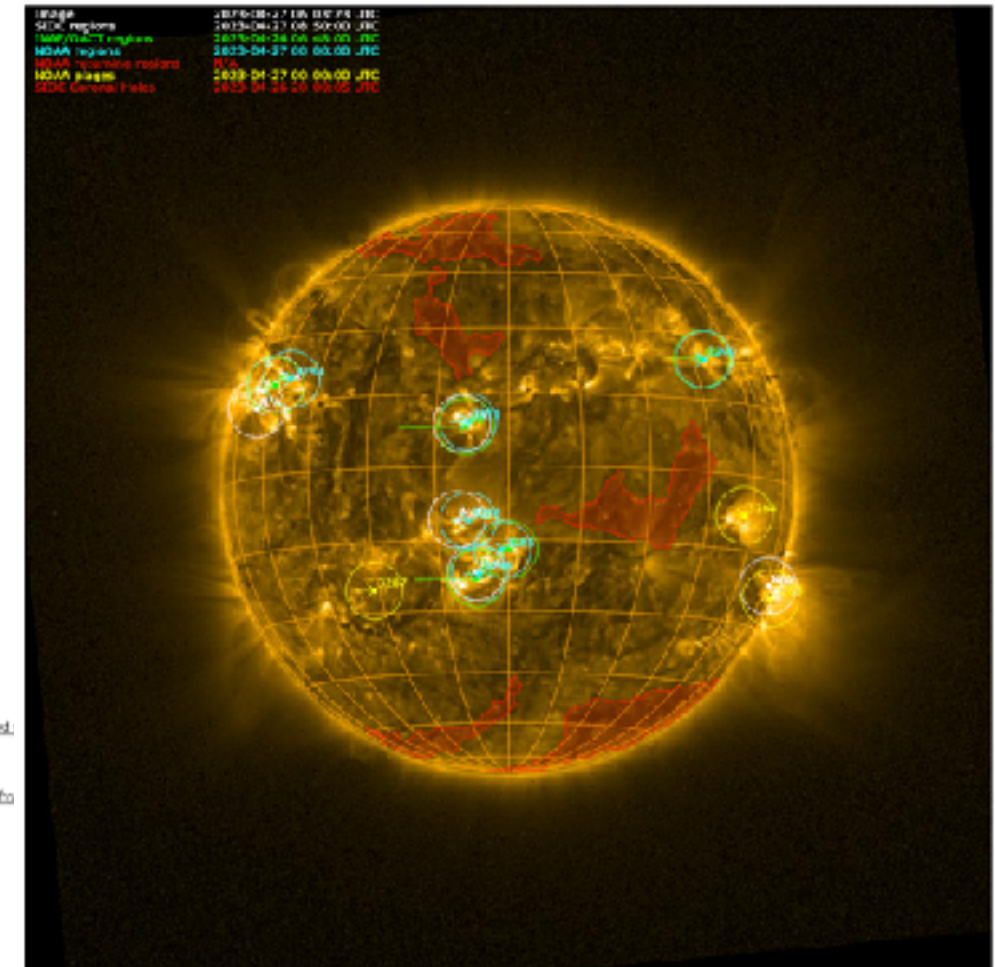
- Solar map
- LSST regions
- Solar Monitor Regions
- Latest NOAA regions
- Region maps
- RTG 2020 coronal hole forecasts
- PROB2 LYRA data and SWAP images
- SDO movies
- SDO movies (RCB page)
- SDHC movie theater (default)
- SDHC data
- STEREO movies
- Feature GONG H-alpha movie (beta)

Flares

- NOAA SWPC event list: today, yesterday, archive, RCB-hosted
- Keppler's flare list
- Solar Storm
- Solarsoft Latest Events
- GONG X-ray, proton & electron flux, estimated ION/assumed FO
- GLG X-ray plots
- LYRA Quick Look viewer
- Solar monitor Flare Forecast
- Brockton University Flare monitor (AEAP)
- RTG flare forecast archive

Radio

- Latest 10.7cm measurement, Archive of 10.7cm measurement
- SWPC radio flux measurements
- 10.7cm forecast by GLG
- Radio bursts | kunitz
- NOAA SWPC event list: today, yesterday, archive, RCB-hosted search for flare archive
- Culpeper spectrographs
- Culpeper Latest Radio burst
- Learn more spectrographs



Solar Flares - Forecast

Forecast regions
Forecast 10cm flux
Forecast K
Forecast Hells
Finish forecast

Catania info (Last update: 2023-Apr-26)						NOAA info (Last update: 2023-Apr-27)						Probabilities for			
Number	area	rapots	Zurich	Longitude	Latitude	Number	Macintosh	Macintosh	Longitude	Latitude	C flare	M flare	X flare	Proton	
65	20	5	C	-16.0	-17.3	3285	Cie	De	-5.0	-17.0	95	1	1	1	
						3286	Acc	De	-12.0	-18.0	1	1	1	1	
67	15	11	B	-21.0	-33.3	3288	Cie	Fets	-30.0	-12.0	85	1	1	1	
49	7	4	D	-78.0	19.0	3289	Cie	Fets	-58.0	26.3	90	10	1	1	
66	4	4	D	34.0	14.0	3290	Cie	Fets	45.0	24.3	30	1	1	1	
48	1	3	B	-28.0	8.0	3291	Cie	Fets	-12.0	9.0	95	1	1	1	

Total flare forecast (computed range of probabilities, depending on the above filled out info)

Flare level	Total flares Catania (Last update: 2023-Apr-26)	Total flares NOAA (Last update: 2023-Apr-27)	Predictions
C	16	16	
M	13	14	
X	4	5	

Flare forecast (computed range of probabilities, depending on the above filled out info)

Proton forecast

Total protons:

Solar activity info

Links

Solar images and features

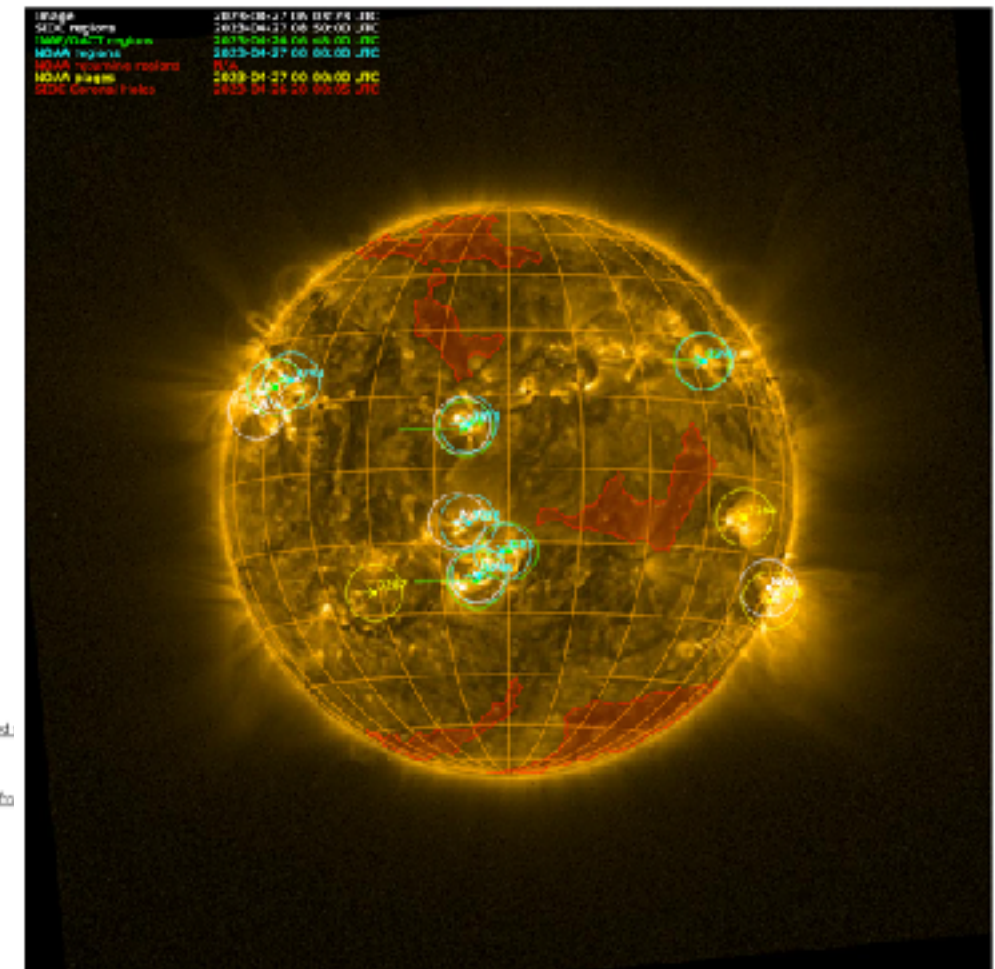
- Solar map
- LSST images
- Solar Monitor Regions
- Latest NOAA solar images
- Proton maps
- RTS-D Solarwind heliographic maps
- PROBE2 LYRA data and SWAP images
- SDO movies
- SDO movies (RCB usage)
- SDHC moviehost (defunct)
- SDHC data
- STEREO movies
- Feature: GONG H-alpha movies (backup)

Flares

- NOAA SWPC event info: today, yesterday, archive, RCB-hosted
- Kendall's Solar Flare
- Solar Detector
- Solarsoft Latest Events
- GONG X-ray proton & electron flux estimates (RCB-hosted)
- LYRA Quick look viewer
- LYRA Quick look viewer
- Solar monitor: Flare forecast
- Brockford University Flare monitor (ASAP)
- SDC flare forecast archive

Radio

- Latest 10.7m measurement, Archive of 10.7m measurement
- SWPC radio flux measurements
- 10.7m forecast by GLE
- Radio bursts & events
- NOAA SWPC event info: today, yesterday, archive, RCB-hosted searchdata flare archive
- Culpeper spectrographs
- Culpeper Latest Radio burst
- Leamington spectrographs



Solar Flares - Forecast Disk

Forecast regions					Forecast 10cm flux					Forecast K					Forecast H&K					Flare forecast									
Catalina info (Last update: 2023-Apr-26)										NOAA info (Last update: 2023-Apr-27)										Probabilities for:									
Number	area	spots	Zurich	Longitude	Latitude	Number	Machosch	Mag. type	Longitude	Latitude	C flare	M flare	X flare	Proton															
65	20	6	C	-18.0	-19.3	3285	Gae	Beta	-5.0	-17.0	[30]	[1]	[1]	[1]															
						3286	Aac	Alpha	-12.0	-18.0	[5]	[1]	[1]	[1]															
67	15	11	D	-21.0	-23.3	3288	Baa	Beta	-10.0	-19.0	[40]	[1]	[1]	[1]															
68	7	6	D	-78.0	19.0	3289	Baa	Beta	-58.0	25.0	[20]	[10]	[1]	[1]															
66	4	6	D	34.0	14.0	3290	Bra	Beta	45.0	24.0	[30]	[1]	[1]	[1]															
68	1	3	E	-23.0	8.0	3291	Baa	Beta	-12.0	9.0	[15]	[1]	[1]	[1]															

Total flare forecast (computed range of probabilities, depending on the above filled out info)

Flare level	Total flares Catalina (Last update: 2023-Apr-26)	Total flares NOAA (Last update: 2023-Apr-27)	Predictions
C	16	36	
M	13	14	
X	8	5	

Flare forecast (computed range of probabilities, depending on the above filled out info)

Proton forecast

Solar activity info

Links

- Solar map
- L3BT regions
- Solar Monitor Regions
- Latest NOAA regional news
- Fogor Maps
- STIR-TO-SOON virtual heliographic maps
- PROB2 LYRA data and SWAP images
- SDO movies
- SDO movies (RCR page)
- RDPIC movie browser (latest)
- Solar wind speed
- Realtime GONG H-alpha movies (backup)

Flares

- NOAA SWPC event list: today, yesterday, archive, RCR-hosted searchable flare archive
- Kendall's flare list
- Solar Decade
- Solarsoft Latest Events
- GONG X-ray proton & electron flux estimated from assembled from NOAA by h3bc
- GLS X-ray plots
- LYRA Quick look viewer
- Solar monitor Flare Forecast
- Bructford university Flare monitor (AEAP)
- SWPC flare forecast archive

Radio

- Latest 10.7m measurement, Archive of 10.7m measurements
- SWPC radio flux measurements
- 10.7m forecast by GLS
- Radio bursts / funnel
- NOAA SWPC event list: today, yesterday, archive, RCR-hosted searchable flare archive
- Culpeper spectrographs
- Culpeper Latest Radio burst
- Leamington spectrographs

Flare forecast (computed range of probabilities, depending on the above filled out info)

No forecast

Quiet conditions (<50% probability of C-class flares)

C-class flares expected, (probability >=50%)

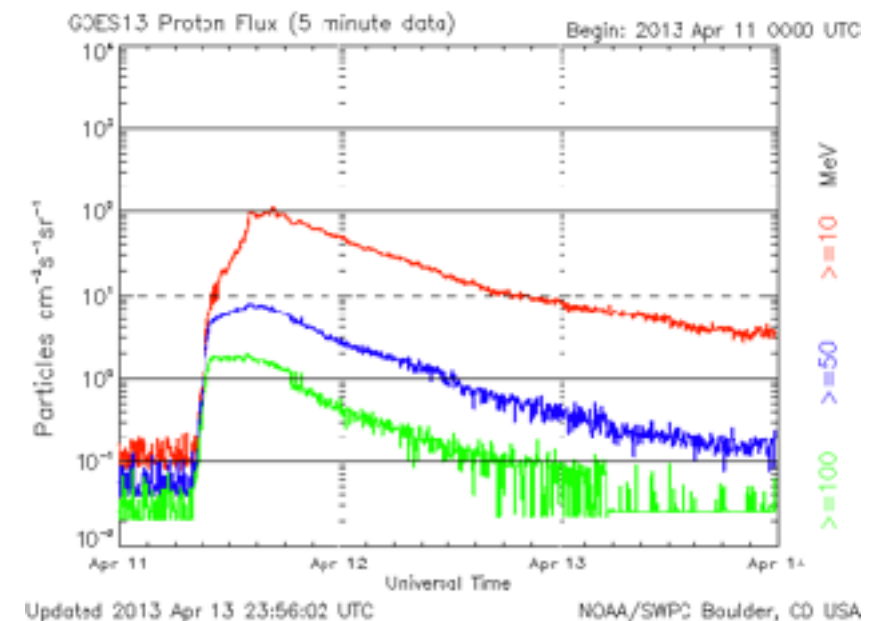
M-class flares expected (probability >=50%)

X-class flares expected (probability >=50%)

Proton flares expected [proton flares expected, probability >=50%]

Warning condition (activity levels expected to increase, but no numeric forecast given)





Solar Activity - Forecast

Forecast regions
Forecast 10cm flux
Forecast K
Forecast Hells
Finish forecast

Catania Info (Last update: 2023-Apr-26)						HCAA Info (Last update: 2023-Apr-27)				Probabilities for				
Number	area	rapots	Zurich	Longitude	Latitude	Number	Macintosh	Mag. type	Longitude	Latitude	C flare	M flare	X flare	Proton
65	20	5	C	-16.0	-17.3	3285	Civ	Beta	-5.0	-17.0	95	1	1	1
						3286	Joc	Alpha	-12.0	-18.0	1	1	1	1
67	15	11	B	-21.0	-33.3	3288	Buc	Beta	-30.0	-12.0	85	1	1	1
49	7	4	D	-78.0	19.0	3289	Buc	Beta	-58.0	25.3	90	10	1	1
66	4	6	D	34.0	14.0	3290	Buc	Beta	45.0	24.3	30	1	1	1
48	1	3	B	-28.0	8.0	3291	Buc	Beta	-12.0	9.0	95	1	1	1

Total flare forecast (computed range of probabilities, depending on the above filled out info)

Flare level	Total flares Catania (Last update: 2023-Apr-26)	Total flares HCAA (Last update: 2023-Apr-27)	Predictions
C	16	16	
M	13	14	
X	6	5	

