

SPACE WEATHER INTRODUCTORY COURSE



Collaboration of



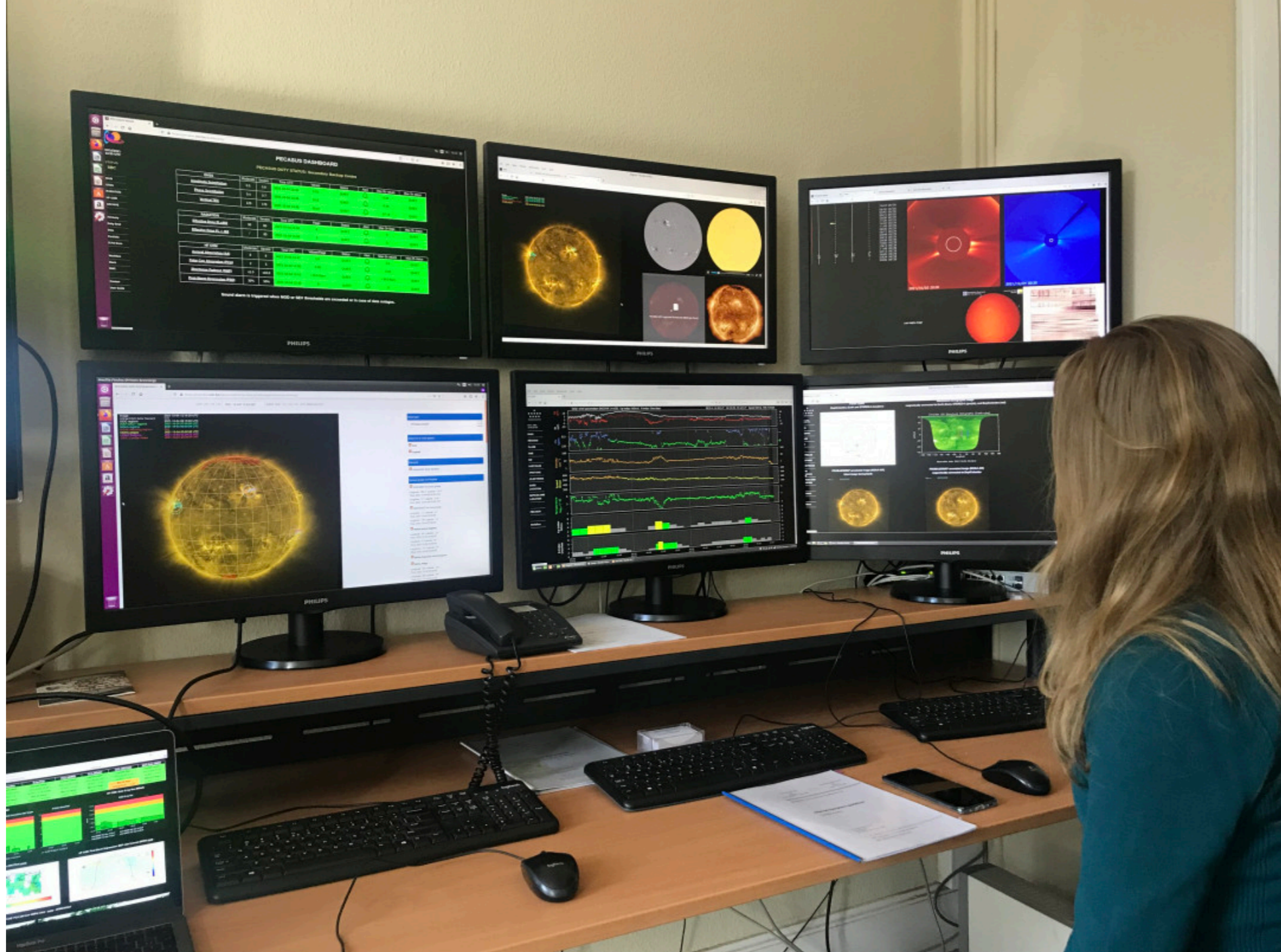
Solar-Terrestrial Centre of Excellence



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

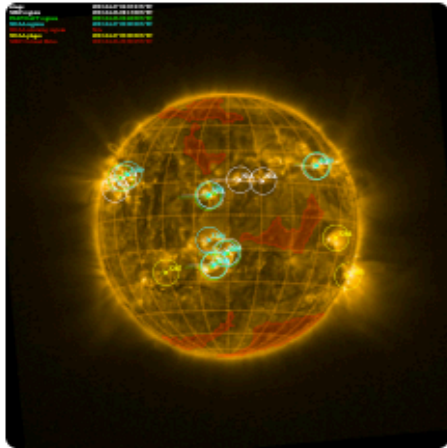
[2023-04-27 02:51 B8 flare](#)

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 reach 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

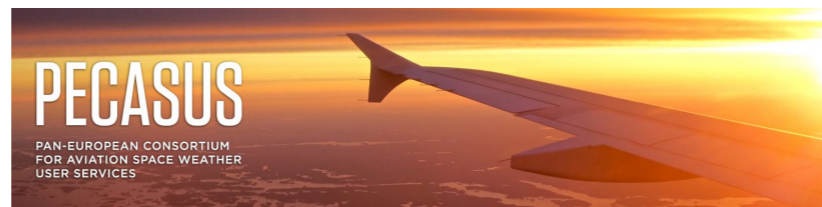
Forecaster tasks

Forecasters

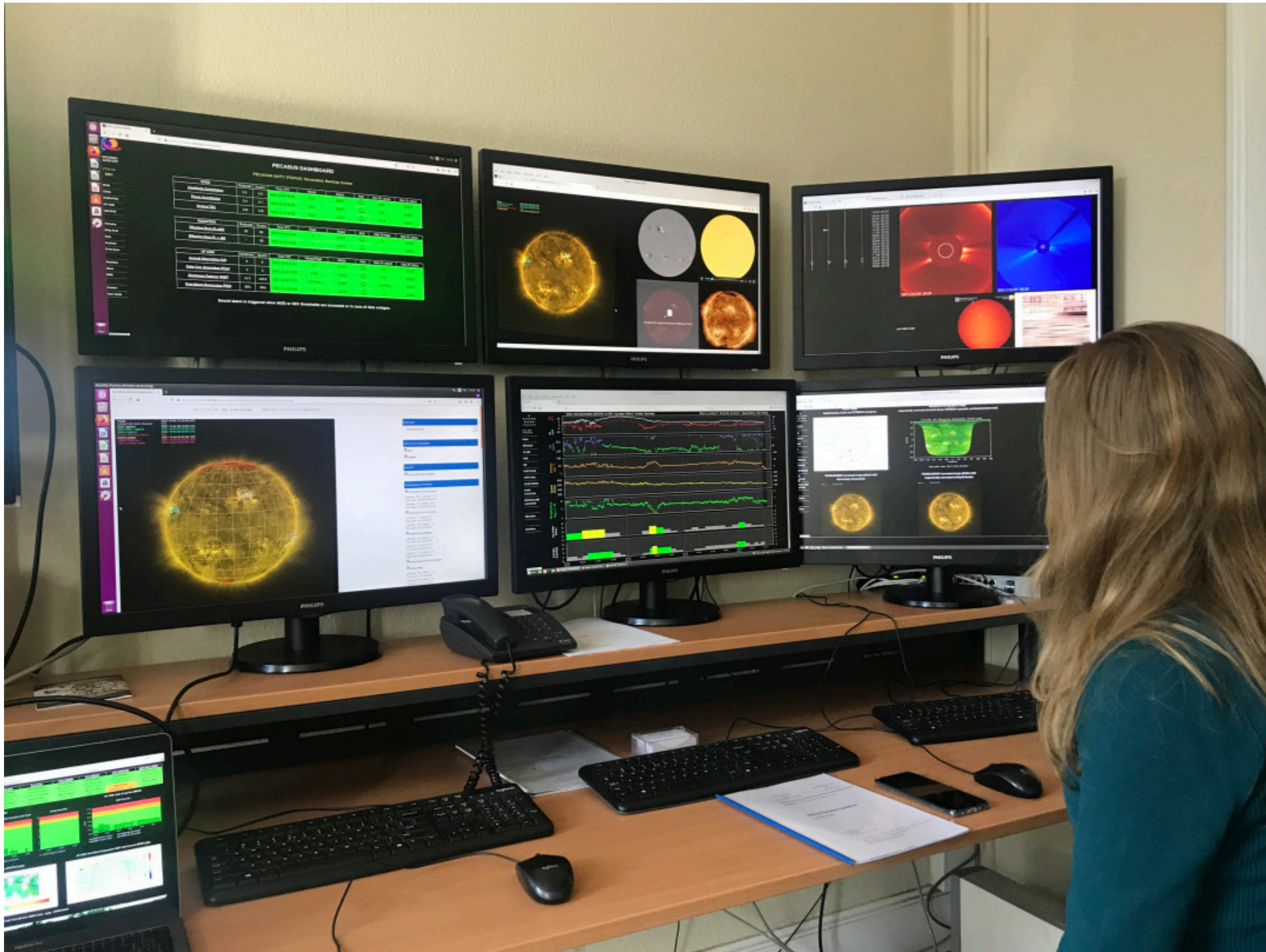
- One week duty cycle
- Daily ursigram
- Alerts when needed
- Briefing/handover on Monday
- 24/7 with automated alerts
- PECASUS operator during day (9-17h)
- Tailored bulletins (BepiColombo, Mars Express)

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 10cm flux Forecast K Forecast helio Finish forecast

Catania info (Last update: 2023-Apr-26)						NOAA info (Last update: 2023-Apr-27)					Probabilities for			
Number	area	nspots	Zurich	Longitude	Latitude	Number	Macintosh	Mag. type	Longitude	Latitude	C flare	M flare	X flare	Proton
65	20	6	C	-14.0	-17.0	3285	Cso	Beta	-5.0	-17.0	10	1	1	1
						3286	Axx	Alpha	-12.0	-11.0	5	1	1	1
67	15	10	D	-21.0	-23.0	3288	Dso	Beta	-10.0	-22.0	40	1	1	1
69	7	4	D	-74.0	19.0	3289	Dso	Beta	-58.0	20.0	90	10	1	1
66	4	4	D	34.0	24.0	3290	Dro	Beta	45.0	24.0	30	1	1	1
68	1	3	B	-23.0	8.0	3291	Bxo	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 Catania (Last update: 2023-Apr-26)	Total flares NOAA (Last update: 2023-Apr-27)	Predictions
C	96	96	<input type="text"/>
M	13	14	<input type="text"/>
X	4	5	<input type="text"/>