Flare forecast (computed range of probabilities, depending on the above filled out info)

Proton forecast

Total protons:

Solar activity info

Links
Solar images and features
Solar map

- Past 24 hours general solar activity
- Past 24 hours [M,X]-class flares peak time and location (and optionally C-Flare).
- Forecast of new/decaying active regions
- Forecast of the flare activity level
- Filament observations and eruptions
- Proton flux and fluence

Previweb - Forecaster's Page

[Forecast](#) [Weekly](#) [Presto](#) [Cactus](#) [All quiet](#) [CME arrival](#) [Monthly bulletin](#) [Quarterly](#) [Links](#)

UTC time: 10:01:43 Date: 2023-05-05 Forecast status : Busy Forecaster: de Patoul Judith

Login : elked **Warning : you are not the forecaster :** [Make me forecaster](#) [Logout](#)

Catania needs update [Click here](#)

Forecast regions

Forecast 10cm flux

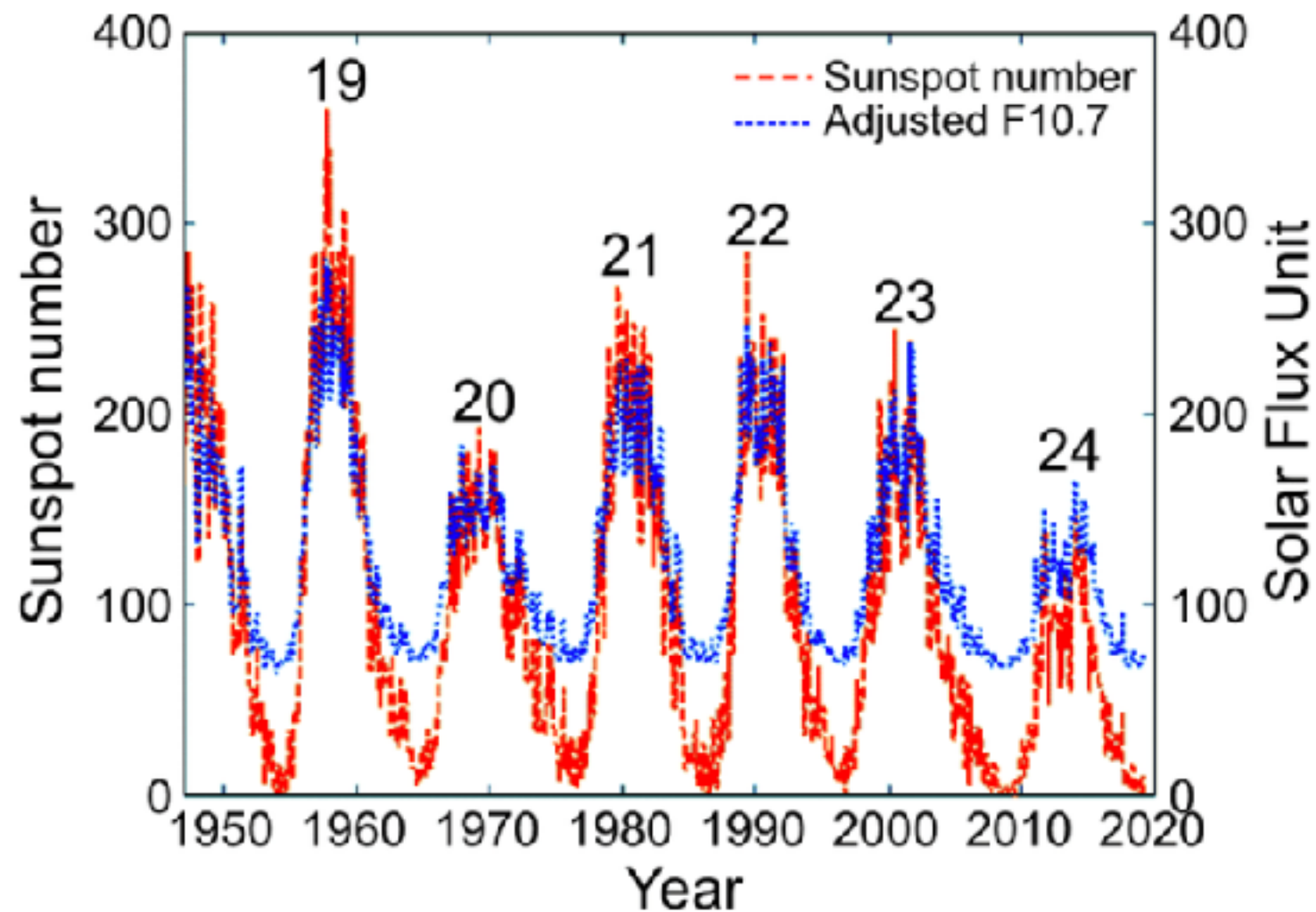
Forecast K

Forecast helio

Finish forecast



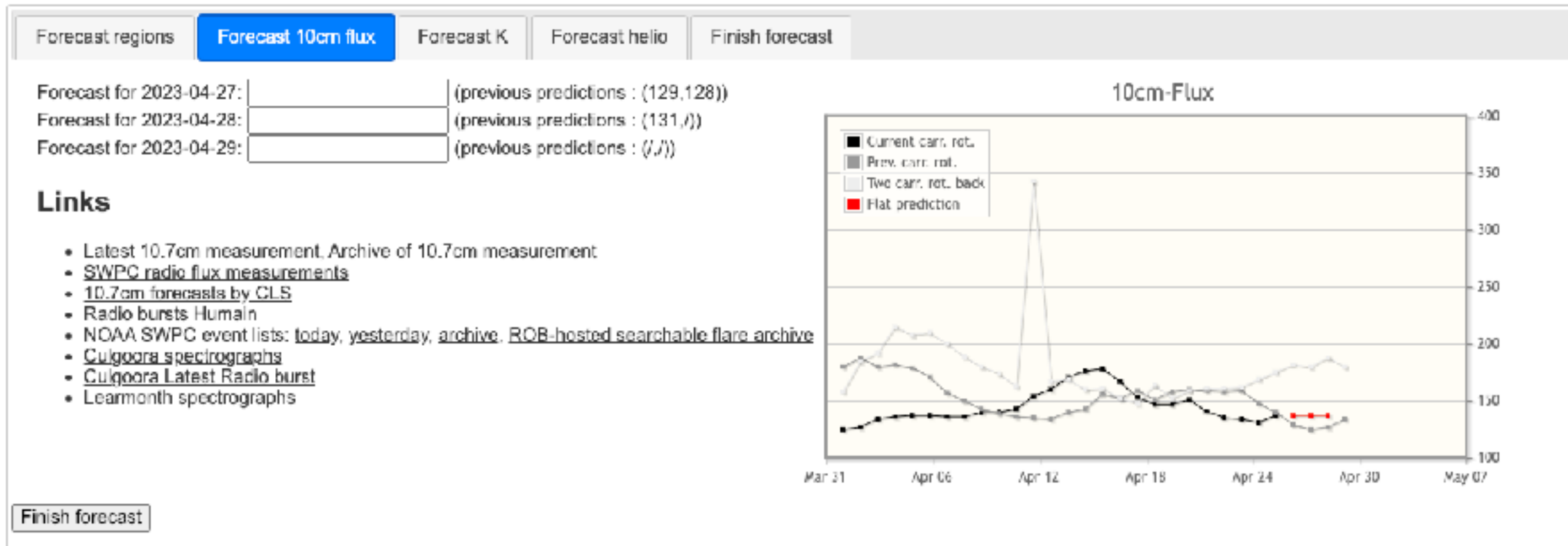
F10.7 - Observation



The sunspot numbers (red curve) and the 10.7 cm solar flux (F10.7, blue curve) from the middle of the 20th century [68-71]. The F10.7 values are in solar flux units (sfu), 1 sfu is equal to $10^{-22} \text{ W m}^{-2} \cdot \text{Hz}^{-1}$. The observed F10.7 is presented on the right axis.

(Grytsai et al., 2020)

F10.7 - Forecast



Previweb - Forecaster's Page

[Forecast](#) [Weekly](#) [Presto](#) [Cactus](#) [All quiet](#) [CME arrival](#) [Monthly bulletin](#) [Quarterly](#) [Links](#)

UTC time: 10:02:43 Date: 2023-05-05 Forecast status : Busy Forecaster: de Patoul Judith

Login : elked **Warning : you are not the forecaster :** [Make me forecaster](#) [Logout](#)

Catania needs update [Click here](#)