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

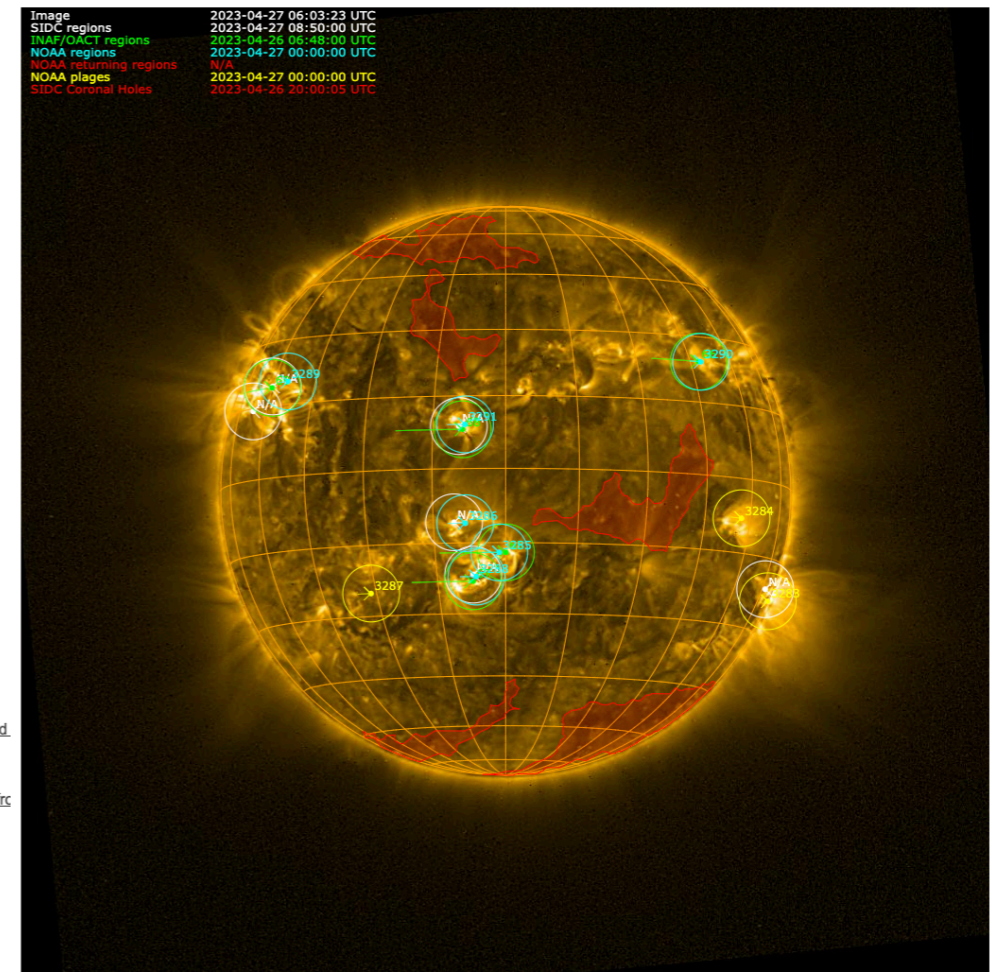
- Solar map
- USET regions
- Solar Monitor Regions
- Latest NOAA synoptic map
- Raben Maps
- STEREO Stonyhurst heliographic maps
- PROBA2 LYRA data and SWAP images
- SDO movies
- SDO movies (ROB page)
- SOHO movie theater (defunct)
- SOHO data
- STEREO movies
- Realtime GONG H-alpha movies (backup)

Flares

- NOAA SWPC event lists: today, yesterday, archive, ROB-hosted
- Kanzelhoehe flare list
- Solar Demon
- SolarSoft Latest Events
- GOES X-ray, proton & electron flux, estimated Kp (assembled fr
- GOES X-ray plots
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- Solar monitor Flare Forecast
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Radio

- Latest 10.7cm measurement, Archive of 10.7cm measurement
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Solar Flares - Forecast

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

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

Proton forecast

Total protons:

Solar activity info

Links

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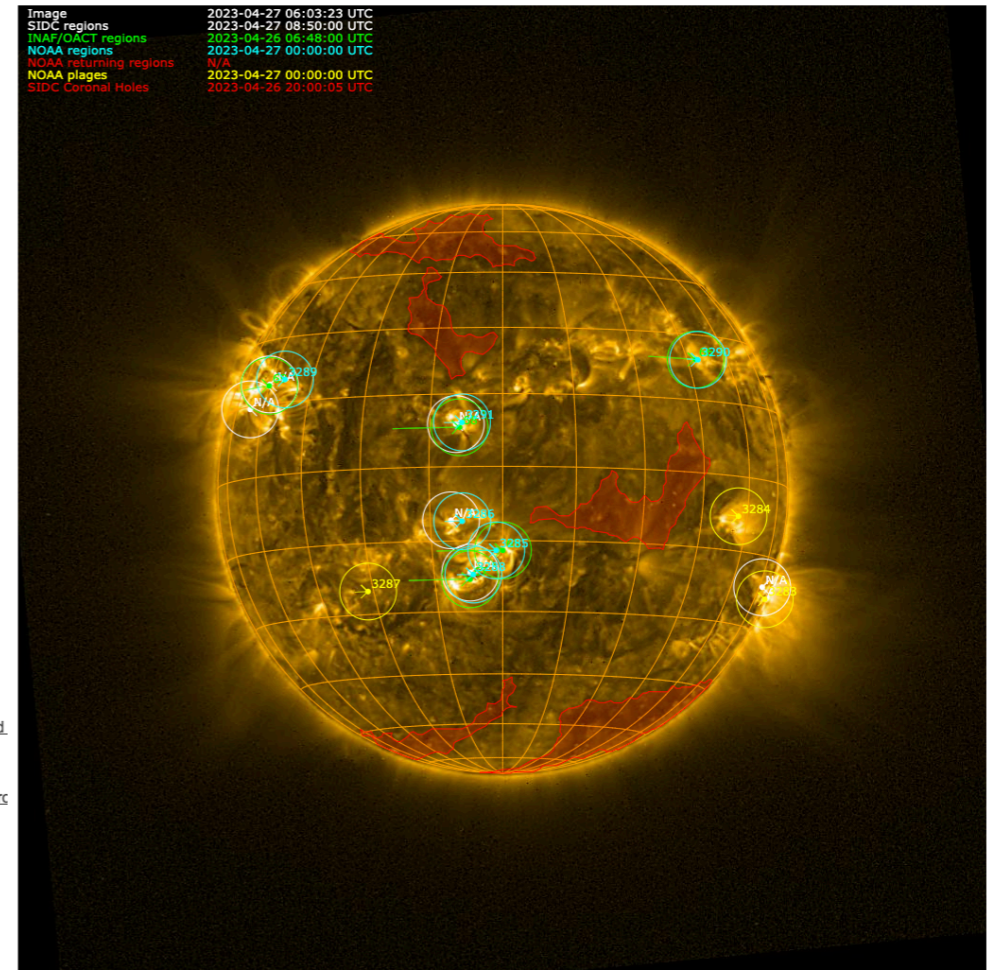
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Solar Flares - Forecast Disk

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

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

Proton forecast

Total protons:

Solar activity info

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)

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Protons - Forecast

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

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Proton forecast

Total protons:

Solar activity info

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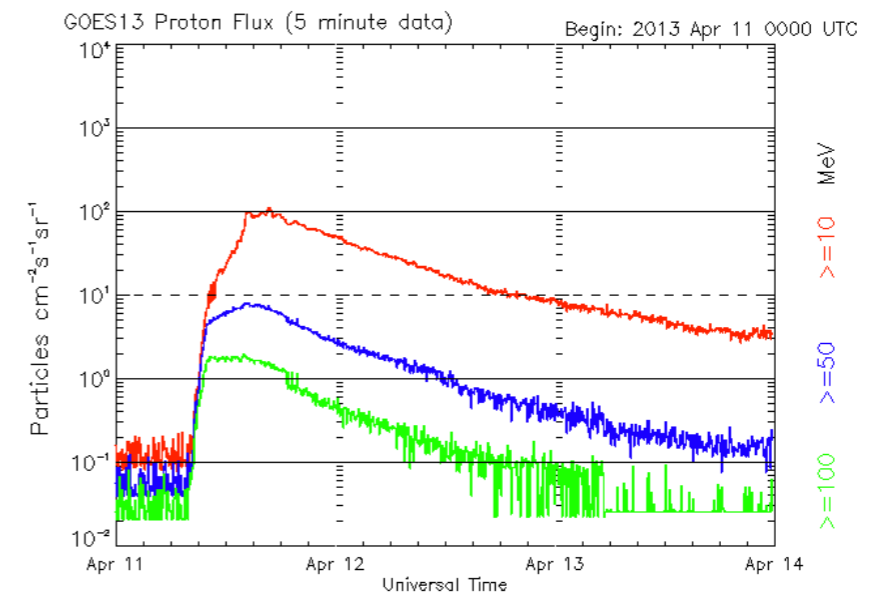
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Updated 2013 Apr 13 23:56:02 UTC

NOAA/SWPC Boulder, CO USA



Proton forecast

Total protons:

- ✓ -----
- No forecast
- Quiet
- Proton event expected (10 pfu at >10 MeV)
- Major proton event expected (100 pfu at >100 MeV)
- Proton event in progress (>10 MeV)
- Warning condition (activity levels expected to increase, but no numeric forecast given)



Solar Activity - Forecast

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

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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

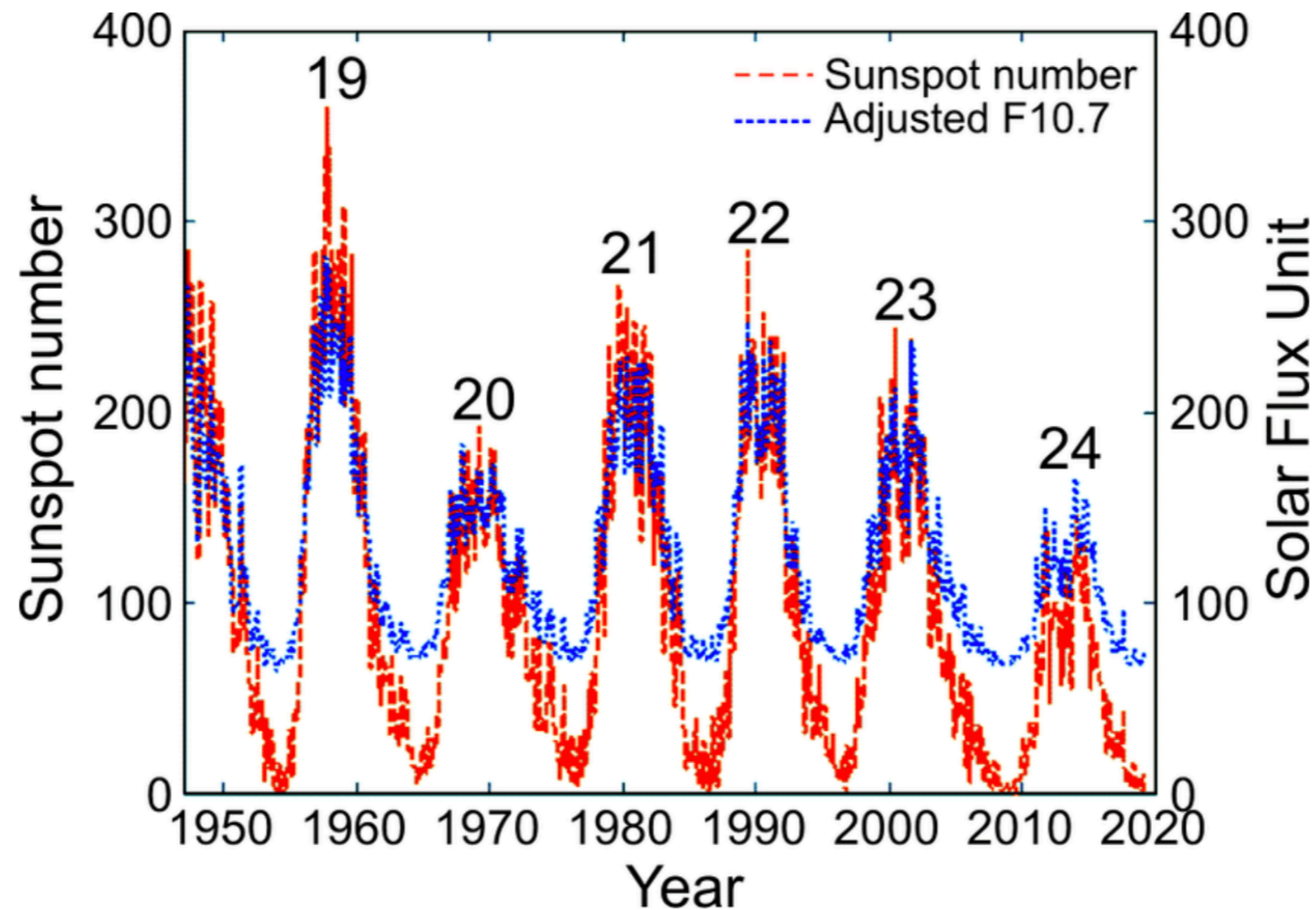
Forecast K

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 [69-71]. 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