Forecast regions

Forecast 10cm flux

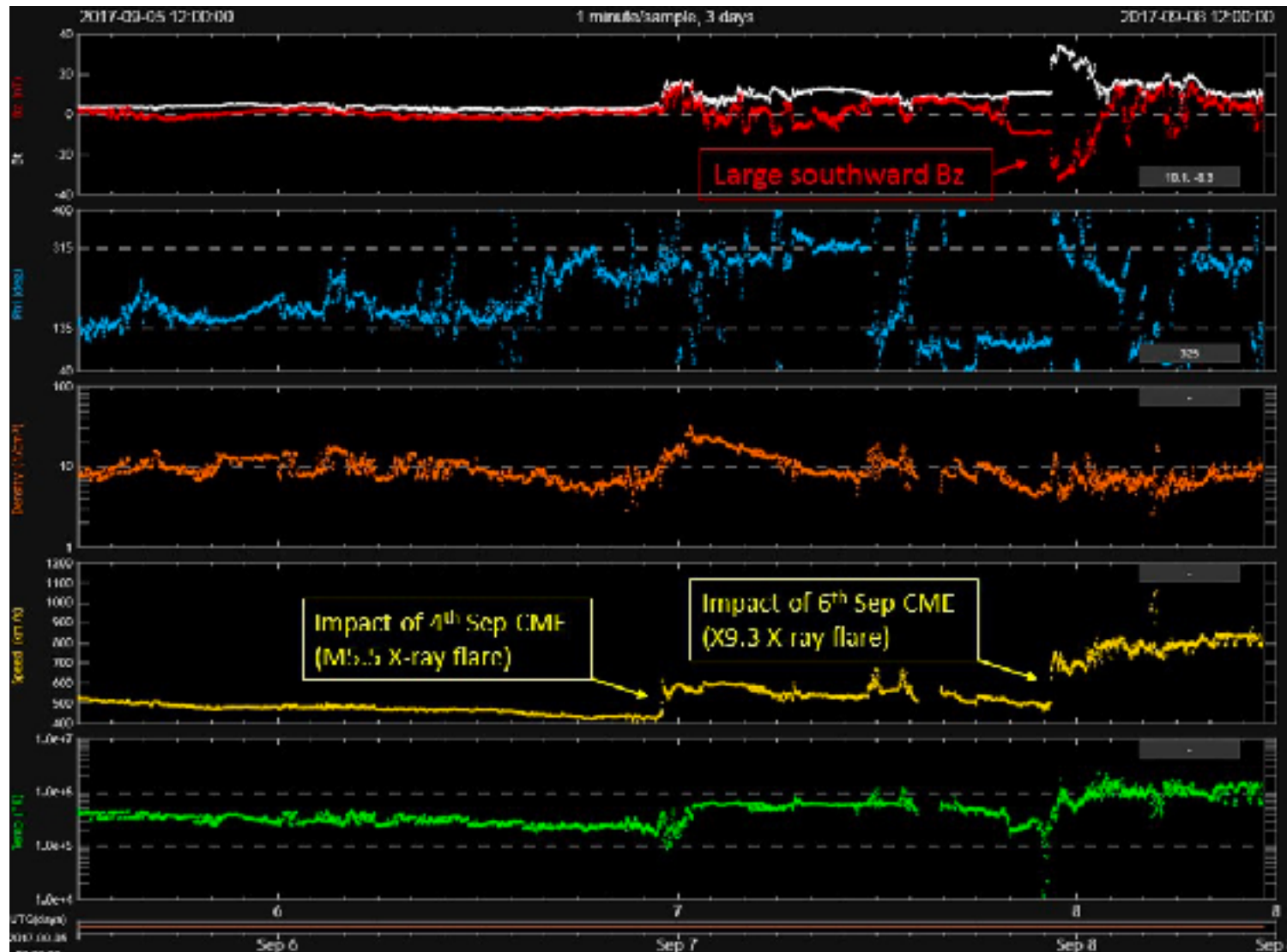
Forecast K

Forecast helio

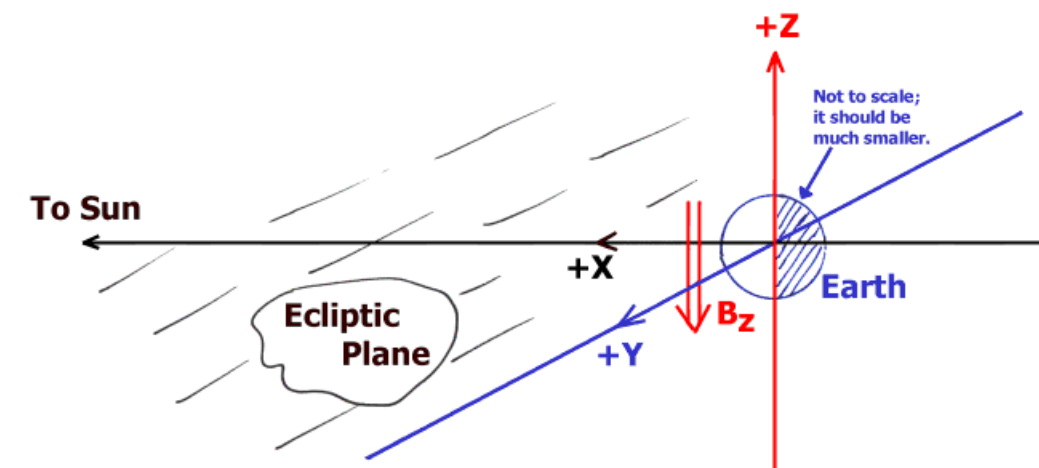
Finish forecast



Solar Wind - Observations

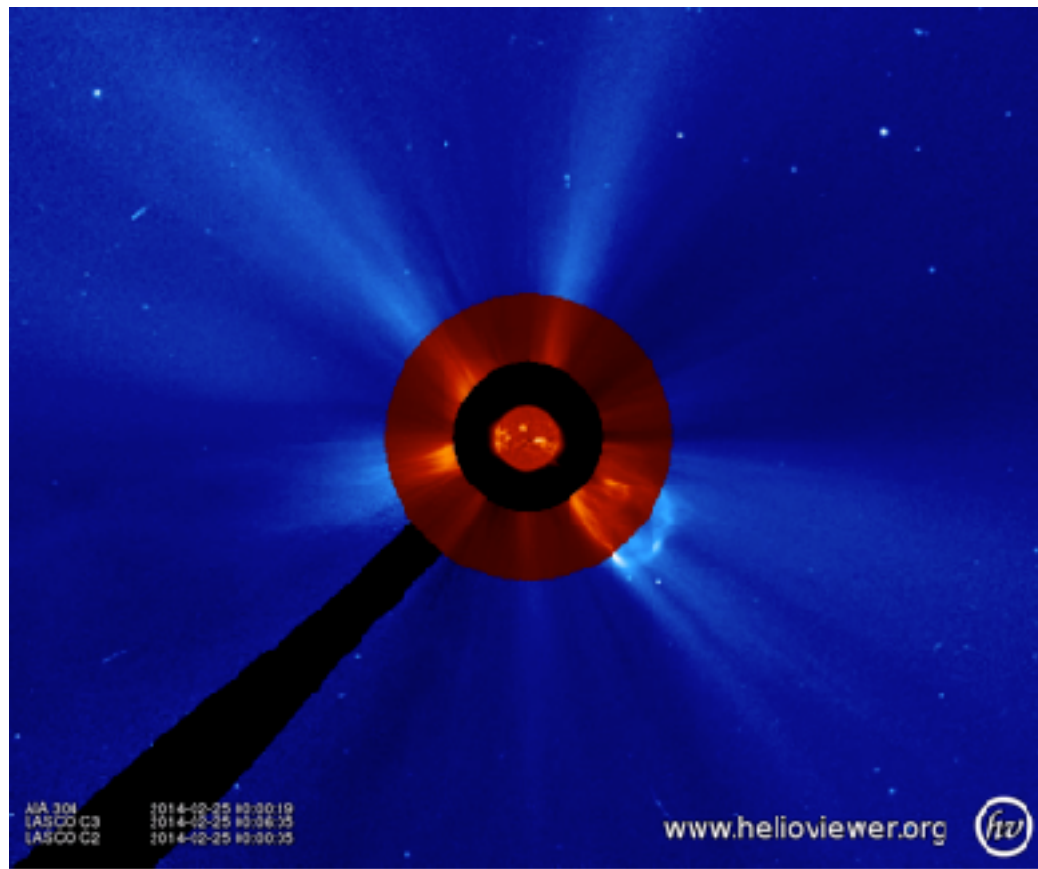


DSCOVR

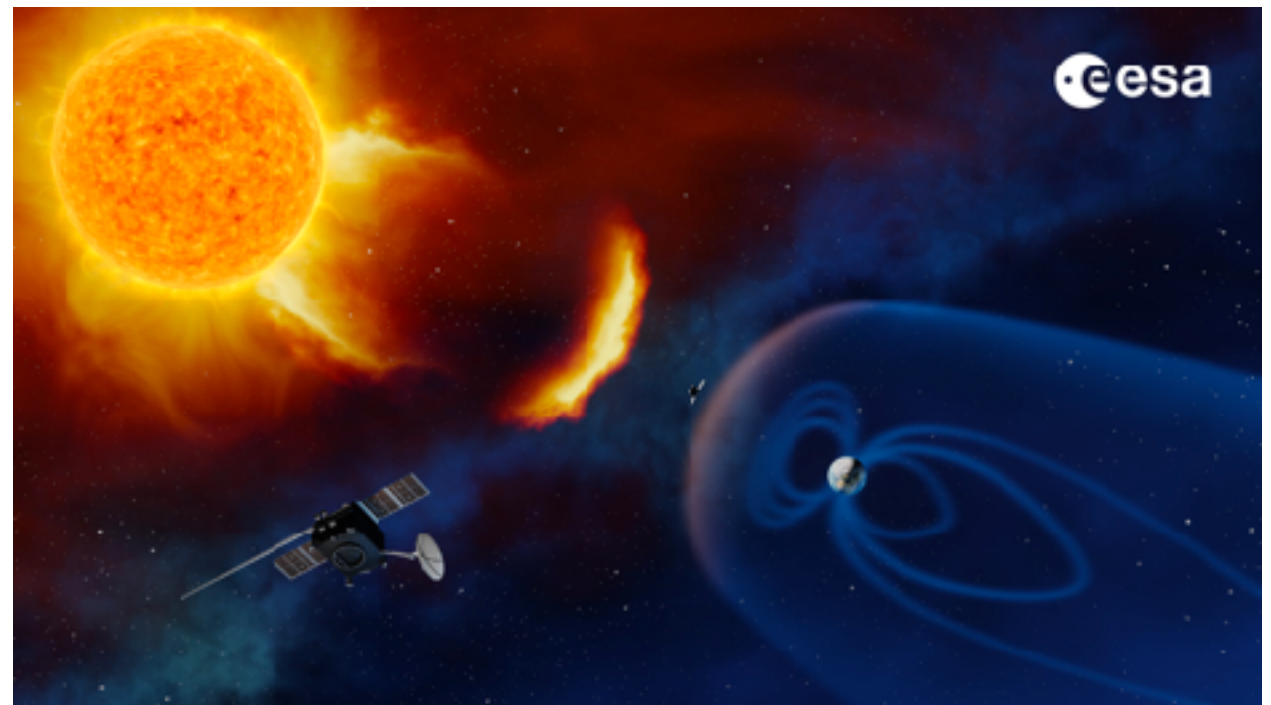


+Z is perpendicular to the Ecliptic Plane.

SW Disturbance - Coronal Mass Ejection

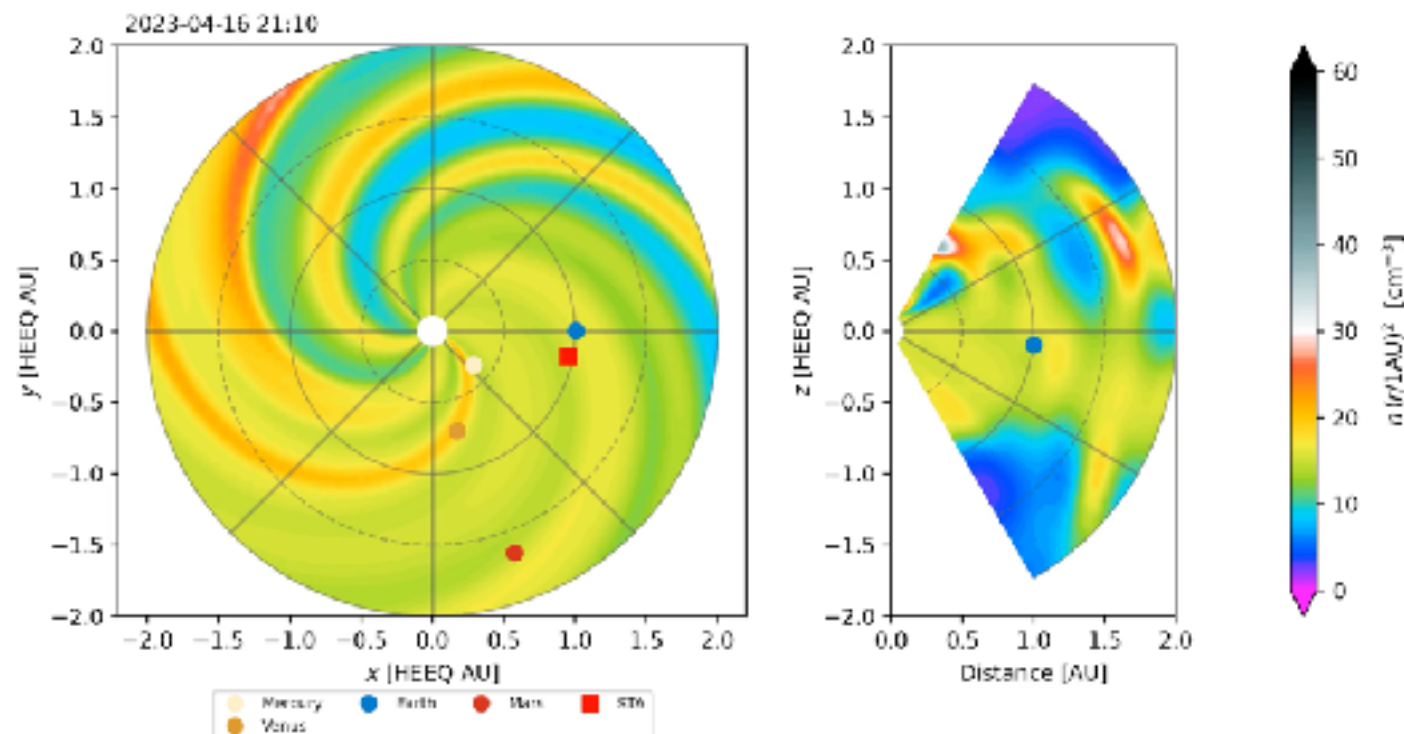


SDO/AIA and SOHO/LASCO

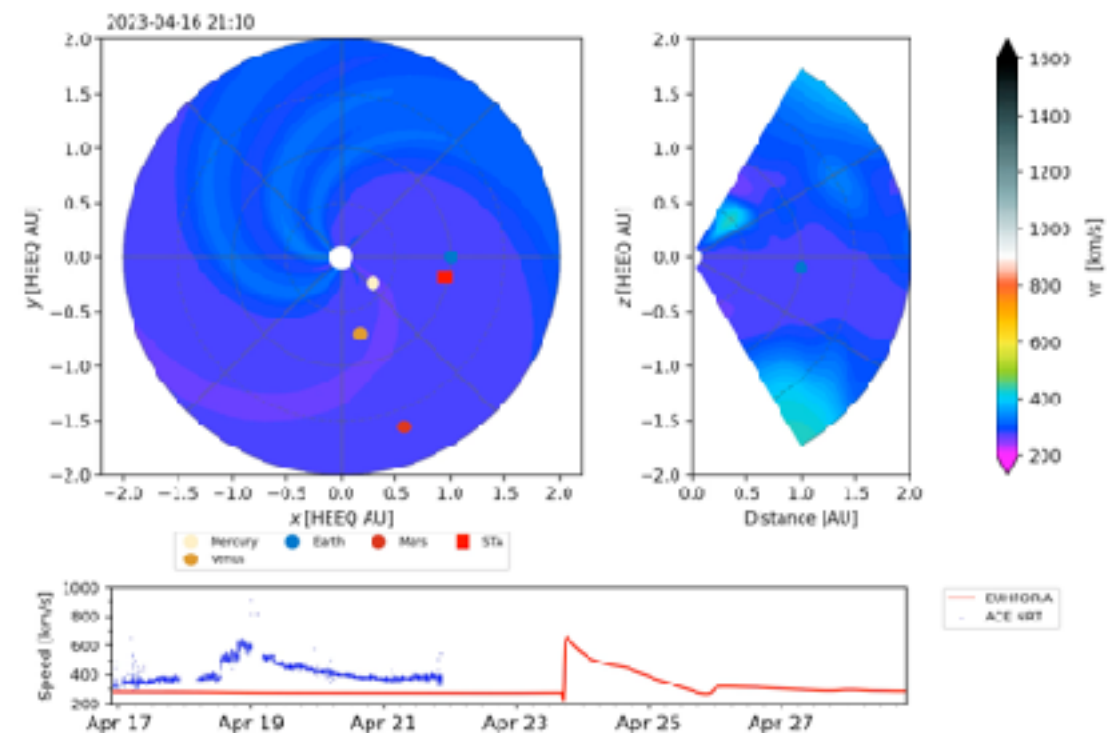


SW Disturbance - CME Arrival Prediction

Density



Velocity



euforia

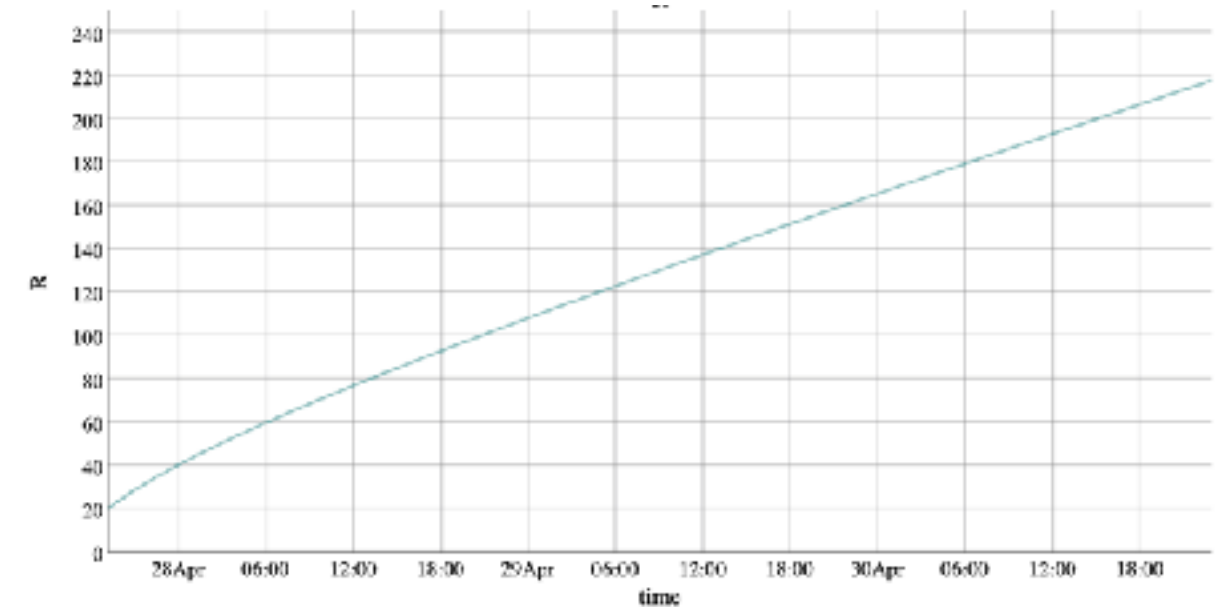
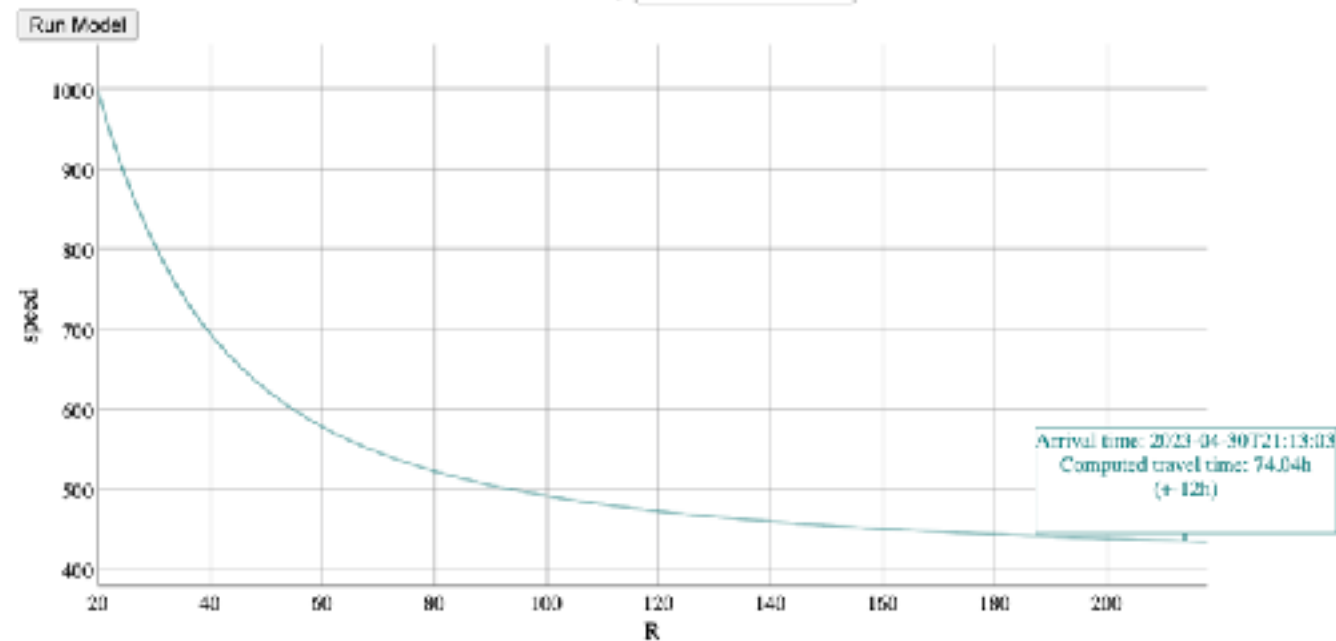
SW Disturbance - CME Arrival Prediction

Calculation of ICME arrival times

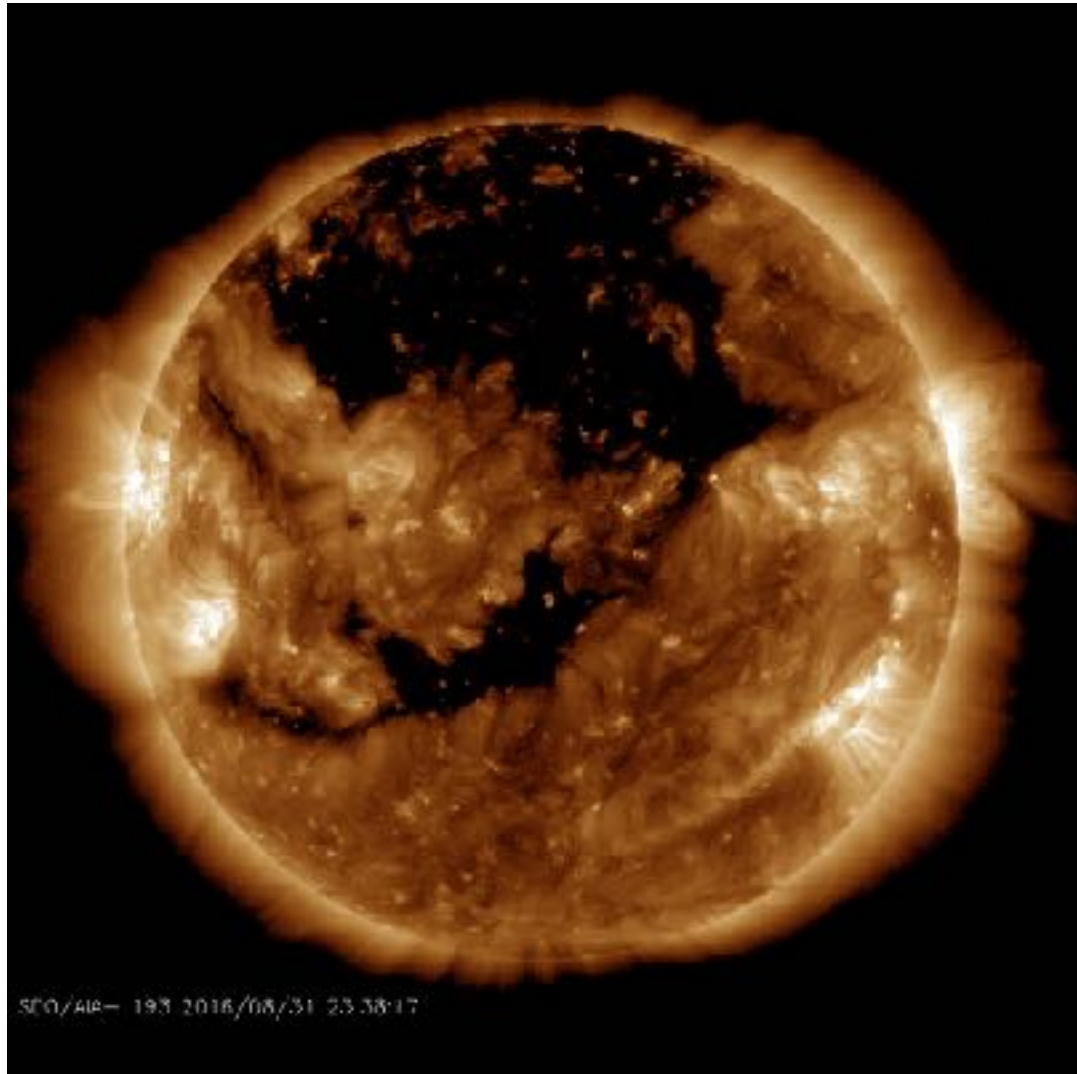
Main reference

This model is based on the article "[Propagation of Interplanetary Coronal Mass Ejections: The Drag-Based Model](#)" (Vrsnak et al. 2012).

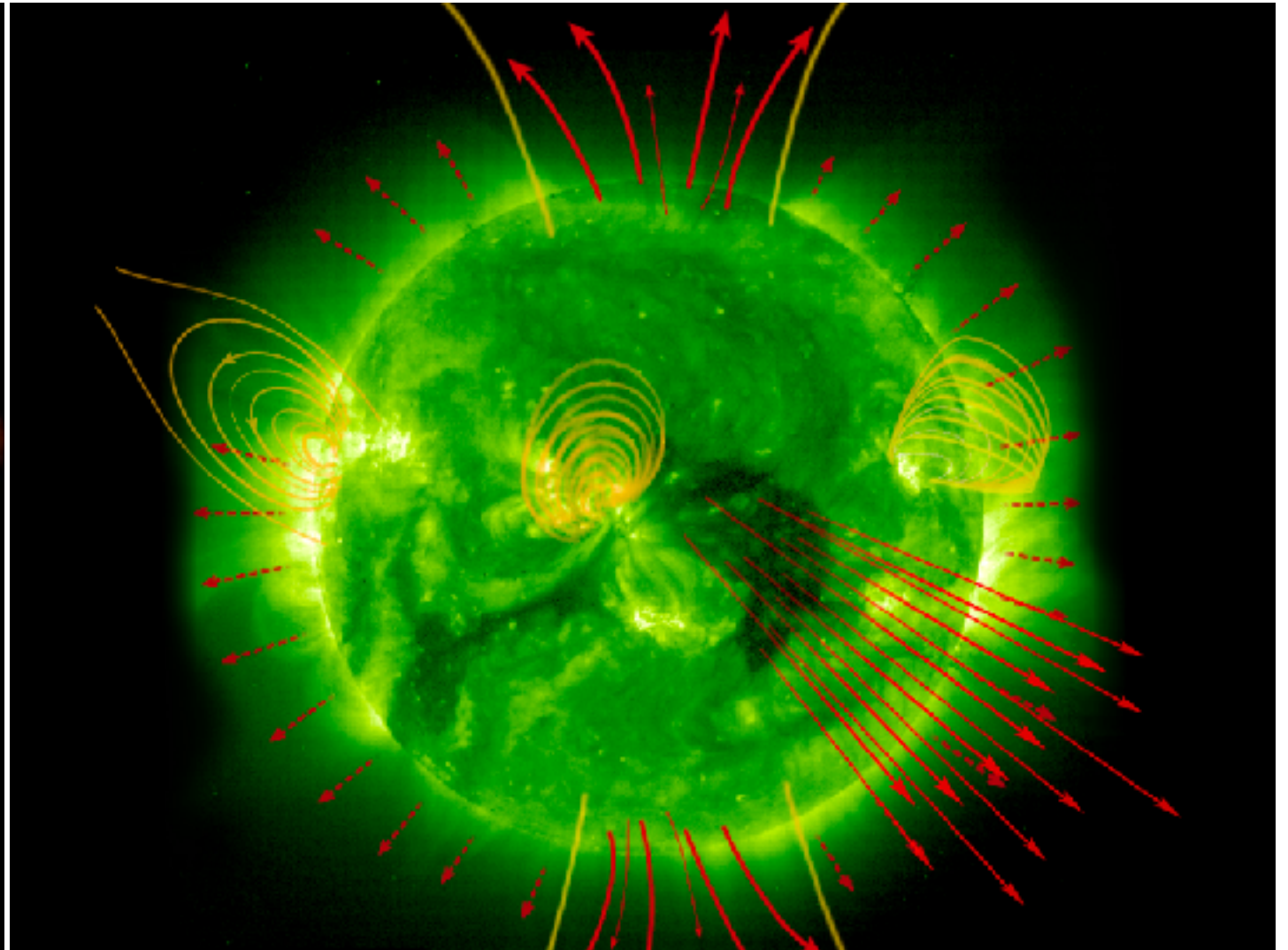
Gamma drag parameter; usually between 0.2 and 2 (10^{-7} km^{-1}):
 R_s : distance where the CME speed is measured (solar radii): (Preferentially near 20 R_s)
 v_0 : speed of CME R_s (km/s):
 w : background solar wind speed (km/s):
Date and time of CME at the given R_s :



SW Disturbance - Coronal Hole



SDO/AIA



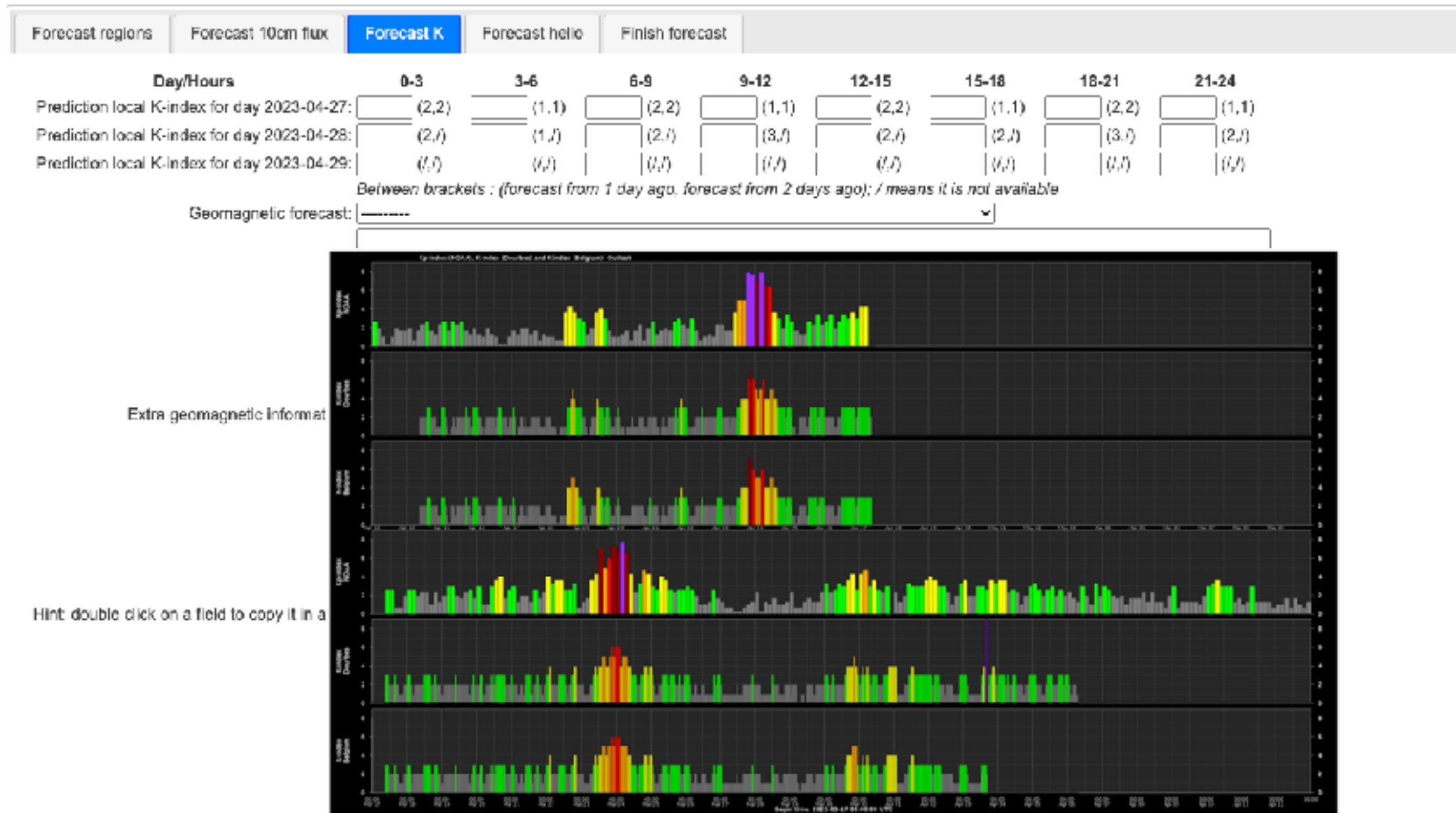
SOHO/EIT

K index - Forecast

Forecast regions	Forecast 10cm flux	Forecast K	Forecast helio	Finish forecast																																				
<table border="1"> <thead> <tr> <th>Day/Hours</th> <th>0-3</th> <th>3-6</th> <th>6-9</th> <th>9-12</th> <th>12-15</th> <th>15-18</th> <th>18-21</th> <th>21-24</th> </tr> </thead> <tbody> <tr> <td>Prediction local K-index for day 2023-04-27:</td> <td> (2,2)</td> <td> (1,1)</td> <td> (2,2)</td> <td> (1,1)</td> <td> (2,2)</td> <td> (1,1)</td> <td> (2,2)</td> <td> (1,1)</td> </tr> <tr> <td>Prediction local K-index for day 2023-04-28:</td> <td> (2,/)</td> <td> (1,/)</td> <td> (2,/)</td> <td> (3,/)</td> <td> (2,/)</td> <td> (2,/)</td> <td> (3,/)</td> <td> (2,/)</td> </tr> <tr> <td>Prediction local K-index for day 2023-04-29:</td> <td> (/,/)</td> <td> (/,/)</td> <td> (/,/)</td> <td> (/,/)</td> <td> (/,/)</td> <td> (/,/)</td> <td> (/,/)</td> <td> (/,/)</td> </tr> </tbody> </table>					Day/Hours	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Prediction local K-index for day 2023-04-27:	(2,2)	(1,1)	(2,2)	(1,1)	(2,2)	(1,1)	(2,2)	(1,1)	Prediction local K-index for day 2023-04-28:	(2,/)	(1,/)	(2,/)	(3,/)	(2,/)	(2,/)	(3,/)	(2,/)	Prediction local K-index for day 2023-04-29:	(/,/)	(/,/)	(/,/)	(/,/)	(/,/)	(/,/)	(/,/)	(/,/)
Day/Hours	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24																																
Prediction local K-index for day 2023-04-27:	(2,2)	(1,1)	(2,2)	(1,1)	(2,2)	(1,1)	(2,2)	(1,1)																																
Prediction local K-index for day 2023-04-28:	(2,/)	(1,/)	(2,/)	(3,/)	(2,/)	(2,/)	(3,/)	(2,/)																																
Prediction local K-index for day 2023-04-29:	(/,/)	(/,/)	(/,/)	(/,/)	(/,/)	(/,/)	(/,/)	(/,/)																																
Between brackets : (forecast from 1 day ago, forecast from 2 days ago); / means it is not available																																								
Geomagnetic forecast:																																								
Extra geomagnetic information:																																								

Hint: double click on a field to copy it in all empty fields!

K index - Forecast



K index - Forecast

Forecast regions	Forecast 10cm flux	Forecast K	Forecast helio	Finish forecast
------------------	--------------------	------------	----------------	-----------------

Day/Hours	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Prediction local K-index for day 2023-04-27:	(2,2)	(1,1)	(2,2)	(1,1)	(2,2)	(1,1)	(2,2)	(1,1)
Prediction local K-index for day 2023-04-28:	(2, /)	(1, /)	(2, /)	(3, /)	(2, /)	(2, /)	(3, /)	(2, /)
Prediction local K-index for day 2023-04-29:	(/, /)	(/, /)	(/, /)	(/, /)	(/, /)	(/, /)	(/, /)	(/, /)

Between brackets : (forecast from 1 day ago, forecast from 2 days ago); / means it is not available

Geomagnetic forecast:

Extra geomagnetic information:

Between brackets : (forecast from 1 day ago, forecast from 2 days ago); / means it is not available

ISI ☒ ☐

No forecast

Quiet ($A < 20$ and $K < 4$)

Active conditions expected ($A \geq 20$ or $K = 4$)

Minor storm expected ($A \geq 30$ or $K = 5$)

Moderate (ISES: Major) magstorm expected ($A \geq 50$ or $K = 6$)

Major (ISES: Severe) magstorm expected ($A \geq 100$ or $K \geq 7$)

Warning condition (activity levels expected to increase, but no numeric forecast given)

Hint: double click on a field to copy it in all empty fields!

K index - Forecast

Forecast regions	Forecast 10cm flux	Forecast K	Forecast helio	Finish forecast				
Day/Hours								
	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Prediction local K-index for day 2023-04-27:	(2,2)	(1,1)	(2,2)	(1,1)	(2,2)	(1,1)	(2,2)	(1,1)
Prediction local K-index for day 2023-04-28:	(2,/)	(1,/)	(2,/) (3,/)	(2,/) (3,/)	(2,/) (3,/)	(2,/) (3,/)	(3,/) (4,/)	(2,/) (3,/)
Prediction local K-index for day 2023-04-29:	(/,/) (/,/)	(/,/) (/,/)	(/,/) (/,/)	(/,/) (/,/)	(/,/) (/,/)	(/,/) (/,/)	(/,/) (/,/)	(/,/) (/,/)
Between brackets : (forecast from 1 day ago, forecast from 2 days ago); / means it is not available								
Geomagnetic forecast:								
Extra geomagnetic information:								

Hint: double click on a field to copy it in all empty fields!