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

Forecast for 2023-04-27: (previous predictions : (129,128))
Forecast for 2023-04-28: (previous predictions : (131,/))
Forecast for 2023-04-29: (previous predictions : (/,/))

Links

- [Latest 10.7cm measurement](#), [Archive of 10.7cm measurement](#)
- [SWPC radio flux measurements](#)
- [10.7cm forecasts by CLS](#)
- [Radio bursts Humain](#)
- NOAA SWPC event lists: [today](#), [yesterday](#), [archive](#), [ROB-hosted searchable flare archive](#)
- [Culgoora spectrographs](#)
- [Culgoora Latest Radio burst](#)
- [Learmonth spectrographs](#)

10cm-Flux

Date	Current carr. rot.	Prev. carr. rot.	Two carr. rot. back	Flat prediction
Mar 31	125	150	150	
Apr 06	125	180	200	
Apr 12	125	150	350	
Apr 18	125	150	150	
Apr 24	125	150	150	
Apr 25	125	150	150	125
Apr 26	125	150	150	125
Apr 27	125	150	150	125
Apr 28	125	150	150	125
Apr 29	125	150	150	125
Apr 30	125	150	150	125
May 07	125	150	150	



Previweb - Forecaster's Page

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Forecast regions

Forecast 10cm flux

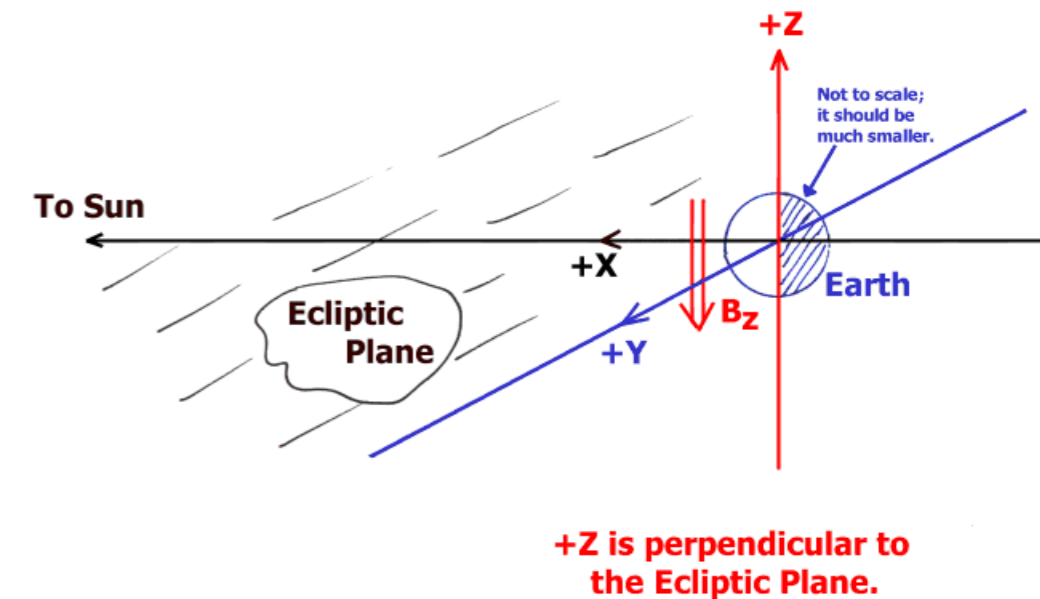
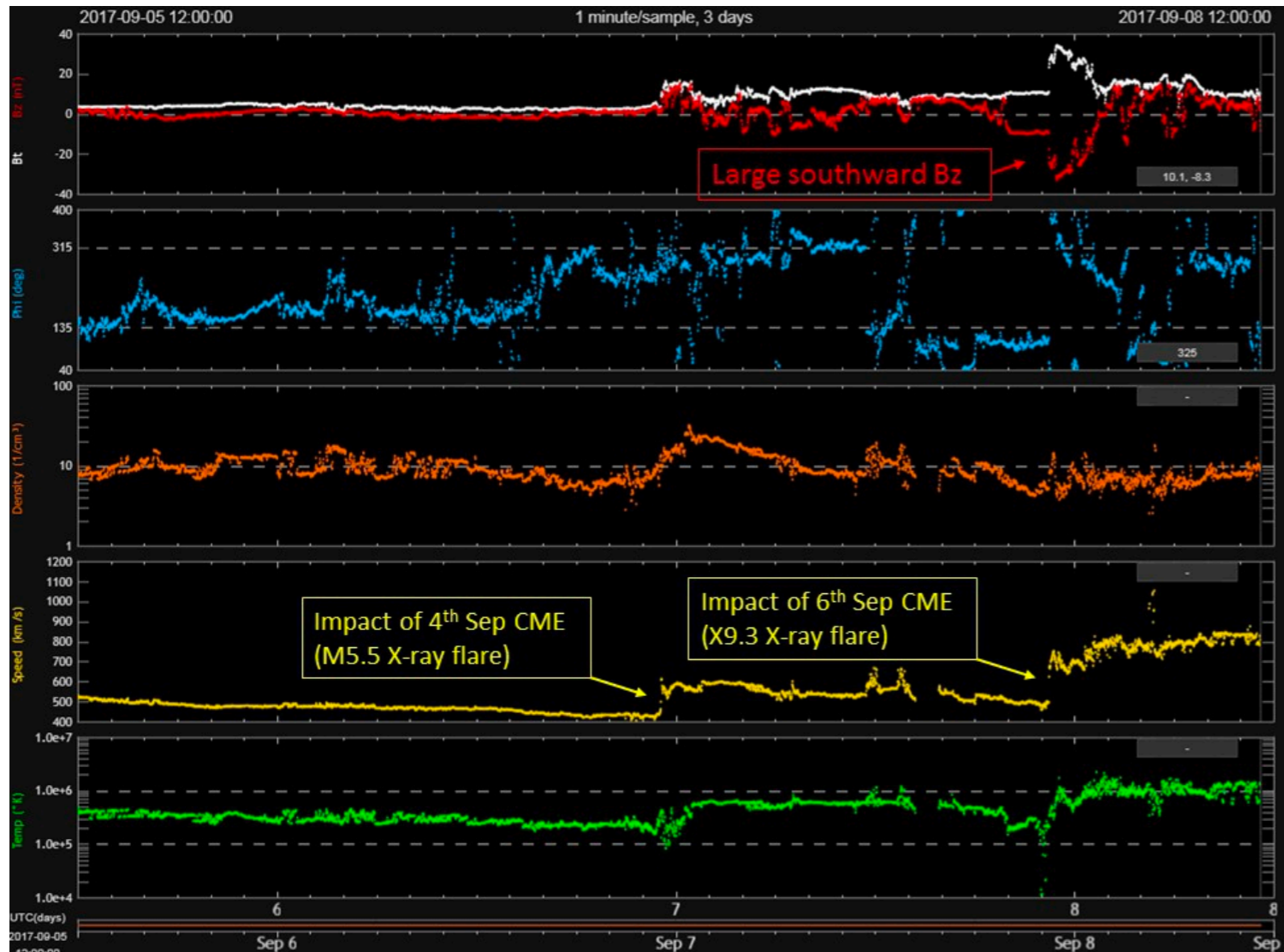
Forecast K

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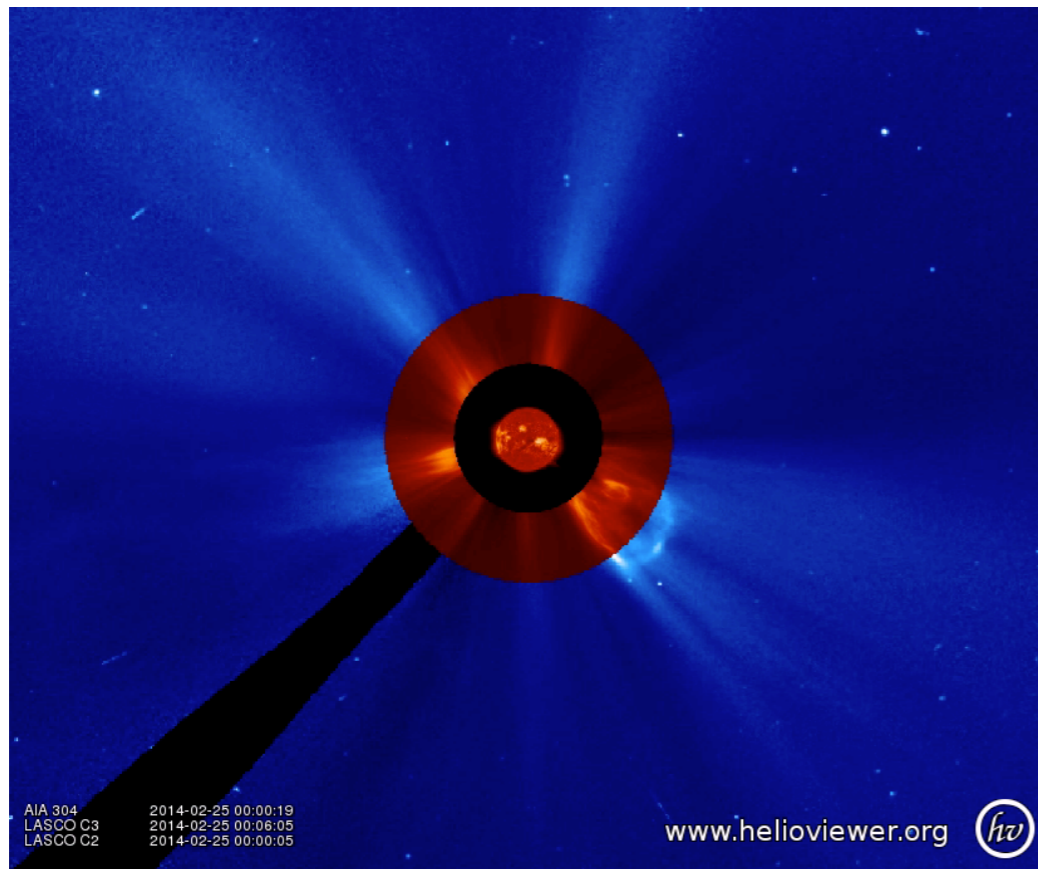
Finish forecast