- Solar wind observations
- CME predictions and (possible) arrival
- Coronal hole observations and (possible) arrival
- Geomagnetic conditions: K-index measurements and predictions

Daily Forecast - URSIgram

:Issued: 2022 Sep 07 1232 UTC
:Product: documentation at <http://www.sidc.be/products/meu>
#-----#
DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #
(RWC Belgium) #
#-----#

SIDC URSIGRAM 20907
SIDC SOLAR BULLETIN 07 Sep 2022, 1230UT
SIDC FORECAST (valid from 1230UT, 07 Sep 2022 until 09 Sep 2022)
SOLAR FLARES : C-class flares expected, (probability >=50%)
GEOMAGNETISM : Active conditions expected (A>=20 or K=4)
SOLAR PROTONS : Quiet
PREDICTIONS FOR 07 Sep 2022 10CM FLUX: 123 / AP: 010
PREDICTIONS FOR 08 Sep 2022 10CM FLUX: 122 / AP: 010
PREDICTIONS FOR 09 Sep 2022 10CM FLUX: 120 / AP: 010

COMMENT: Solar flaring activity was low during the last 24 hours, with six C-class flares detected, the brightest being an C3 at 18:42 UTC yesterday. However, all but one of those flares originated from NOAA Active Region (AR) 3088 that is now invisible from Earth. NOAA AR 3092 produced a C1 flare in the previous 24 hours and it is likely to produce some more C-class activity in the next 24 hours.

No Earth directed CMEs observed in the last 24 hours.

The greater than 10 MeV proton flux was at nominal levels over the past 24 hours and is expected to remain so for the next 24 hours. The greater than 2 MeV electron flux was above the 1000 pfu alert threshold during the last 24 hours and is expected to remain above this level for the next 24 hours.

The 24h electron fluence was at moderate levels in the past 24 hours and is expected to remain at these levels during the next 24 hours.

The Solar Wind (SW) conditions remained affected by the High Speed Stream (HSS) that arrived on 3 Sep. The SW speed ranged between 530 and 630 km/s over the last 24 hours. The total magnetic field (Bt) varied between 3 and 6 nT, while its Bz component ranged between -6 and 6 nT. The interplanetary magnetic field (phi) angle was directed away from the Sun during the last 24 hours. The SW conditions are expected to continue in the same pattern in the next 24 hours.

Geomagnetic conditions reached globally active (Kp 2-4) and locally unsettled (K-Belgium 2-3) levels over the last 24 hours. Unsettled conditions are expected for the next 24 hours with intervals of active conditions.

TODAY'S ESTIMATED ISN : 095, BASED ON 19 STATIONS.

SOLAR INDICES FOR 06 Sep 2022
WOLF NUMBER CATANIA : ///
10CM SOLAR FLUX : ///
AK CHAMBON LA FORET : ///
AK WINGST : 022
ESTIMATED AP : 019
ESTIMATED ISN : 078, BASED ON 28 STATIONS.

Flaring Activity

CMEs

Particles

Solar Wind

Geomagnetic



SIDC Webpage - Predictions

Space Weather Services

Detections

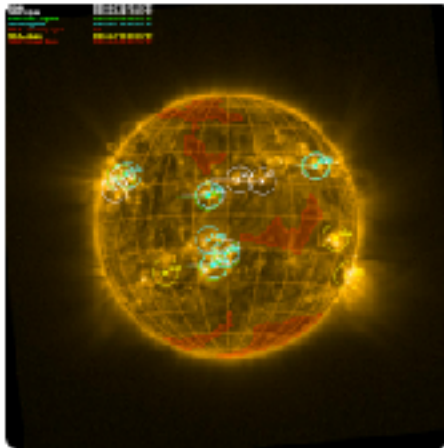
Solardemon

2023-04-27 02:51 B8 flare

CACTus

2023-04-21 18:12
844km/s

Solar Map



Latest Alerts

Presto 2023-04-24

The Corona Mass Ejection (CME) arrival first reported yesterday continues to cause a major geomagnetic storm. Although the solar wind velocity has now dropped to 500 km/s and the North-South component of the Interplanetary magnetic field (Bz) has now increased to -10 nT, the Kp index has reached the severe level (Kp=8, G4). The geomagnetic conditions are expected

Forecasts

Flare:

Quiet conditions
(<50% C-class flares)

Protons:

Quiet

Geomagnetic:

Quiet
(A<20 and K<4)

All quiet:

False

Provisional SSN:

127

Solar Activity

URSIdgram 2023-04-26

Solar flaring activity was low and infrequent with two C1 flares detected during the past 24 hours. NOAA Active Region (AR) 3285 (Catania group 65) produced one of them, while a yet unnamed AR turning into Earth's view produced the second flare. More C-class flare activity is expected in the next 24 hours, most probably from the unnamed AR mentioned above. No Earth-directed Coronal Mass Ejections

Solar Wind

URSIdgram 2023-04-26

The Solar Wind (SW) conditions were stable during the last 24 hours. The SW speed ranged between 490 and 570 km/s in the last 24 hours. The total Interplanetary magnetic field (Bt) varied between 2 and 6 nT and its North-South component (Bz) ranged between -5 and 5 nT. The interplanetary magnetic field phi angle was directed away from the Sun until yesterday 19:00 UT and has turned

SIDC Webpage - Detections

Space Weather Services

Detections

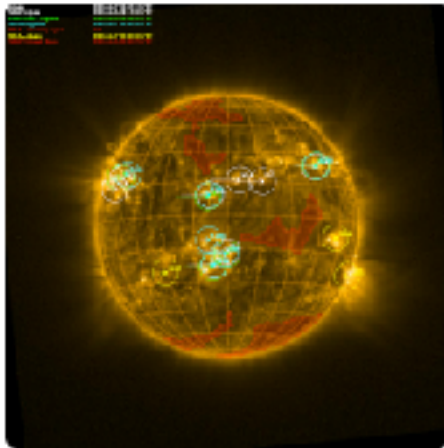
Solardemon

2023-04-27 02:51 B8 flare

CACTus

2023-04-21 18:12
844km/s

Solar Map



Latest Alerts

Presto 2023-04-24

The Corona Mass Ejection (CME) arrival first reported yesterday continues to cause a major geomagnetic storm. Although the solar wind velocity has now dropped to 500 km/s and the North-South component of the Interplanetary magnetic field (Bz) has now increased to -10 nT, the Kp index has reached the severe level (Kp=8, G4). The geomagnetic conditions are expected

Forecasts

Flare:

Quiet conditions
(<50% C-class flares)

Protons:

Quiet

Geomagnetic:

Quiet
(A<20 and K<4)

All quiet:

False

Provisional SSN:

127

Solar Activity

URSigram 2023-04-26

Solar flaring activity was low and infrequent with two C1 flares detected during the past 24 hours. NOAA Active Region (AR) 3285 (Catania group 65) produced one of them, while a yet unnamed AR turning into Earth's view produced the second flare. More C-class flare activity is expected in the next 24 hours, most probably from the unnamed AR mentioned above. No Earth-directed Coronal Mass Ejections

Solar Wind

URSigram 2023-04-26

The Solar Wind (SW) conditions were stable during the last 24 hours. The SW speed ranged between 490 and 570 km/s in the last 24 hours. The total Interplanetary magnetic field (Bt) varied between 2 and 6 nT and its North-South component (Bz) ranged between -5 and 5 nT. The interplanetary magnetic field phi angle was directed away from the Sun until yesterday 19:00 UT and has turned

CACTUS - CME Detection



CACTUS

A software package for 'Computer Aided CME Tracking'

```
# CME      t0      dt0    pa    da    v    dv    ninv  narv  halo?
0027 2023/04/21 06:26 02 259 038 0669 0057 0509 0753
0026 2023/04/20 18:36 03 334 010 0422 0169 0157 0659
0025 2023/04/20 15:36 04 336 042 0452 0064 0359 0624
0024 2023/04/20 15:24 02 026 006 0520 0190 0466 0092
0023 2023/04/20 09:36 01 265 008 0306 0056 0224 0390
0022 2023/04/19 23:36 02 158 022 0255 0074 0186 0452
0021 2023/04/19 23:24 02 117 038 0355 0147 0160 0654
0020 2023/04/19 18:36 03 162 038 0199 0064 0112 0390
0019 2023/04/19 11:40 10 124 070 0374 0343 0104 1420
0018 2023/04/19 10:00 01 259 009 0466 0084 0312 0530
0017 2023/04/19 02:36 02 263 020 0477 0775 0176 1953
0016 2023/04/19 02:24 02 057 060 0268 0089 0203 0594
0015 2023/04/18 23:12 04 268 018 0125 0049 0315 0480
0014 2023/04/18 21:12 01 268 008 0548 0060 0534 0651
0013 2023/04/18 19:36 01 270 018 0428 0216 0130 0091
0012 2023/04/18 01:25 03 212 042 0470 0092 0284 0560
0011 2023/04/18 00:40 05 122 038 0359 0110 0120 0569
0010 2023/04/17 13:36 02 207 052 0398 0086 0237 0558
0009 2023/04/17 13:36 01 084 010 0135 0030 0100 0473
0008 2023/04/17 07:12 01 110 030 0396 0045 0318 0466
0007 2023/04/17 03:12 02 108 018 0134 0072 0118 0889
0006 2023/04/16 23:24 03 130 010 0600 0297 0315 1077
0005 2023/04/16 20:12 01 120 019 0919 0273 0550 1361
0004 2023/04/16 20:12 03 129 068 0470 0252 0220 1116
0003 2023/04/16 06:48 02 227 020 0264 0031 0238 0318
0002 2023/04/16 00:48 02 219 020 0188 0214 0220 0894
0001 2023/04/16 00:48 02 000 063 0369 0028 0317 0312

# Flow      t0      dt0    pa    da    v    dv    ninv  narv  halo?
0002 2023/04/19 21:24 01 113 008 0345 0068 0284 0456
0001 2023/04/19 06:12 02 259 008 1247 0076 1114 1250
#EOF

smecal.txt
```

S W N E



CACTUS - CME Detection



CACTUS

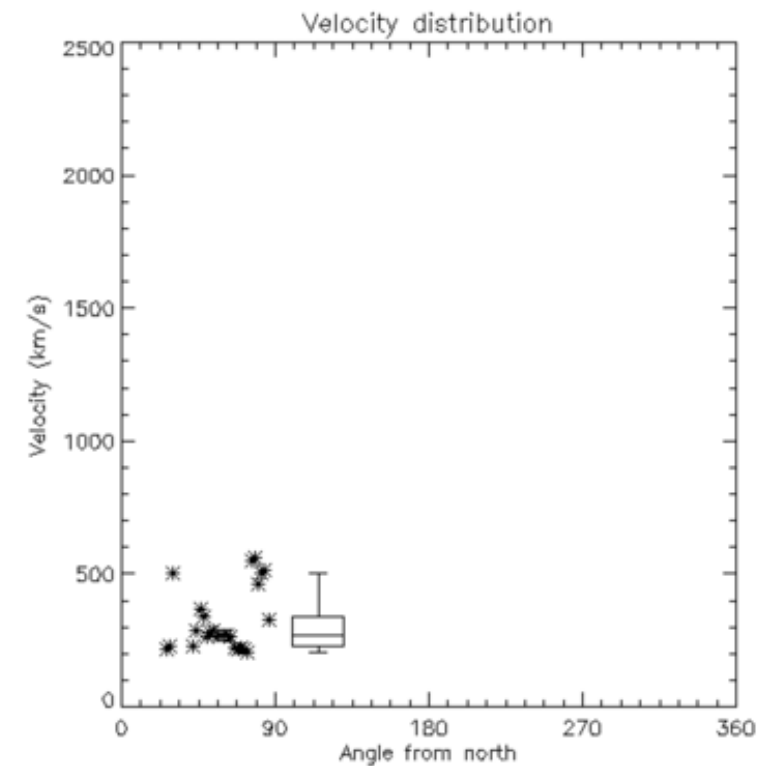
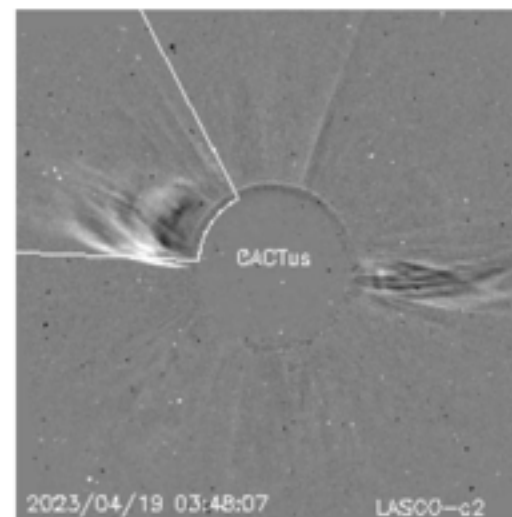
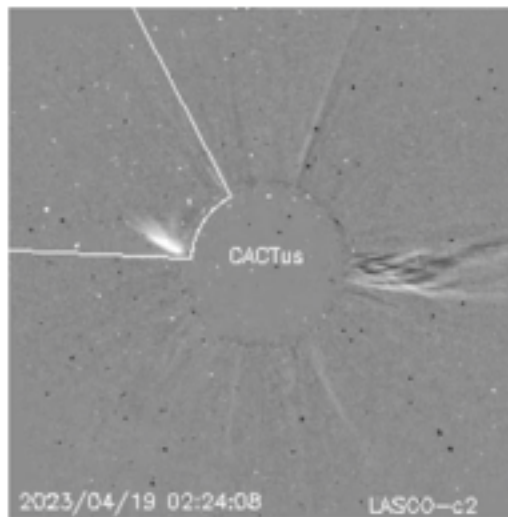
A software package for 'Computer Aided CME Tracking'

Details and graphs for CME0016

#	CME	t0	dt0	pa	da	v	dv	minv	maxv	halo?
0016		2023/04/19 02:24	02	057	060	0268	0089	0203	0504	

CME Movie :: [Download](#) ::

Sample Image



Solar Demon

Solar Demon Flare Detection (qlk)

Quick-look! running in real time on SDC/AIA 94 QKL data
3 minute cadence, typical delay 15 minutes
(detection version 1.00)
([view all Solar Demon detection tools](#))

Detector 24h operating status:



Last processed image:

0 hours and 34 minutes ago (2023-11-09 13:33 UTC)

Last detected flare:

2 hours and 46 minutes ago (2023-11-09 11:21 UTC)

Filters (category)

-- [All classes](#)

[Only C class flares and above](#)

[Only M class flares and above](#)

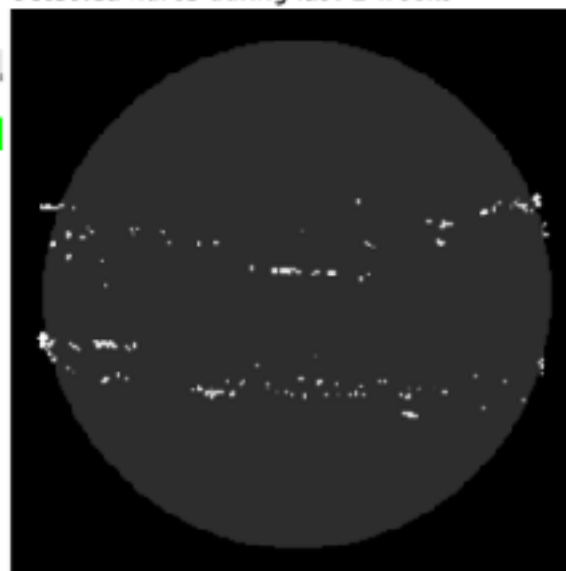
[Only X class flares and above](#)

Filters (time)