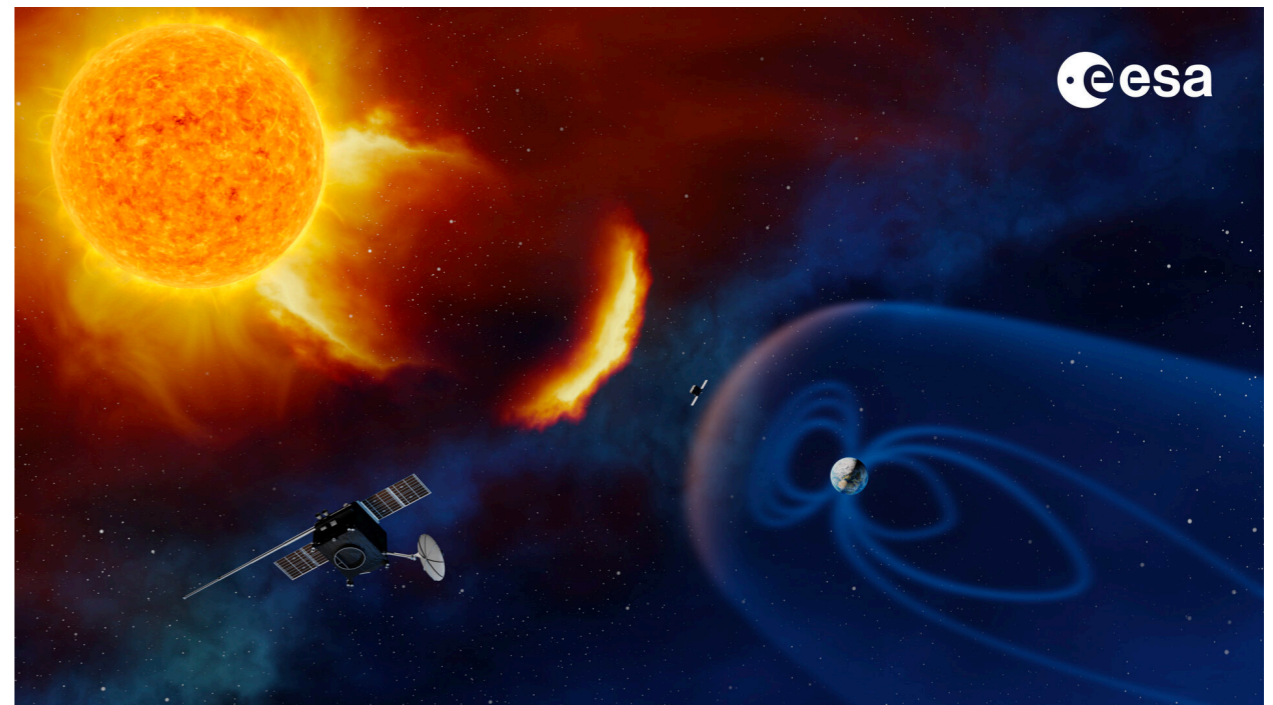
Solar Wind - Observations



SW Disturbance - Coronal Mass Ejection

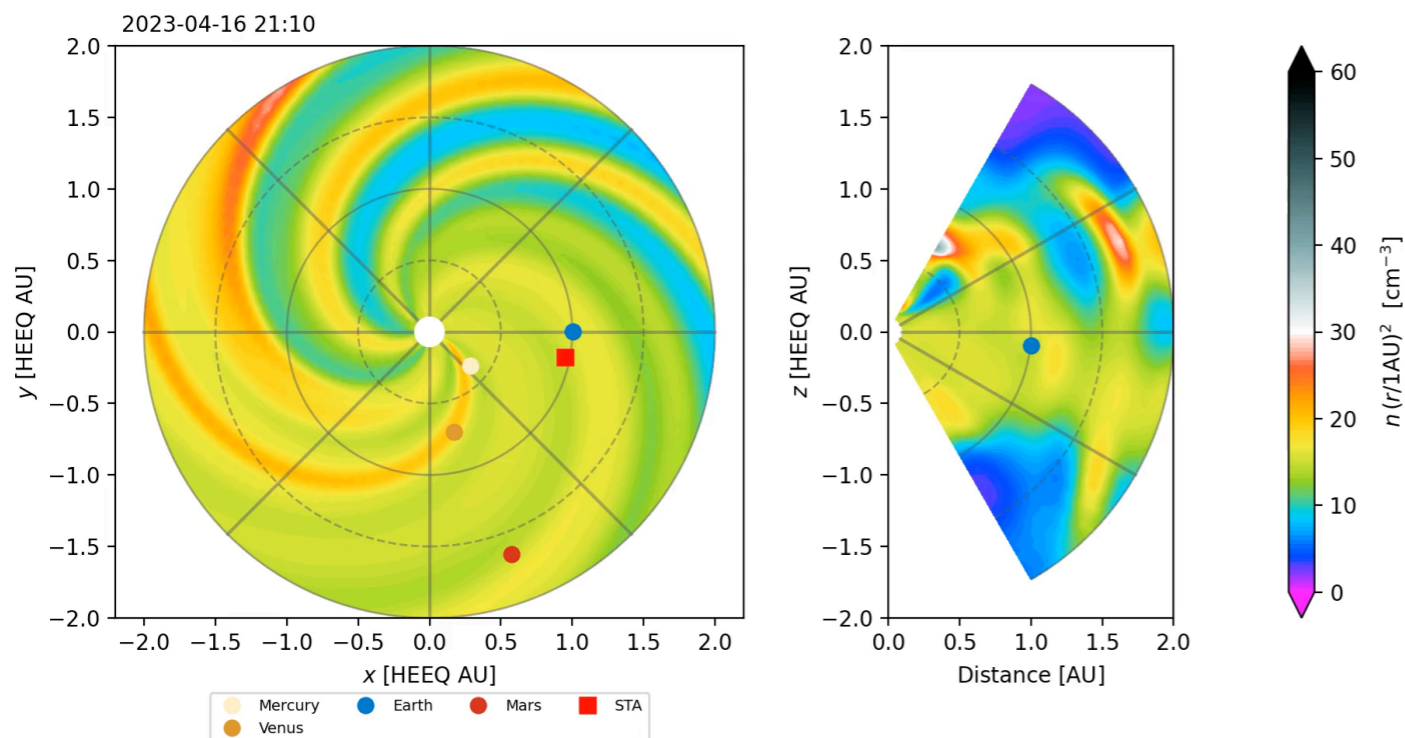


SDO/AIA and SOHO/LASCO

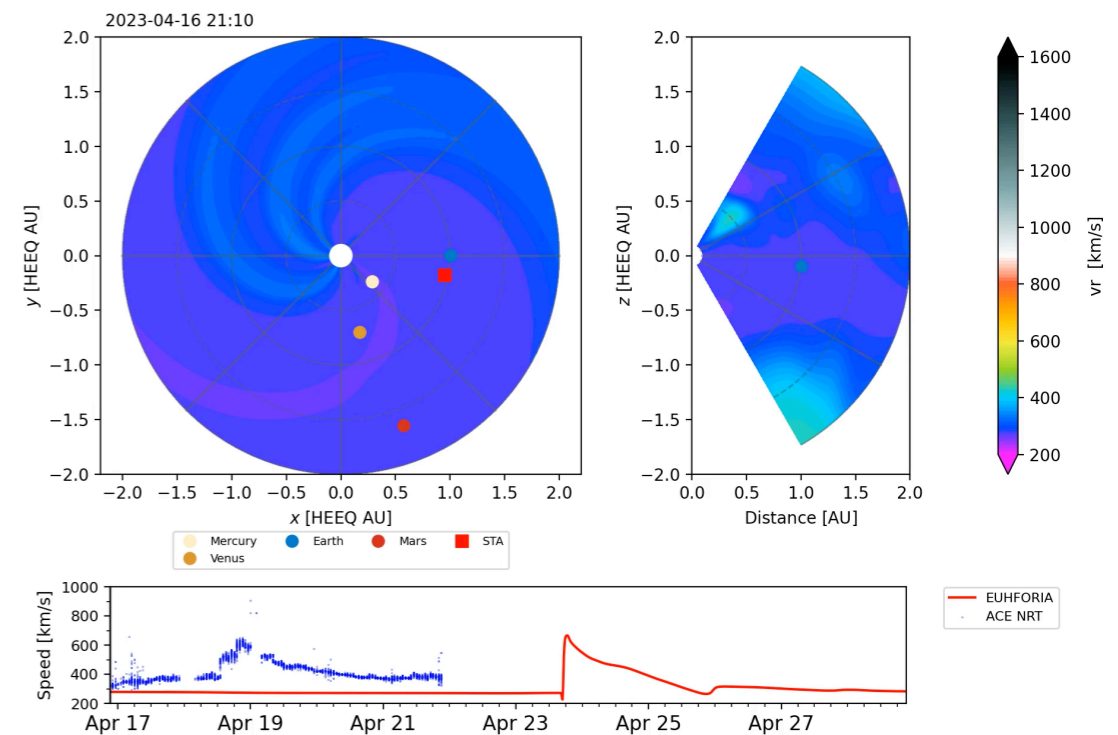


SW Disturbance - CME Arrival Prediction

Density



Velocity



eu{h}foria



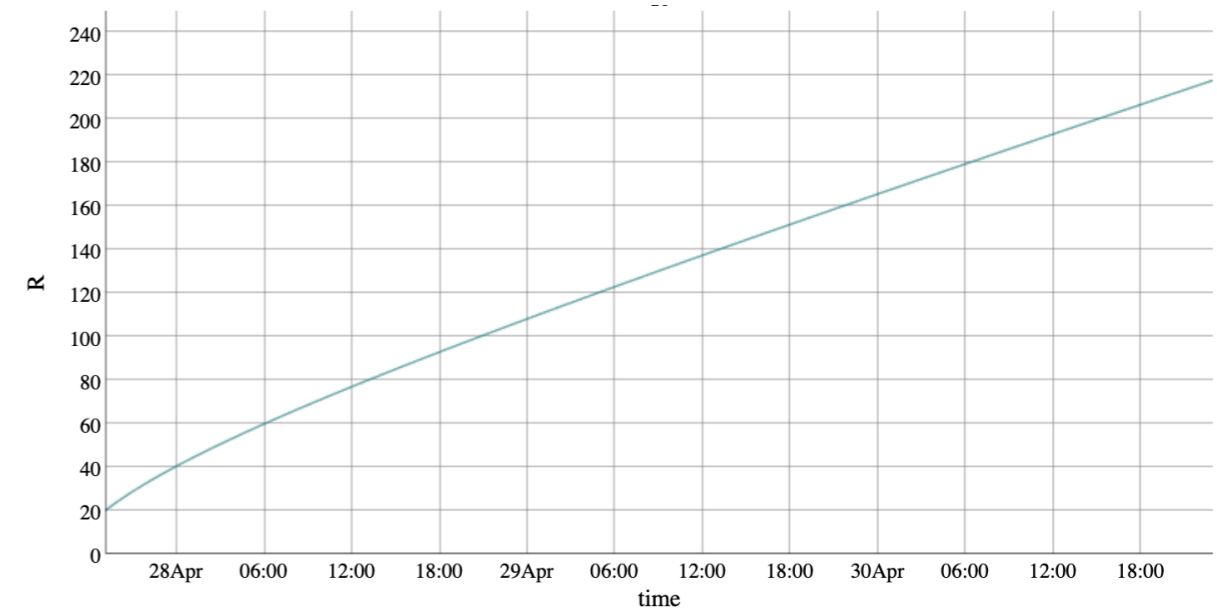
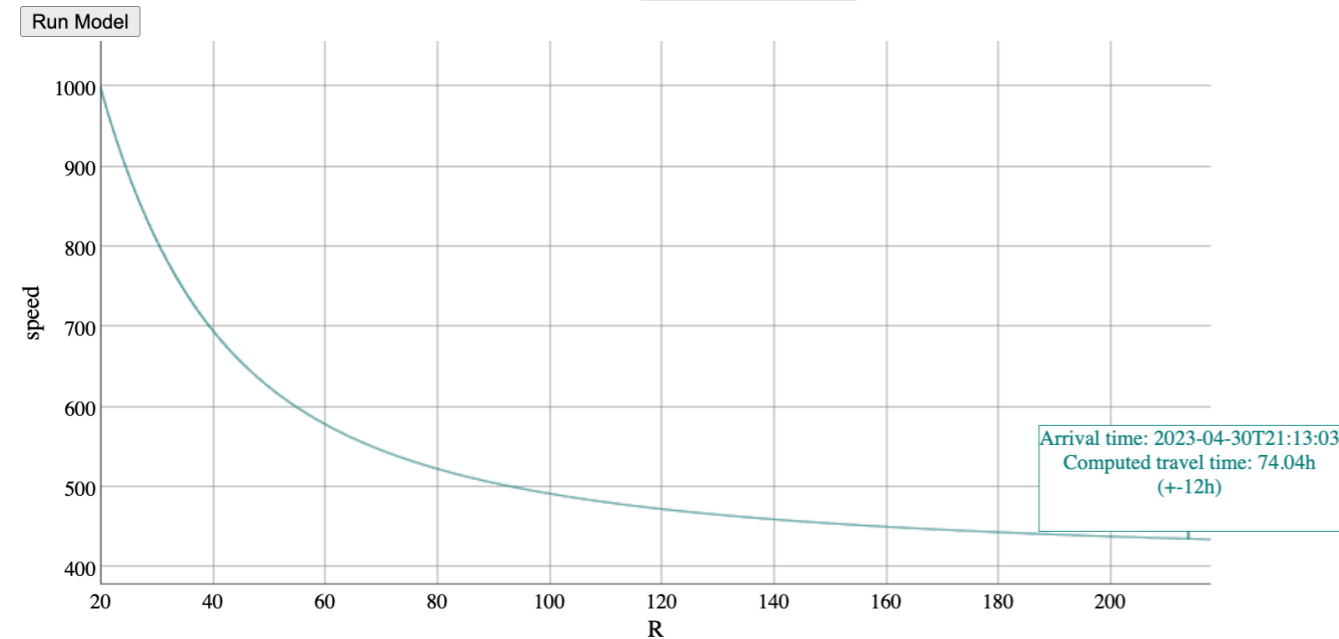
SW Disturbance - CME Arrival Prediction

Calculation of ICME arrival times

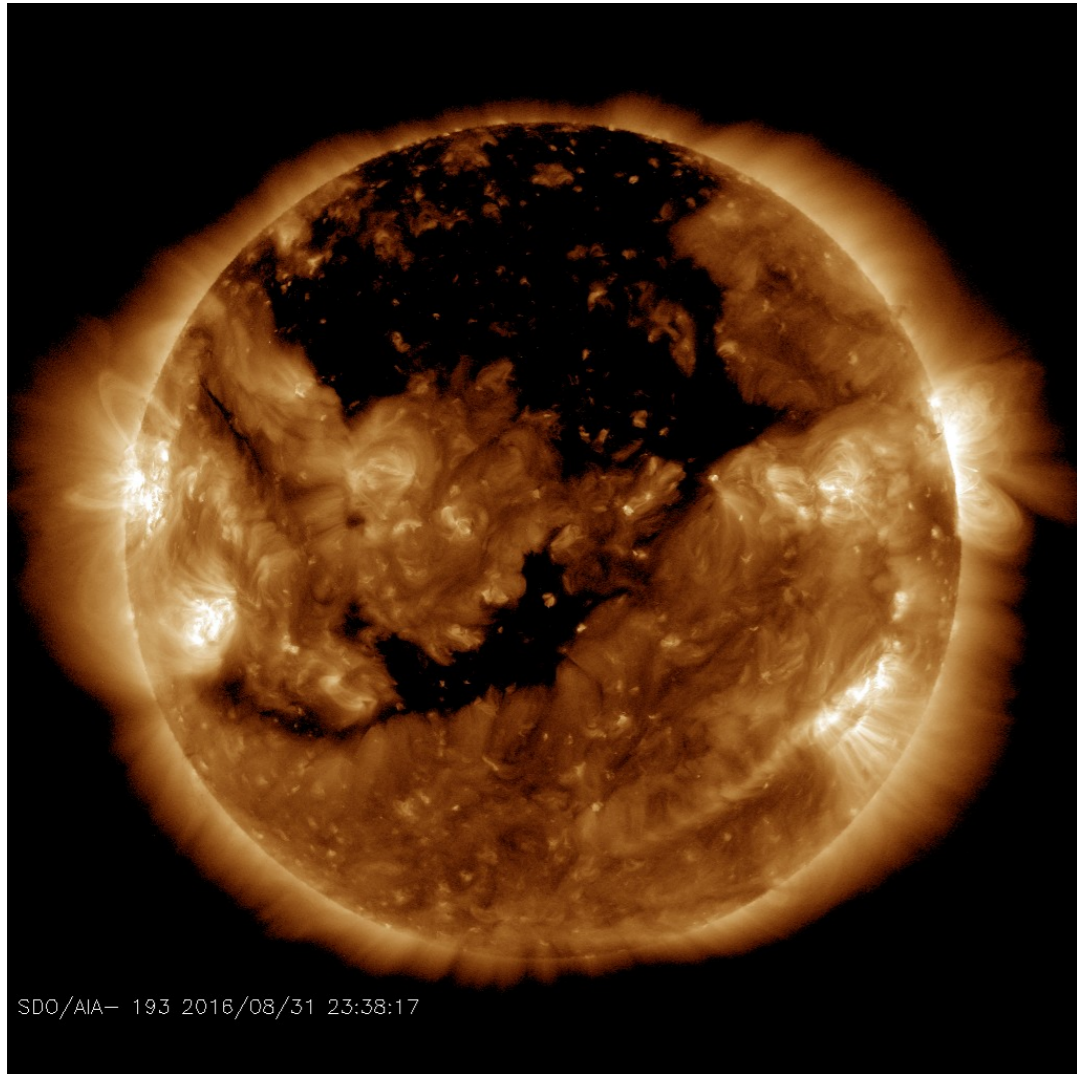
Main reference

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

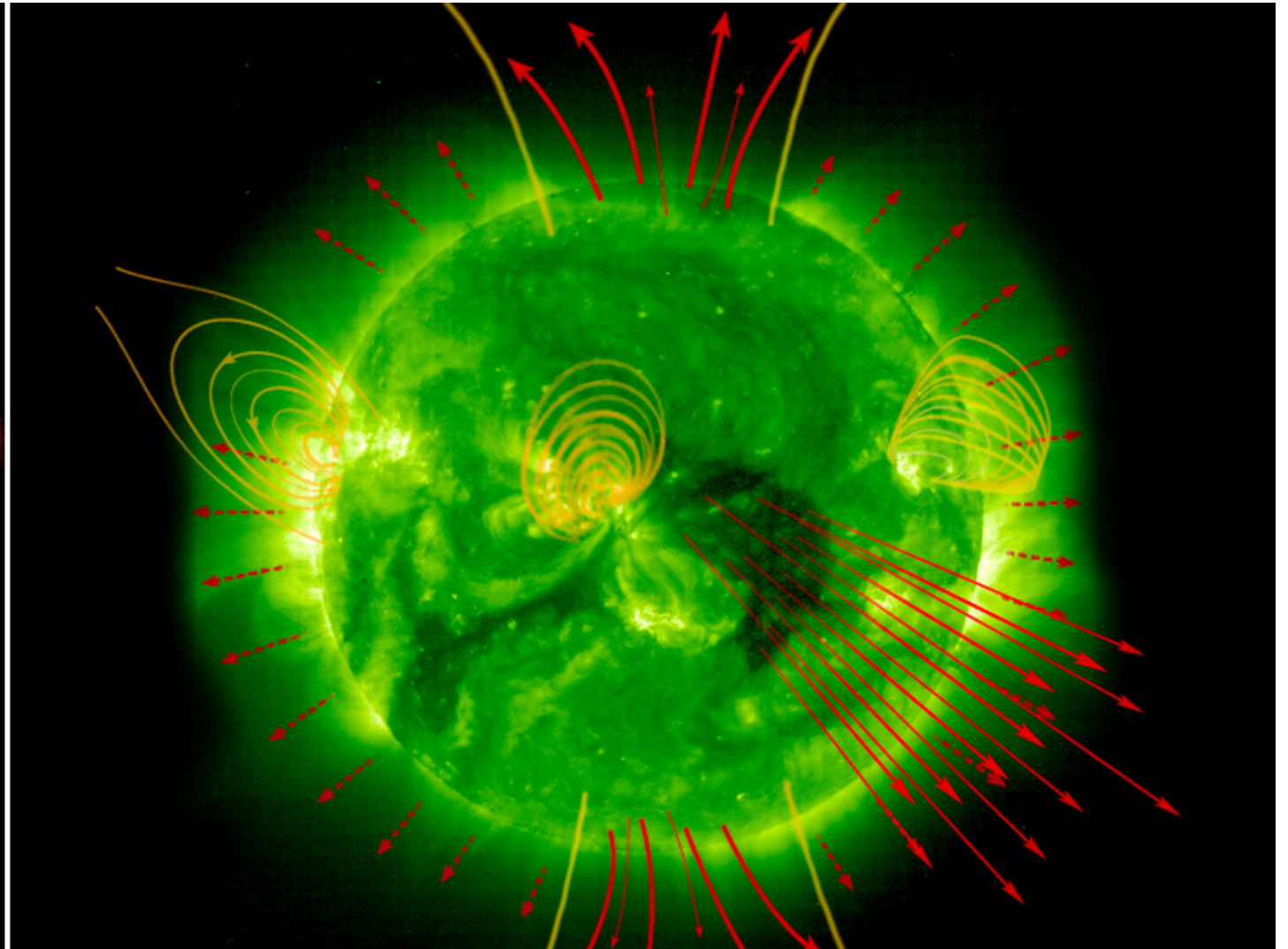
Gamma drag parameter; usually between 0.2 and 2 (10^{-7} km^{-1}):
R_s: distance where the CME speed is measured (solar radii): (Preferentially near 20 R_s.)
v₀: speed of CME R_s, (km/s):
w; background solar wind speed (km/s):
Date and time of CME at the given R_s:



SW Disturbance - Coronal Hole



 SDO/AIA



 SOHO/EIT

K index - Forecast

Forecast regions	Forecast 10cm flux	Forecast K	Forecast helio	Finish forecast				
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:	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)
Prediction local K-index for day 2023-04-28:	<input type="text"/> (2,/)	<input type="text"/> (1,/)	<input type="text"/> (2,/)	<input type="text"/> (3,/)	<input type="text"/> (2,/)	<input type="text"/> (2,/)	<input type="text"/> (3,/)	<input type="text"/> (2,/)
Prediction local K-index for day 2023-04-29:	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)
<i>Between brackets : (forecast from 1 day ago, forecast from 2 days ago); / means it is not available</i>								
Geomagnetic forecast:	<input type="text" value="-----"/>							
Extra geomagnetic information:	<div style="border: 1px solid black; height: 150px;"></div>							

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

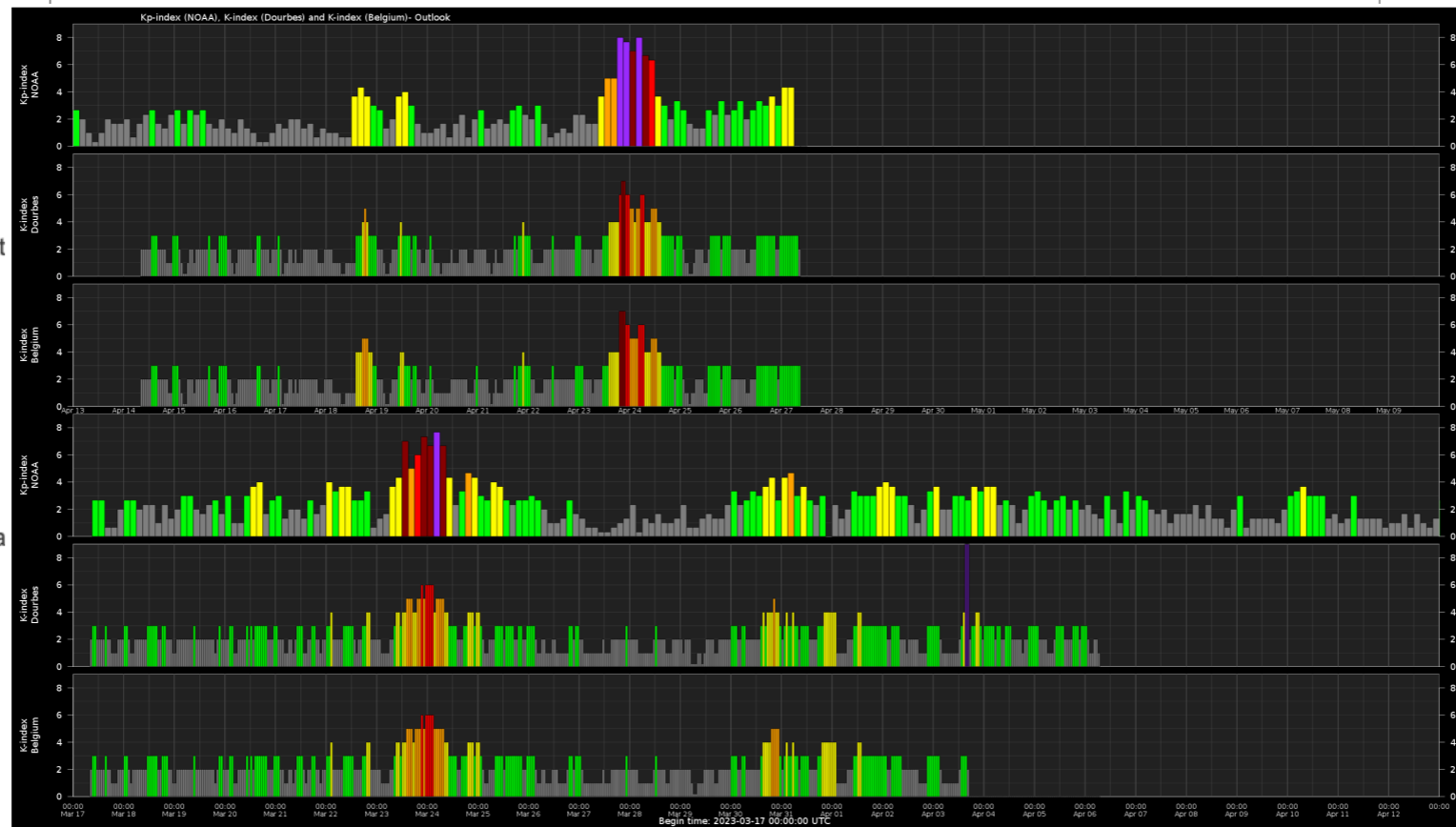
Day/Hours	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Prediction local K-index for day 2023-04-27:	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/>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

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

Geomagnetic forecast:

Extra geomagnetic informat

Hint: double click on a field to copy it in a



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:	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)
Prediction local K-index for day 2023-04-28:	<input type="text"/> (2,/)	<input type="text"/> (1,/)	<input type="text"/> (2,/)	<input type="text"/> (3,/)	<input type="text"/> (2,/)	<input type="text"/> (2,/)	<input type="text"/> (3,/)	<input type="text"/> (2,/)
Prediction local K-index for day 2023-04-29:	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)

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

Geomagnetic forecast:

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

ist -----

- 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)

Extra geomagnetic information:

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:	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)	<input type="text"/> (2,2)	<input type="text"/> (1,1)
Prediction local K-index for day 2023-04-28:	<input type="text"/> (2,/)	<input type="text"/> (1,/)	<input type="text"/> (2,/)	<input type="text"/> (3,/)	<input type="text"/> (2,/)	<input type="text"/> (2,/)	<input type="text"/> (3,/)	<input type="text"/> (2,/)
Prediction local K-index for day 2023-04-29:	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)	<input type="text"/> (/,/)
<i>Between brackets : (forecast from 1 day ago, forecast from 2 days ago); / means it is not available</i>								
Geomagnetic forecast:	<input type="text" value="-----"/>							
Extra geomagnetic information:	<div style="border: 1px solid gray; height: 100px;"></div>							

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

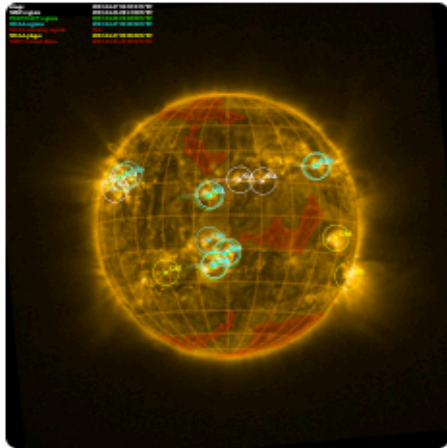
2023-04-27 02:51 B8 flare

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 reach 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

SIDC Webpage - Detections

Space Weather Services

Detections

Solardemon

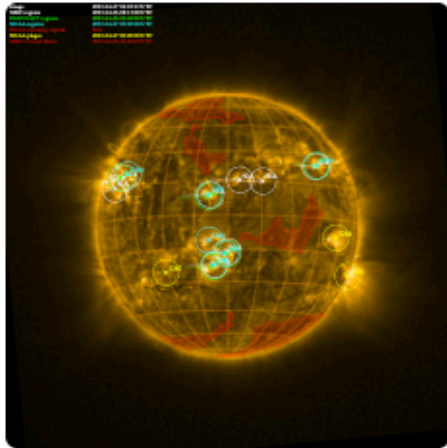
2023-04-27 02:51 B8 flare

CACTus

2023-04-21 18:12

844km/s

Solar Map



Latest Alerts

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Geomagnetic:

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Solar Activity

URSIgram 2023-04-26

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CACTUS - CME Detection



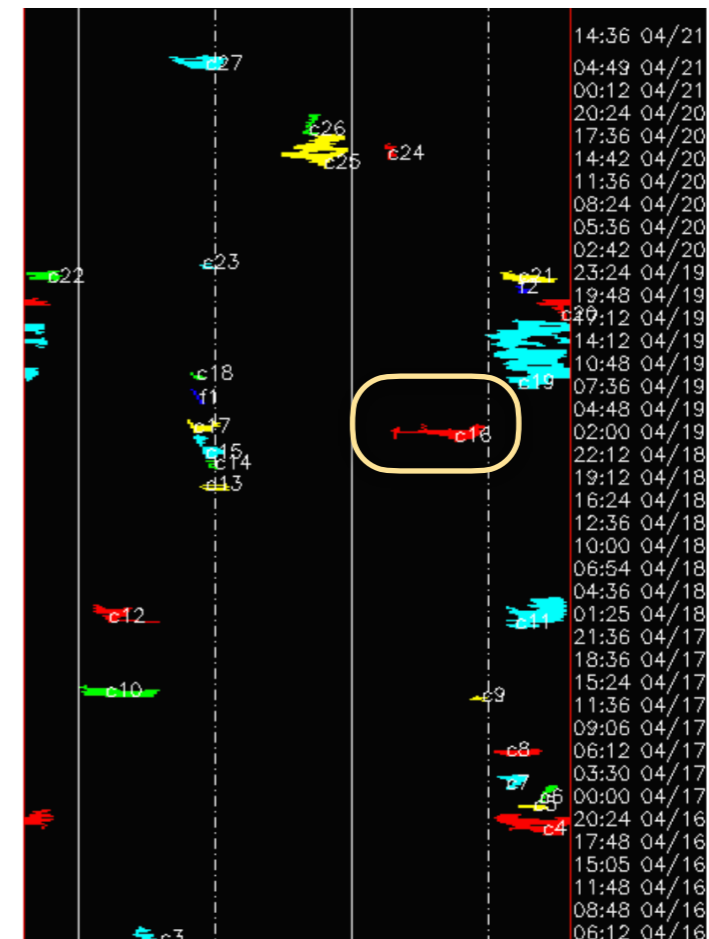
CACTUS

A software package for 'Computer Aided CME Tracking'

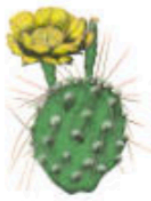
#	CME	t0	dt0	pa	da	v	dv	minv	maxv	halo?
0027	2023/04/21	06:24	02	259	036	0669	0057	0549	0753	
0026	2023/04/20	18:36	03	334	010	0422	0169	0157	0659	
0025	2023/04/20	15:36	04	336	042	0452	0064	0359	0624	
0024	2023/04/20	15:24	02	026	006	0520	0190	0466	0892	
0023	2023/04/20	00:36	01	265	008	0306	0056	0224	0390	
0022	2023/04/19	23:36	02	158	022	0255	0074	0186	0452	
0021	2023/04/19	23:24	02	117	036	0355	0147	0160	0664	
0020	2023/04/19	18:36	03	142	038	0199	0064	0112	0300	
0019	2023/04/19	11:48	10	124	070	0374	0343	0104	1420	
0018	2023/04/19	10:00	01	259	008	0466	0084	0312	0538	
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	0504	
0015	2023/04/18	23:12	04	266	018	0425	0049	0315	0480	
0014	2023/04/18	21:12	01	268	006	0548	0060	0534	0651	
0013	2023/04/18	19:36	01	270	018	0428	0218	0130	0801	
0012	2023/04/18	01:25	03	212	042	0470	0092	0284	0568	
0011	2023/04/18	00:48	05	122	038	0359	0118	0128	0569	
0010	2023/04/17	13:36	02	207	052	0398	0086	0237	0558	
0009	2023/04/17	13:36	01	084	010	0435	0030	0400	0473	
0008	2023/04/17	07:12	01	110	030	0396	0045	0318	0466	
0007	2023/04/17	03:12	02	106	018	0434	0072	0318	0589	
0006	2023/04/16	23:24	03	130	010	0600	0297	0315	1077	
0005	2023/04/16	20:12	01	120	018	0819	0273	0558	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	0488	0214	0220	0804	
0001	2023/04/16	00:48	02	000	062	0269	0028	0217	0332	
# Flow		t0	dt0	pa	da	v	dv	minv	maxv	halo?
0002	2023/04/19	21:24	01	113	008	0345	0068	0284	0466	
0001	2023/04/19	06:12	02	259	008	1247	0076	1114	1250	
#EOF										

cmecat.txt

S W N E



CACTUS - CME Detection



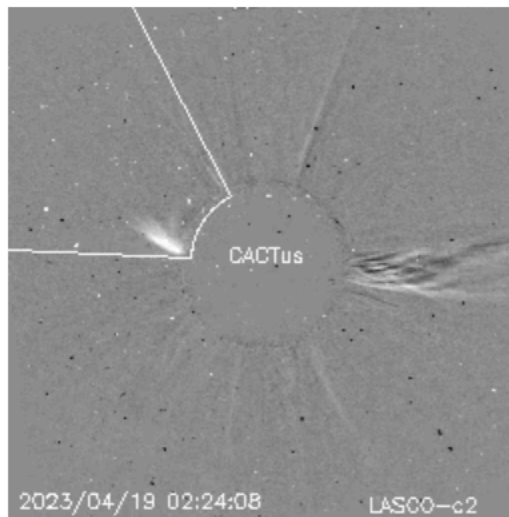
CACTUS

A software package for 'Computer Aided CME Tracking'