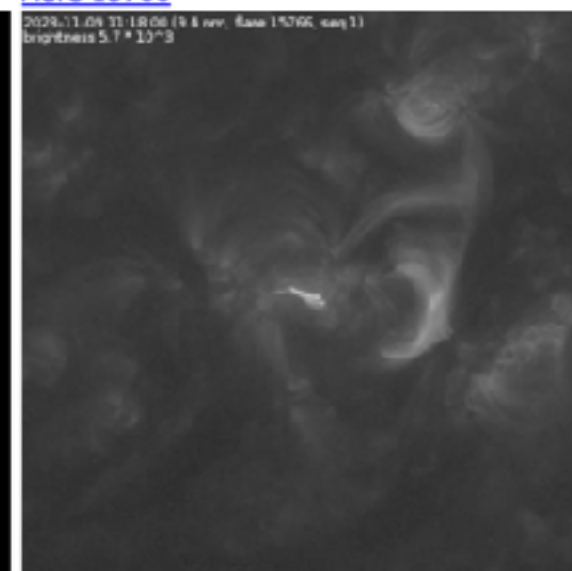
[Last 7 days](#)

-- [Last 14 days](#)

detected flares during last 2 weeks



Flare 15766



Overview of flares

	est. class	start	peak	end	#	lat	lon	dist. R _☉	AR	est. flux	GOES flux	GOES peak time	COMESAP	# det.	dimming
November, 2023															
9	B3	11:18	11:21	11:21	15766	-10	4	0.25	AR 3480	2.5	N/A	N/A	0	2	-1,899
9	B1	10:48	10:51	10:51	15765	25	15	0.44		1.4	N/A	N/A	0	2	
9	A8	08:30	08:33	08:33	15764	8	15	0.29	AR 3483	0.8	N/A	N/A	0	2	
9	B2	01:15	01:15	01:21	15763	7	14	0.26	AR 3483	1.8	N/A	N/A	0	3	-19
9	B2	00:51	00:51	00:51	15762	23	70	0.95	AR 3479	1.5	N/A	N/A	0	1	
8	C2	20:09	20:18	21:00	15761	9	7	0.16	AR 3483	20.1	N/A	N/A	0	18	-44
8	B3	14:48	14:48	14:54	15760	8	4	0.11	AR 3483	2.8	N/A	N/A	0	3	-29
8	C3	08:30	08:51	09:36	15759	9	0	0.09	AR 3483	28.3	N/A	N/A	0	20	
8	B6	07:06	07:24	08:03	15756			1.01		5.8	N/A	N/A	0	19	-256
8	A7	07:24	07:24	07:24	15757	23	59	0.88	AR 3479	0.7	N/A	N/A	0	1	-256
8	B5	06:15	06:18	06:33	15755	9	-3	0.10	AR 3483	4.5	N/A	N/A	0	7	
8	B7	05:00	05:09	05:30	15754	9	-2	0.10	AR 3483	7.0	N/A	N/A	0	11	-41
8	C2	02:54	03:12	04:09	15751	9	-3	0.11	AR 3483	18.0	N/A	N/A	0	24	
8	B7	03:06	03:12	03:18	15753			1.01		7.2	N/A	N/A	0	5	-5



SIDC Webpage - Alerts

Space Weather Services

Detections

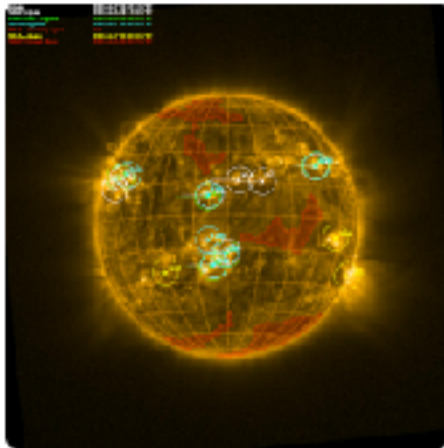
Solardemon

2023-04-27 02:51 B8 flare

CACTus

2023-04-21 18:12
844km/s

Solar Map



Latest Alerts

Presto 2023-04-24

The Corona Mass Ejection (CME) arrival first reported yesterday continues to cause a major geomagnetic storm. Although the solar wind velocity has now dropped to 500 km/s and the North-South component of the Interplanetary magnetic field (Bz) has now increased to -10 nT, the Kp index has reached the severe level (Kp=8, G4). The geomagnetic conditions are expected

Forecasts

Flare:

Quiet conditions
(<50% C-class flares)

Protons:

Quiet

Geomagnetic:

Quiet
(A<20 and K<4)

All quiet:

False

Provisional SSN:

127

Solar Activity

URSIdgram 2023-04-26

Solar flaring activity was low and infrequent with two C1 flares detected during the past 24 hours. NOAA Active Region (AR) 3285 (Catania group 65) produced one of them, while a yet unnamed AR turning into Earth's view produced the second flare. More C-class flare activity is expected in the next 24 hours, most probably from the unnamed AR mentioned above. No Earth-directed Coronal Mass Ejections

Solar Wind

URSIdgram 2023-04-26

The Solar Wind (SW) conditions were stable during the last 24 hours. The SW speed ranged between 490 and 570 km/s in the last 24 hours. The total Interplanetary magnetic field (Bt) varied between 2 and 6 nT and its North-South component (Bz) ranged between -5 and 5 nT. The interplanetary magnetic field phi angle was directed away from the Sun until yesterday 19:00 UT and has turned

Previweb - Forecaster page

[Forecast](#) [Weekly](#) [Presto](#) [Cactus](#) [All quiet](#) [CME arrival](#) [Monthly bulletin](#) [Quarterly](#) [Links](#)

UTC time: 10:02:16 Date: 2023-05-05 Forecast status : Busy Forecaster: de Patoul Judith

Login : elked **Warning : you are not the forecaster :** [Make me forecaster](#) [Logout](#)

Catania needs update [Click here](#)

Forecast regions

Forecast 10cm flux

Forecast K

Forecast helio

Finish forecast



Types of Alerts



Automated

- Halo CME by CACTus
- Flaremail

Manual

- Presto
- ~~CACTus Correction~~
- ~~CME Arrival~~
- All quiet - End of all quiet

Automated Alerts



Automated: Halo CME



```
:Issued: 2023 Sep 24 2326 UTC
:Product: documentation at http://www.sidc.be/products/cactus
#-----#
# HALO CME ALERTS from the SIDC (RWC-Belgium), generated by CACTUS #
#-----#

A halo or partial-halo CME was detected with the following
characteristics:

      t0          | dt0 | pa | da | v | dv | minv | maxv |
2023-09-24T09:36:07.402 | 4.0 | 296 | 150 | 367 | 133 | 123 | 710

      t0: onset time, earliest indication of liftoff
      dt0: duration of liftoff (hours)
      pa: principal angle, counterclockwise from North (degrees)
      da: angular width of the CME (degrees),
      v: median velocity (km/s)
      dv: variation (1 sigma) of velocity over the width of the CME
      mindv: lowest velocity detected within the CME
      maxdv: highest velocity detected within the CME
#-----#
# Solar Influences Data analysis Center - RWC Belgium #
# Royal Observatory of Belgium #
```

Partial or full halo detected, i.e. $da > 180$

Automated: flaremail

```
:Issued: 2014 Sep 10 1926 UTC
:Product: documentation at http://www.sidc.be/products/flaremail
#-----#
# Large flare alerts from the SIDC (RWC-Belgium), detected in GOES      #
# X-ray data                                                            #
#-----#
A class X1.6 solar X-ray flare occurred on 2014/09/10 with peak time 17:45 UT

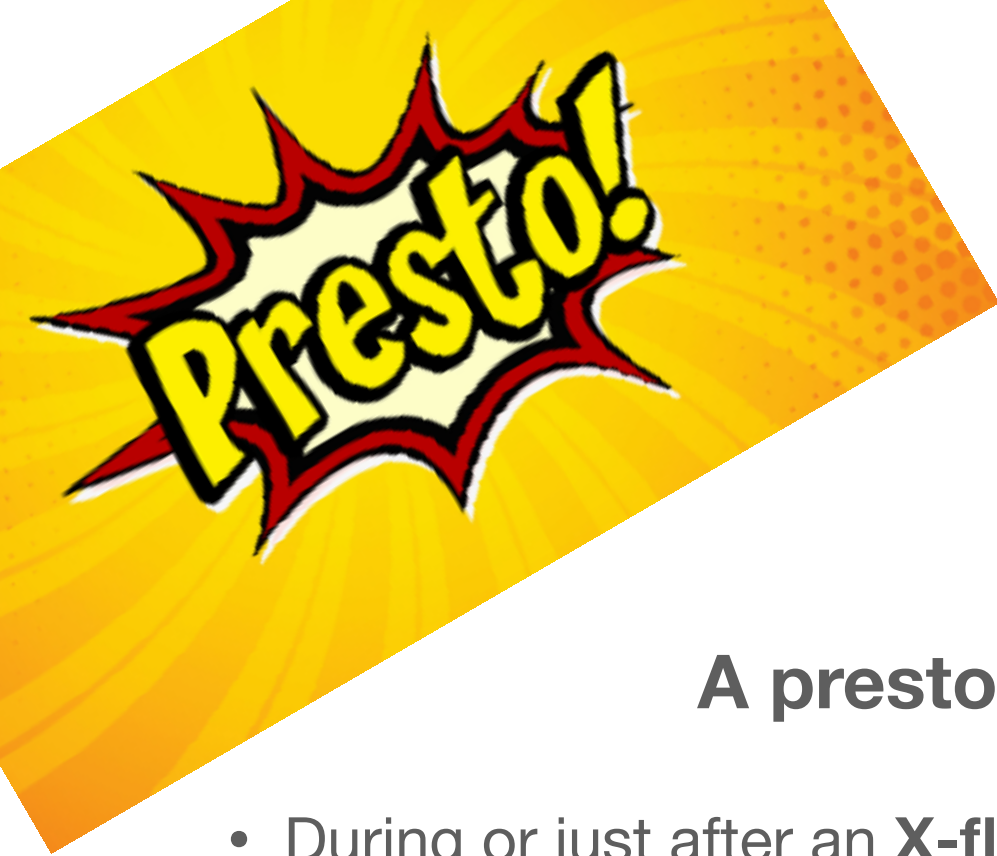
#-----#
# Solar Influences Data analysis Center - RWC Belgium                  #
# Royal Observatory of Belgium                                         #
# Fax : 32 (0) 2 373 0 224                                             #
# Tel.: 32 (0) 2 373 0 491                                             #
#                                                                       #
# For more information, see http://www.sidc.be. Please do not reply #
# directly to this message, but send comments and suggestions to      #
# 'sidctech@oma.be'. If you are unable to use that address, use       #
# 'rvdlinden@spd.aas.org' instead.                                     #
# To unsubscribe, visit http://sidc.be/registration/unsub.php #
#-----#
```

GOES X-ray > M5



Presto Alert





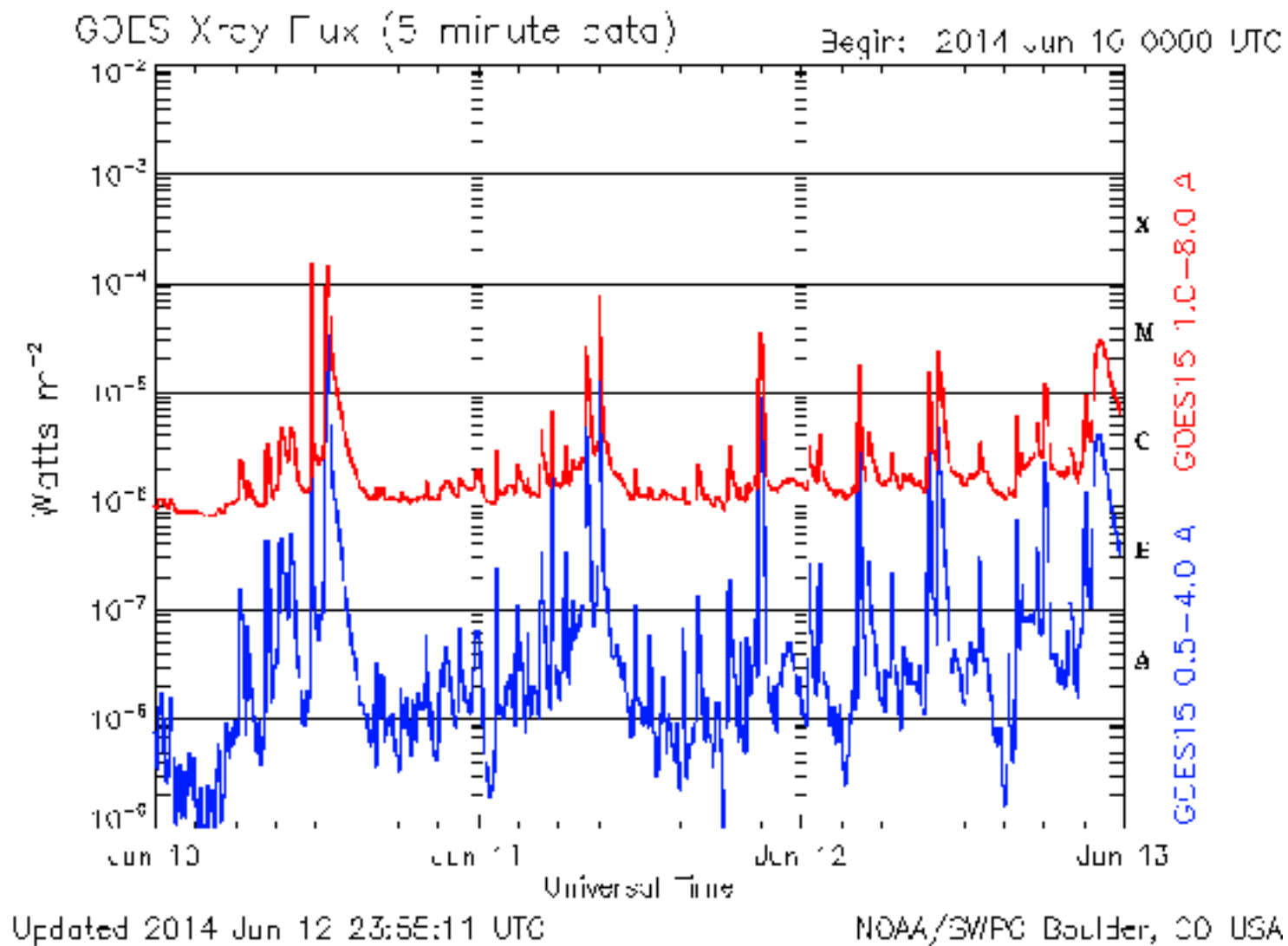
A presto alert needs to be sent ASAP:

- During or just after an **X-flare** (high level of flaring activity)
- In case of a **proton event**, i.e., Flux ≥ 10 pfu (10 MeV particles)
- When a (either front or back-sided) (partial) **halo CME** or a strong westward directed CME occurred.
- In case we observe a **fast forward shock** in the solar wind speed at 1 AU
- When **Kp** > 5 or **K** > 5 .
- In case you observe **enhanced solar wind conditions** which will likely lead to geomagnetic storm conditions K or Kp > 5 .

PRESTO

A presto alert needs to be sent ASAP:

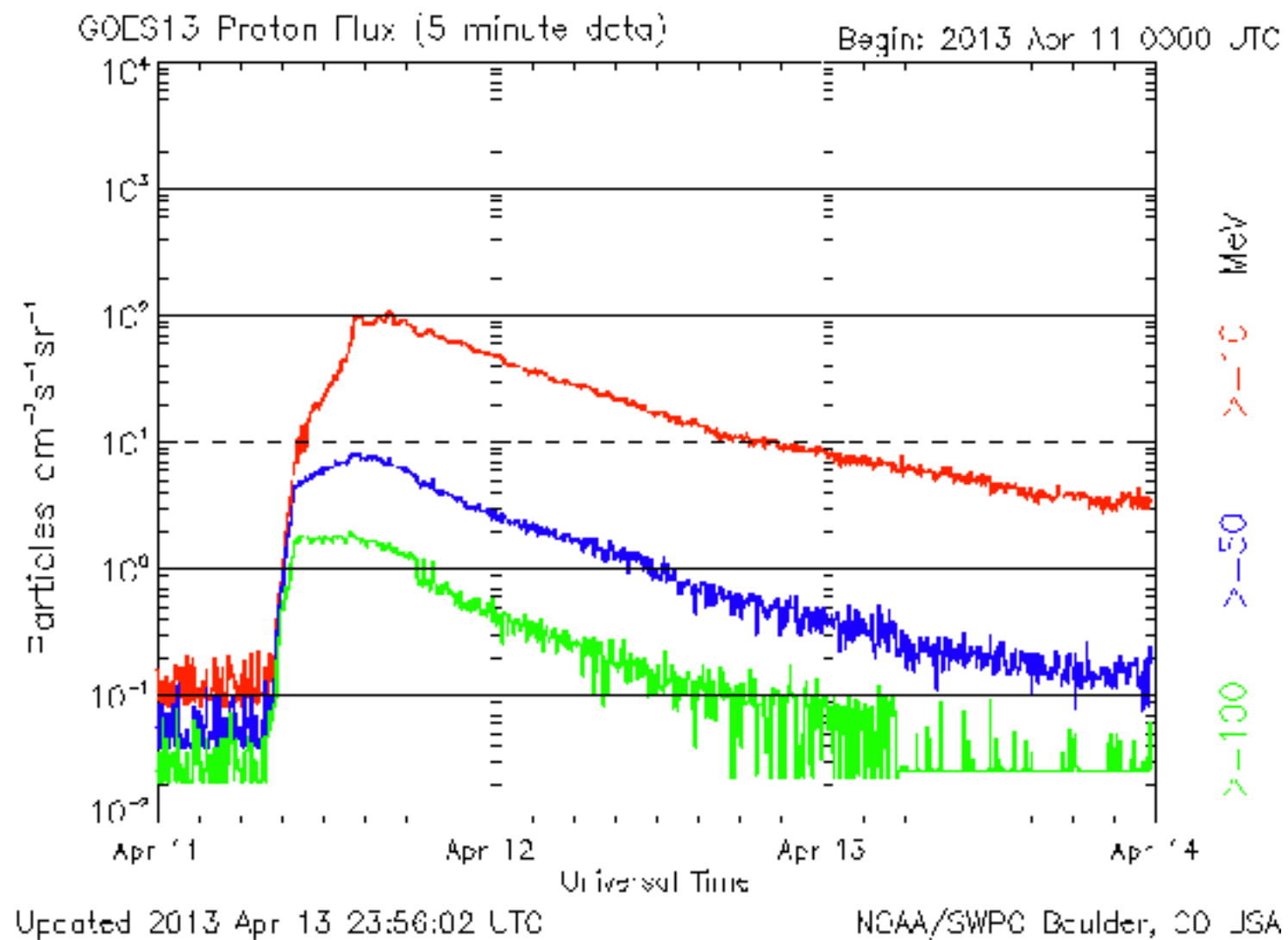
- During or just after an **X-flare**



PRESTO

A presto alert needs to be sent ASAP:

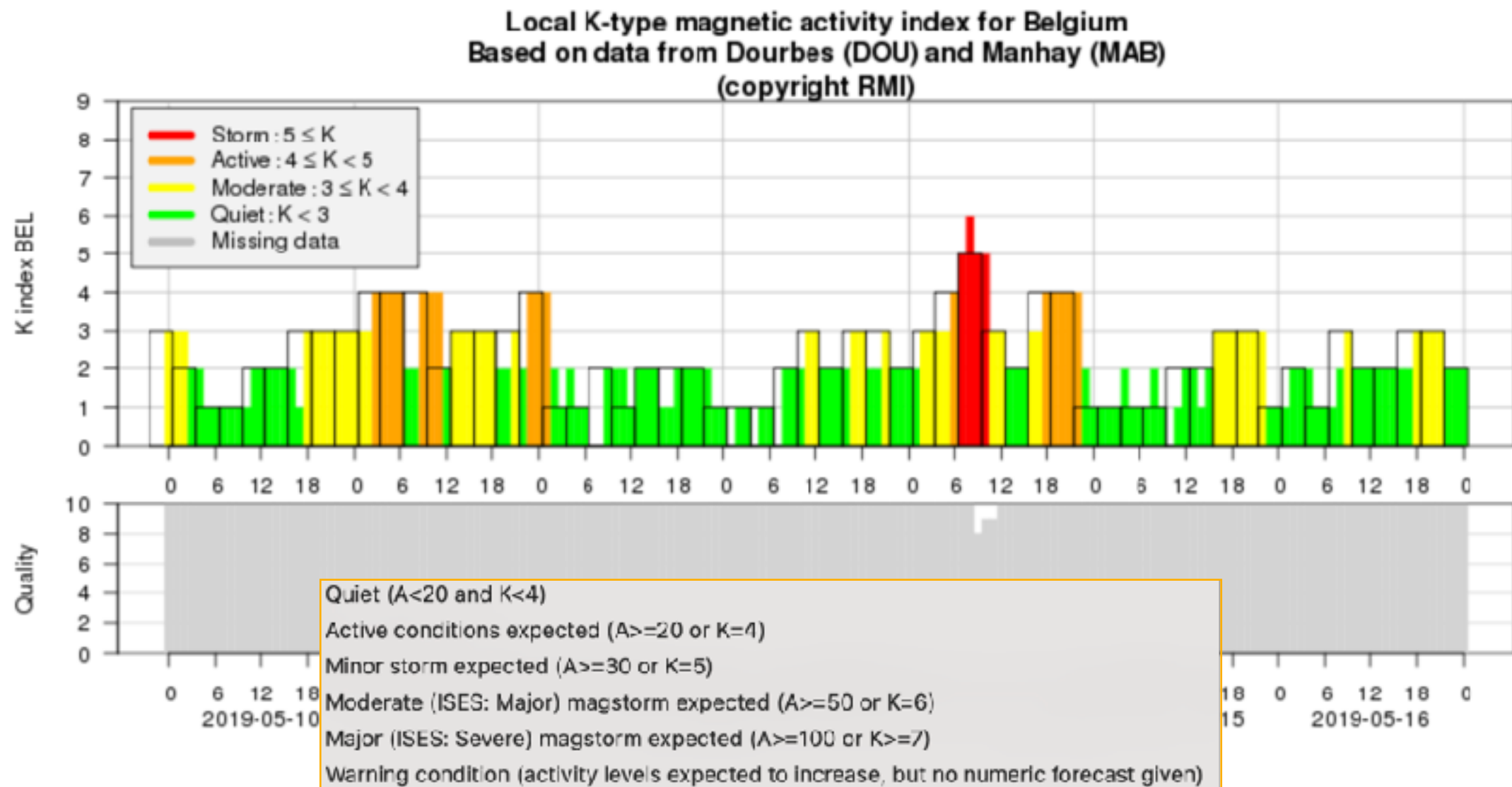
- In case of a **proton event**, i.e., proton flux ≥ 10 pfu (10 MeV particles)



PRESTO

A presto alert needs to be sent ASAP:

- When $K_p > 5$ or $K > 5$.

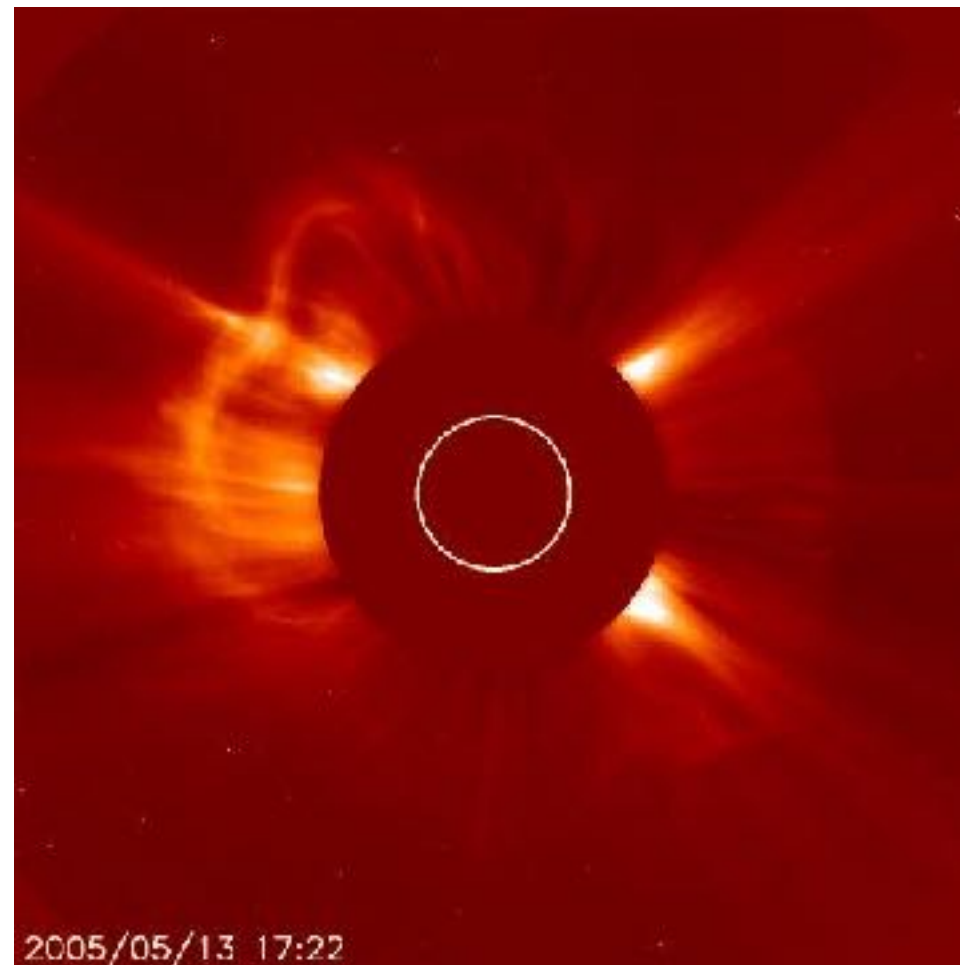


PRESTO

A presto alert needs to be sent ASAP:

- When a (either front or back-side) (partial) **halo CME** or a strong westward directed CME occurred.

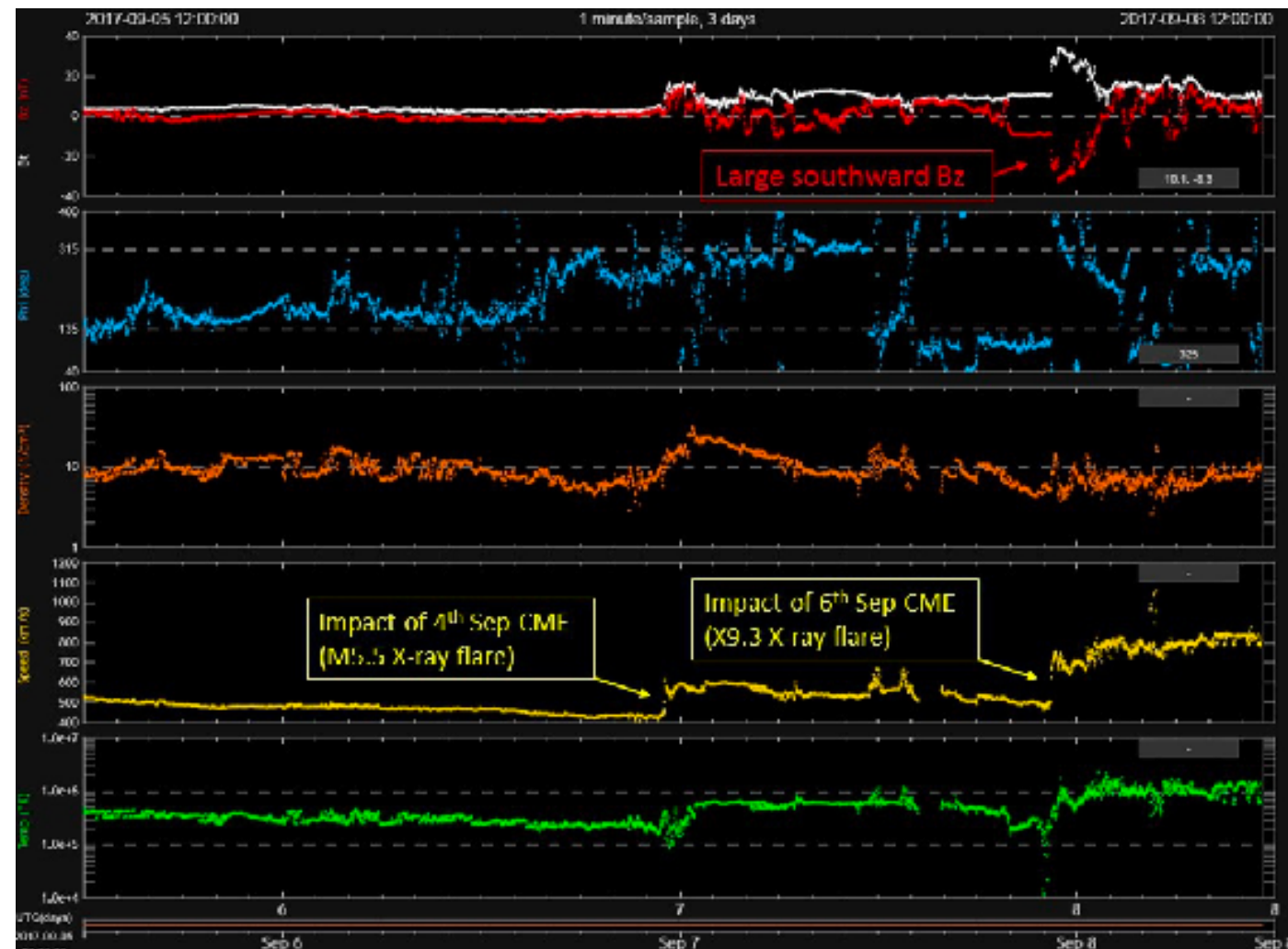
Try to find out whether the halo CME is front-sided or not, by locating the source.



PRESTO

A presto alert needs to be sent ASAP:

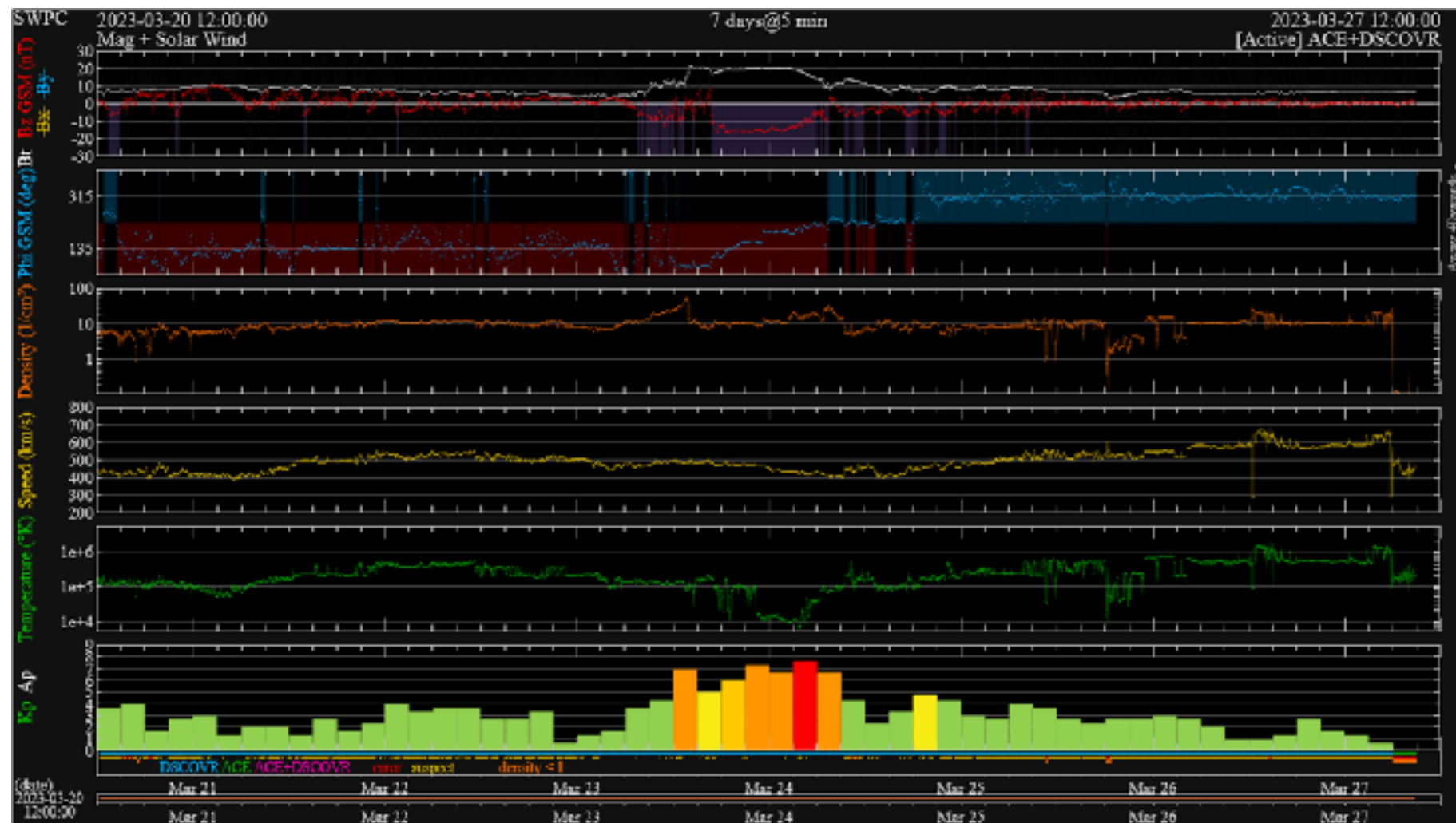
- In case you observe a **fast forward shock** in the solar wind speed.
($\Delta v > 20 \text{ km/s}$, $\text{ratio}_n > 1.2$ and $\text{ratio}_B > 1.2$)



PRESTO

A presto alert needs to be sent ASAP:

- In case you observe **enhanced solar wind conditions** which will likely lead to geomagnetic storm conditions K or $K_p > 5$.



PRESTO: How?

Weekly Daily Earth Daily Heliosphere

All quiet

Presto

Helio Presto

Cactus

CME arrival

Monthly

Quarterly

Links

Presto alert

Please fill in this field

☒ L1 positive

☒ www

☒ mail

Send presto alert



PRESTO: example

:Issued: 2023 Mar 07 1343 UTC

:Product: documentation at <http://www.sidc.be/products/presto>

#-----#

FAST WARNING 'PRESTO' MESSAGE from the SIDC (RWC-Belgium)

#-----#

A halo Coronal Cass Ejection (CME) was observed in SOHO/LASCO-C2 from yesterday 03:12 UT. Although the bulk of the plasma is directed towards the West and South-West, a very faint asymmetric halo can be seen when the data are closely inspected. The speed of the CME is estimated to be 840 km/s and although the bulk of the CME is expected to miss Earth, a glancing blow is likely to arrive on the second half of 8 Mar or early on 9 Mar.

Another partial halo CME was automatically detected by the CACTUS software as launched yesterday 10:36 UT. However, close inspection revealed CACTUS took into account unrelated plasma ejecta and this is a marginally partial halo CME with only a weak component towards Earth's general direction. The speed of the CME is estimated to also be 840 km/s the bulk of the plasma is expected to miss Earth. A glancing blow might arrive on Earth's magnetosphere but if so it is expected to merge with the earlier CME mentioned above.

#-----#

Solar Influences Data analysis Center - RWC Belgium

Royal Observatory of Belgium

#

Website <http://www.sidc.be>.

E-mail sidc-support@oma.be

To unsubscribe <http://www.sidc.be/registration/unsub.php>



PRESTo: More examples

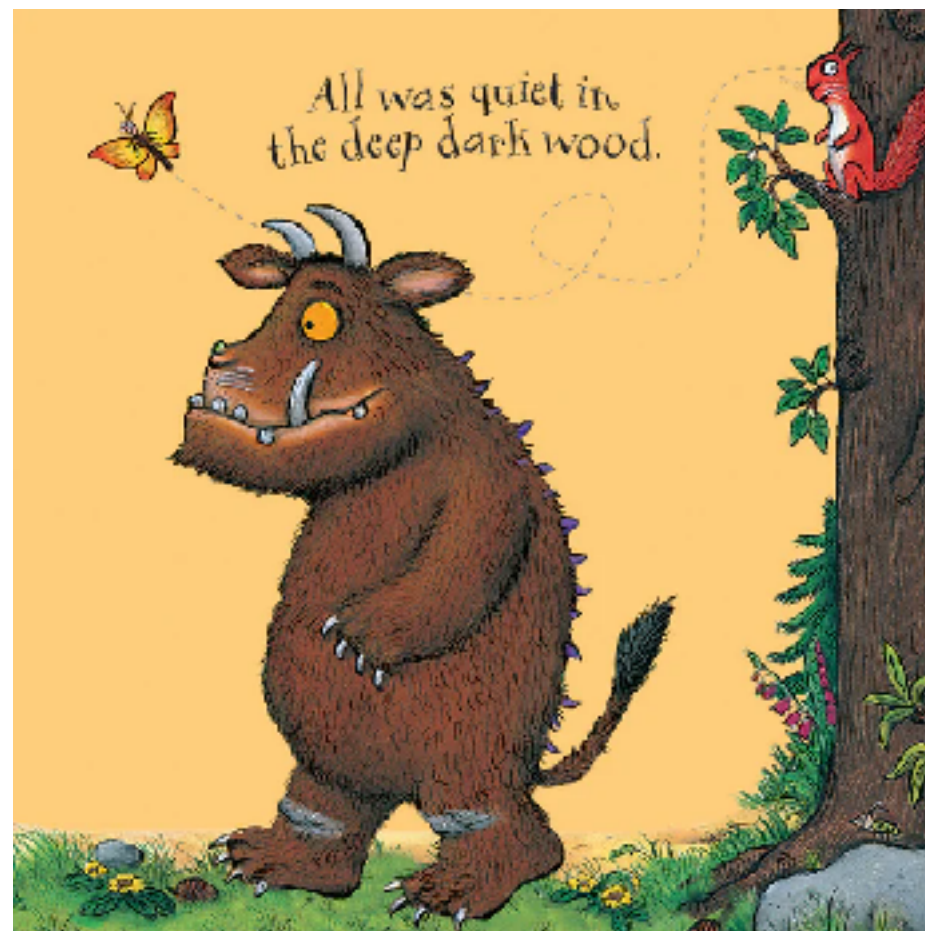
A **shock** in the solar wind at 19:54 UTC on 24 September marks the **arrival** of the ICME from 21 September (and probably that of the 22 September too). The **speed** jumped from 315 km/s to 440 km/s and the interplanetary **magnetic field** from 7 to 19 nT. The speed later reached 470 km/s and the magnetic field 28 nT with Bz down to -27 nT. This created moderate **geomagnetic storms** globally (Kp 6) and minor storms locally (K_{Bel} 5). The Earth is still inside the ICME (or ICMEs, to be confirmed as more data becomes available) and the corresponding geomagnetic storm is still ongoing.

Geomagnetic conditions have reached **moderate storm** levels globally (Kp 6) and minor storm levels locally (K_{Bel} 5), due to the ICME that arrived yesterday (**solar wind** speed up to 600 km/s and interplanetary magnetic field up to 22 nT and Bz down to -17 nT) and probably also some effects from a high speed solar wind stream. More disturbed conditions can be expected in the next 24 hours.

A **partial halo CME** with angular width around 150 degrees was first seen by LASCO-C2 at 13:36 UTC on 21 September. The CME was related to the M8.7 **flare** from NOAA **AR** 3435. The CME **speed** was estimated to be around 500 km/s, with the bulk of the material directed to the south. Since the source is located close to disk center, an **impact** at Earth can be expected on 25 September.

An **X1.5 class flare** was observed on August 07 peaking at 20:46 UTC. The flare was produced by the NOAA Active Region (**AR**) 3386 (Catania sunspot group 01), which was located at the west limb. Following this flare, the greater than 10 MeV **proton flux** started to rise at 21:46 UTC and crossed the 10 MeV warning **threshold** at 01:10 UTC on August 08 as measured by GOES. The 10 MeV proton flux remains currently above the threshold.

All Quiet Alert



All quiet

Send all quiet alert if **for the next 48 hours** you are forecasting that:

- the solar **X-ray** flux is expected to remain **below C-class level**
(probability of C-flares on a daily basis should remain below 20% for the next two days),
- the **Kp** (and **K?**) indices are expected to remain **below 5**,
- **AND** the high-energy **proton** fluxes are expected to remain **below the event threshold**
(10 pfu)

All conditions need to be met!



All quiet

All quiet alert

Last all quiet alert sent:

```
END OF ALL QUIET ALERT
.....
The SIDC - RWC Belgium expects solar or geomagnetic activity to
increase. This may end quiet Space Weather conditions.
```

The computed status is : ALL QUIET.
Please do not forget to send your Daily Heliosphere forecast!

Therefore we suggest to send a start of all quiet message by pressing the button

[Send all quiet alert](#)

However if you do not agree, just continue and to the [forecast overview](#).

For your information: the computed status includes a check of the following elements on the current forecast:

- the solar X-ray output is expected to remain below C-class level,
- the K_p index is expected to remain below 5,
- the high-energy proton fluxes are expected to remain below the event threshold.

All quiet

UTC time: 2023-10-04T12:40:04Z

Weekly **Daily Earth** Daily Heliosphere **All quiet** Presto Helio Presto Cactus CME arrival Monthly Quarterly Links

All quiet alert

Last all quiet alert sent:

END OF ALL QUIET ALERT

.....
The SIDC - RWC Belgium expects solar or geomagnetic activity to increase. This may end quiet Space Weather conditions.

The computed status is : NOT QUIET.

Please do not forget to send your Daily Heliosphere forecast!

Therefore nothing needs to be done and you can just continue to the [forecast overview](#).

However if you do not agree you can still decide to send a start of all quiet message by pressing the button

[Send all quiet alert](#)

For your information: the computed status includes a check of the following elements on the current forecast:

- the solar X-ray output is expected to remain below C-class level,
- the K_p index is expected to remain below 5,
- the high-energy proton fluxes are expected to remain below the event threshold.



All quiet: example

```
:Issued: 2019 May 30 1214 UTC
:Product: documentation at http://www.sidc.be/products/quieta
#-----#
# From the SIDC (RWC-Belgium): "ALL QUIET" ALERT #
#-----#
START OF ALL QUIET ALERT
.....
The SIDC - RWC Belgium expects quiet Space Weather conditions for
the next 48 hours or until further notice.
This implies that:
* the solar X-ray output is expected to remain below C-class level,
* the Kp index is expected to remain below 5,
* the high-energy proton fluxes are expected to remain below the
  event threshold.
#-----#
# Solar Influences Data analysis Center - RWC Belgium #
# Royal Observatory of Belgium #
# #
# Website http://www.sidc.be. #
# E-mail sidc-support@oma.be #
# To unsubscribe http://www.sidc.be/registration/unsub.php #
# #
# Legal notices: #
# - Intellectual Property Rights: #
# http://www.astro.oma.be/common/internet/en/data-policy-en.pdf #
# - Liability Disclaimer: #
# http://www.astro.oma.be/common/internet/en/disclaimer-en.pdf #
# - Use and processing of your personal information: #
# http://www.astro.oma.be/common/internet/en/privacy-policy-en.pdf #
#-----#
```



End of All quiet

```
:Issued: 2023 Jan 30 1608 UTC
:Product: documentation at http://www.sidc.be/products/quieta
#-----#
# From the SIDC (RWC-Belgium): "ALL QUIET" ALERT #
#-----#
END OF ALL QUIET ALERT

.....
The SIDC - RWC Belgium expects solar or geomagnetic activity to
increase. This may end quiet Space Weather conditions.
#-----#
# Solar Influences Data analysis Center - RWC Belgium #
# Royal Observatory of Belgium #
# #
# Website http://www.sidc.be. #
# E-mail sidc-support@oma.be #
# To unsubscribe http://www.sidc.be/registration/unsub.php #
# #
# Legal notices: #
# - Intellectual Property Rights: #
# http://www.astro.oma.be/common/internet/en/data-policy-en.pdf #
# - Liability Disclaimer: #
# http://www.astro.oma.be/common/internet/en/disclaimer-en.pdf #
# - Use and processing of your personal information: #
# http://www.astro.oma.be/common/internet/en/privacy-policy-en.pdf #
#-----#
```



SIDC Webpage - Alerts

Space Weather Services

Detections

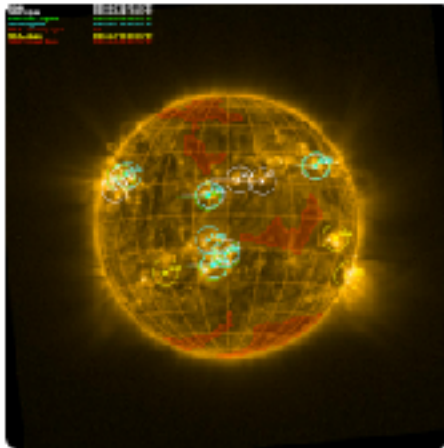
Solardemon

2023-04-27 02:51 B8 flare

CACTus

2023-04-21 18:12
844km/s

Solar Map



Latest Alerts

Presto 2023-04-24

The Corona Mass Ejection (CME) arrival first reported yesterday continues to cause a major geomagnetic storm. Although the solar wind velocity has now dropped to 500 km/s and the North-South component of the Interplanetary magnetic field (Bz) has now increased to -10 nT, the Kp index has reached the severe level (Kp=8, G4). The geomagnetic conditions are expected

Forecasts

Flare:

Quiet conditions
(<50% C-class flares)

Protons:

Quiet

Geomagnetic:

Quiet
(A<20 and K<4)

All quiet:

False

Provisional SSN:

127

Solar Activity

URSigram 2023-04-26

Solar flaring activity was low and infrequent with two C1 flares detected during the past 24 hours. NOAA Active Region (AR) 3285 (Catania group 65) produced one of them, while a yet unnamed AR turning into Earth's view produced the second flare. More C-class flare activity is expected in the next 24 hours, most probably from the unnamed AR mentioned above. No Earth-directed Coronal Mass Ejections

Solar Wind

URSigram 2023-04-26

The Solar Wind (SW) conditions were stable during the last 24 hours. The SW speed ranged between 490 and 570 km/s in the last 24 hours. The total Interplanetary magnetic field (Bt) varied between 2 and 6 nT and its North-South component (Bz) ranged between -5 and 5 nT. The interplanetary magnetic field phi angle was directed away from the Sun until yesterday 19:00 UT and has turned

STCE Newsletter

NEWSLETTER



STCE Newsletter



SOLAR-TERRESTRIAL CENTRE OF EXCELLENCE

STCE Newsletter

19 Feb 2024 - 25 Feb 2024

Published by the STCE - this issue : 4 Mar 2024.

The Solar-Terrestrial Centre of Excellence (STCE) is a collaborative network of the Belgian Institute for Space Aeronomy, the Royal Observatory of Belgium and the Royal Meteorological Institute of Belgium.

[Archive of the newsletters](#)

[Subscribe to this newsletter by mail](#)

Table of Content 1.Wuthering Helg... 2. Review of spac... 3.PROBA2 Observa... 4.Noticeable Sol... 5.International ... 6.Geomagnetic Ob... 7.The STDC space... 8. Review of Iono... 9.Courses, lectu...

1. Wuthering Heights
2. Review of space weather
3. PROBA2 Observations (19 Feb 2024 - 25 Feb 2024)
4. Noticeable Solar Events
5. International Sunspot Number by SILSO
6. Geomagnetic Observations in Belgium
7. The STDC space weather briefing
8. Review of Ionospheric Activity
9. Courses, lectures and presentations



<https://www.stce.be/newsletter/newsletter.php>



Registration



E-mail lists - register!



<https://www.sidc.be/>