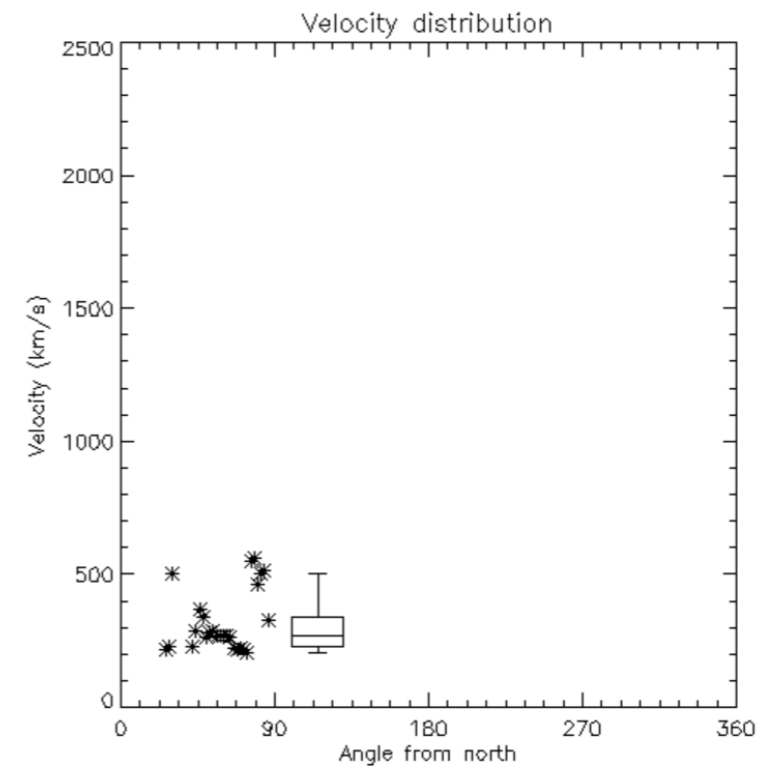
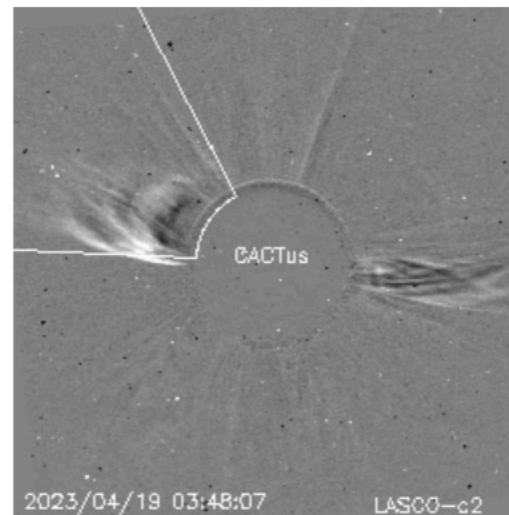
Details and graphs for CME0016

#	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 SDO/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](#)

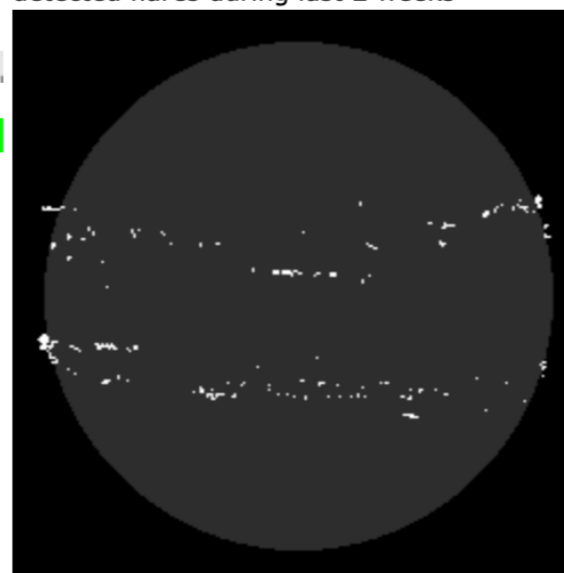
[Only X class flares and above](#)

Filters (time)

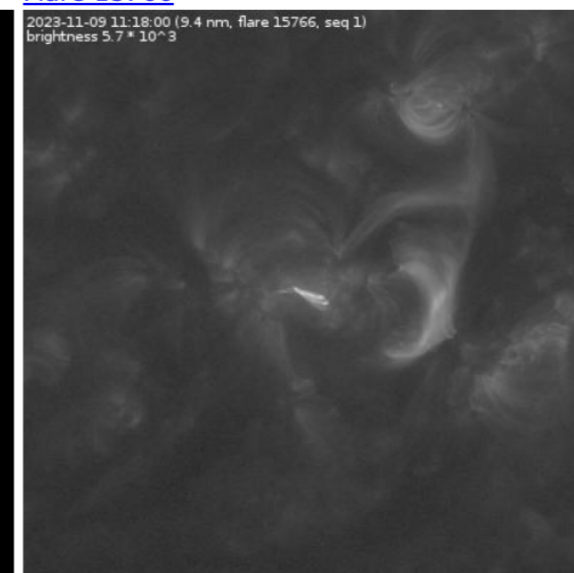
[Last 7 days](#)

-- [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	COMESSEP	# det.	dimming
November, 2023															
9	B3	11:18	11:21	11:21	15766	-10	4	0.25	AR 3480	2.6	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	16	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	1.6	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	-266
8	A7	07:24	07:24	07:24	15757	23	59	0.88	AR 3479	0.7	N/A	N/A	0	1	-266
8	B5	06:15	06:18	06:33	15755	9	-3	0.10	AR 3483	4.6	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

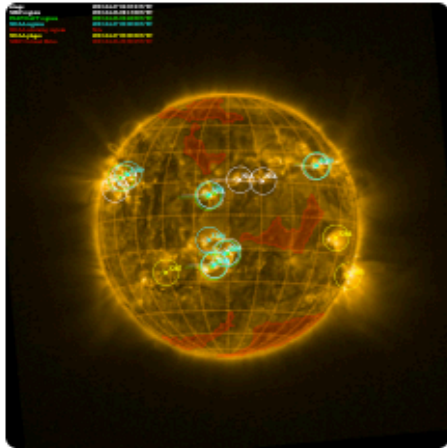
2023-04-27 02:51 B8 flare

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 reach 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

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





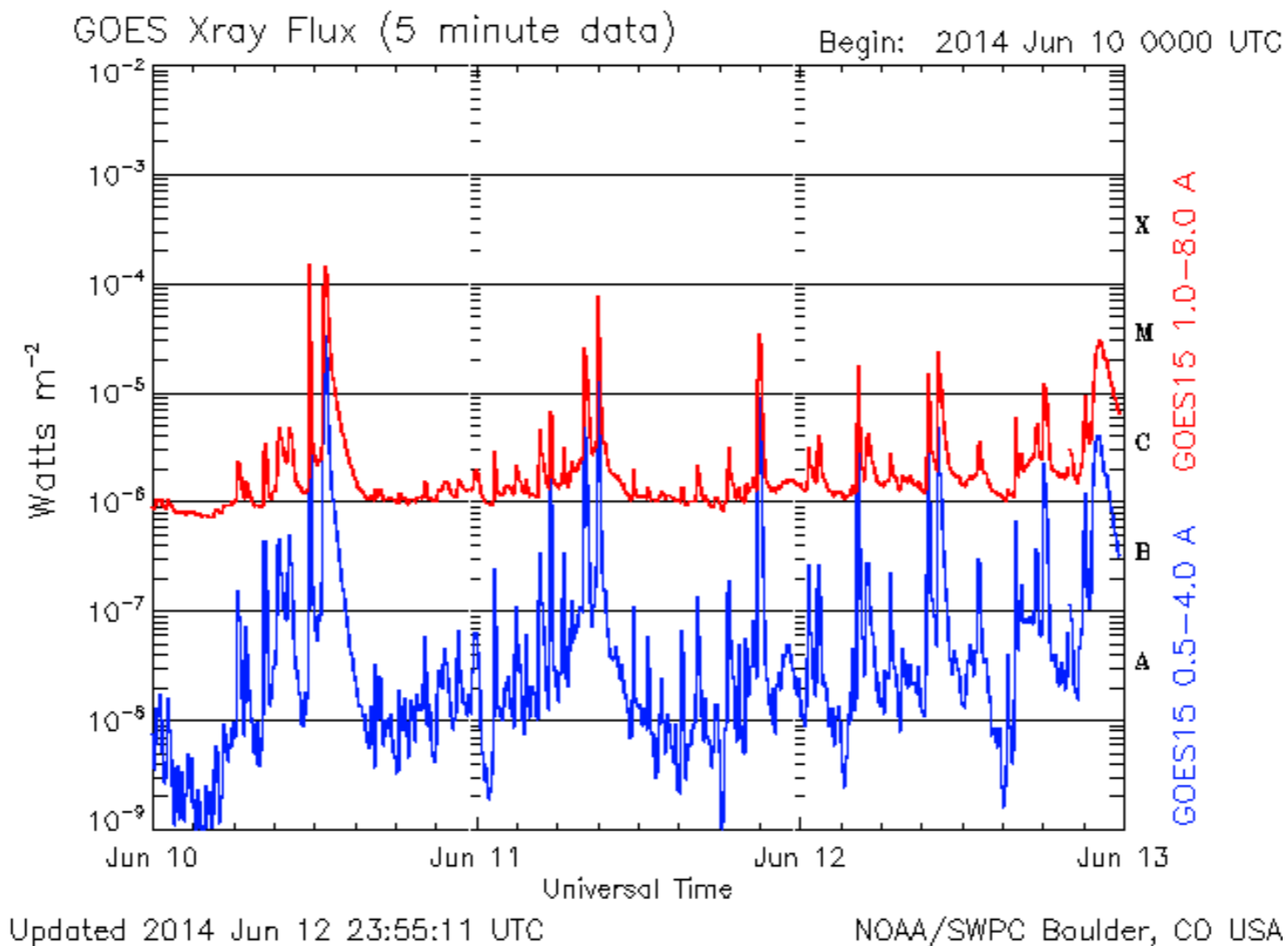
A presto alert needs to be sent ASAP:

- During or just after an **X-flare** (high level of flaring activity)
- In case of a **proton event**, i.e., Flux \geq 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:

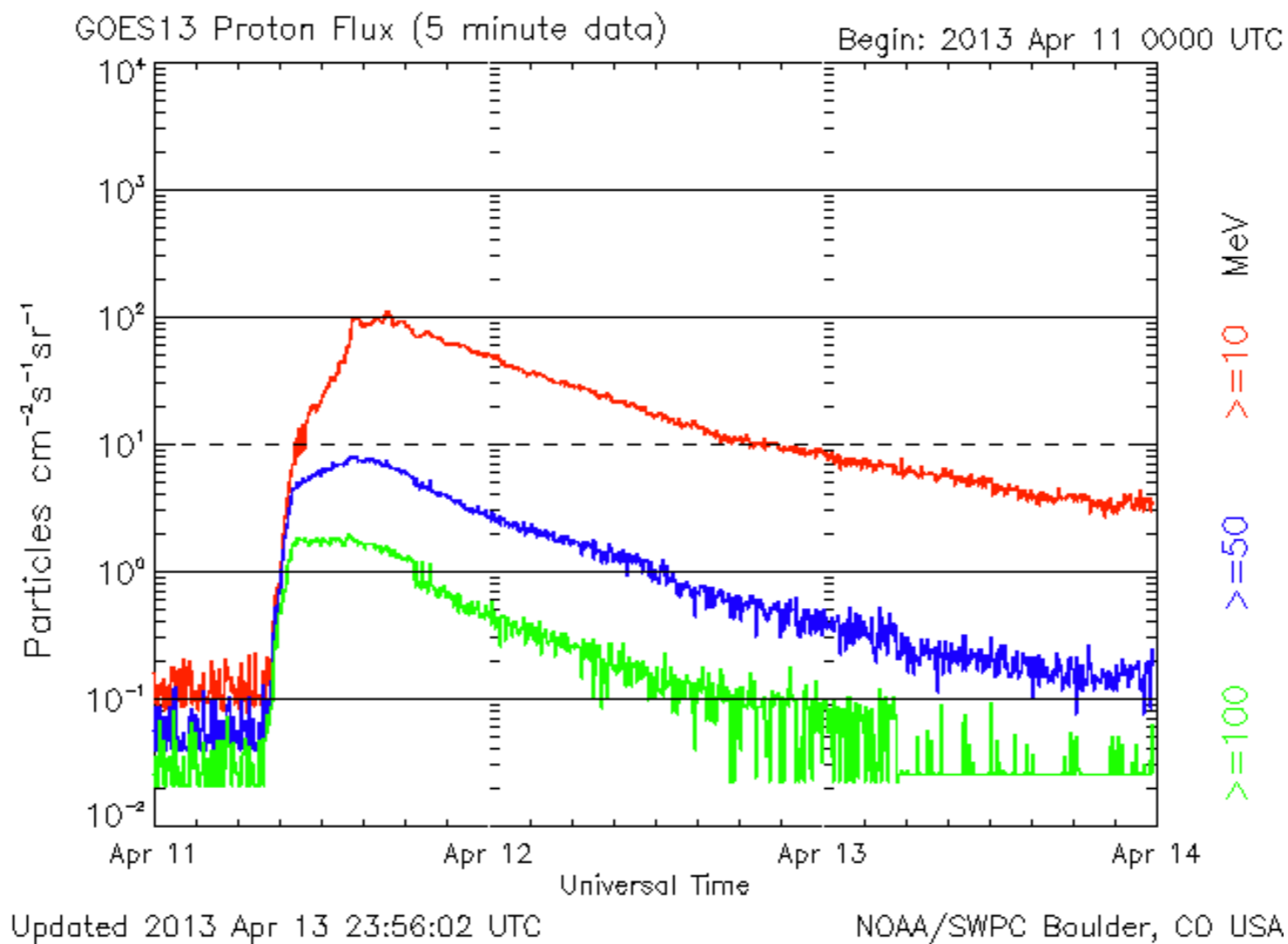
- During or just after an **X-flare**



PRESTO

A presto alert needs to be sent ASAP:

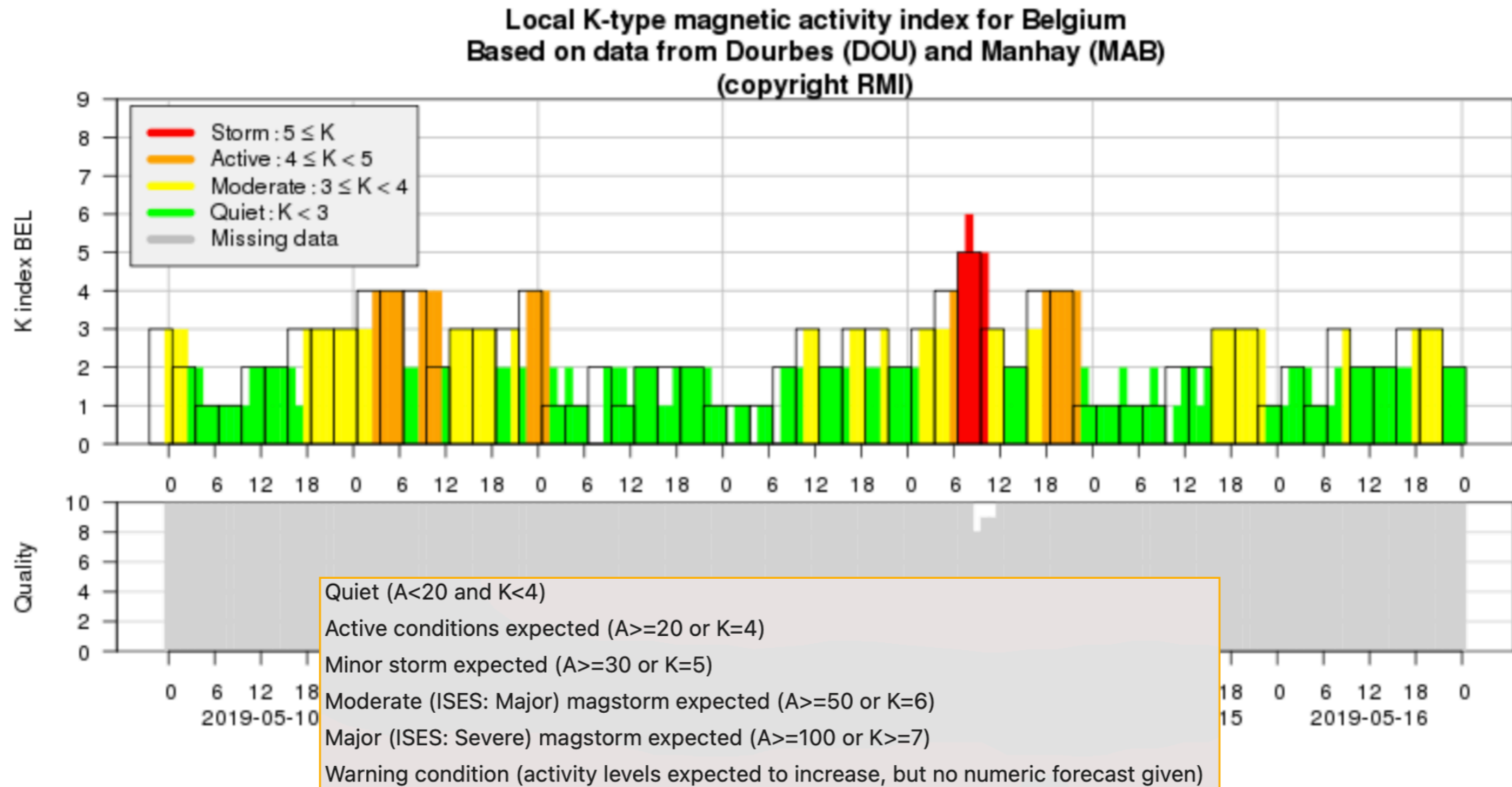
- In case of a **proton event**, i.e., proton flux ≥ 10 pfu (10 MeV particles)



PRESTO

A presto alert needs to be sent ASAP:

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

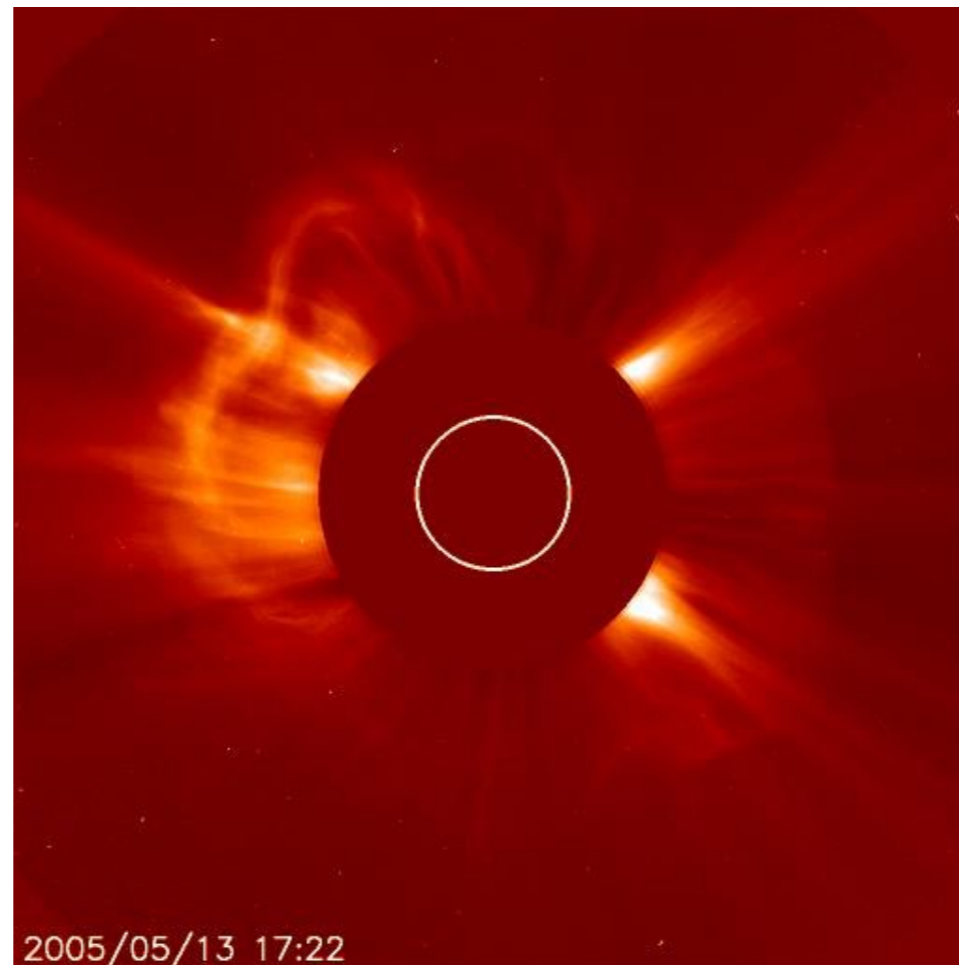


PRESTO

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.

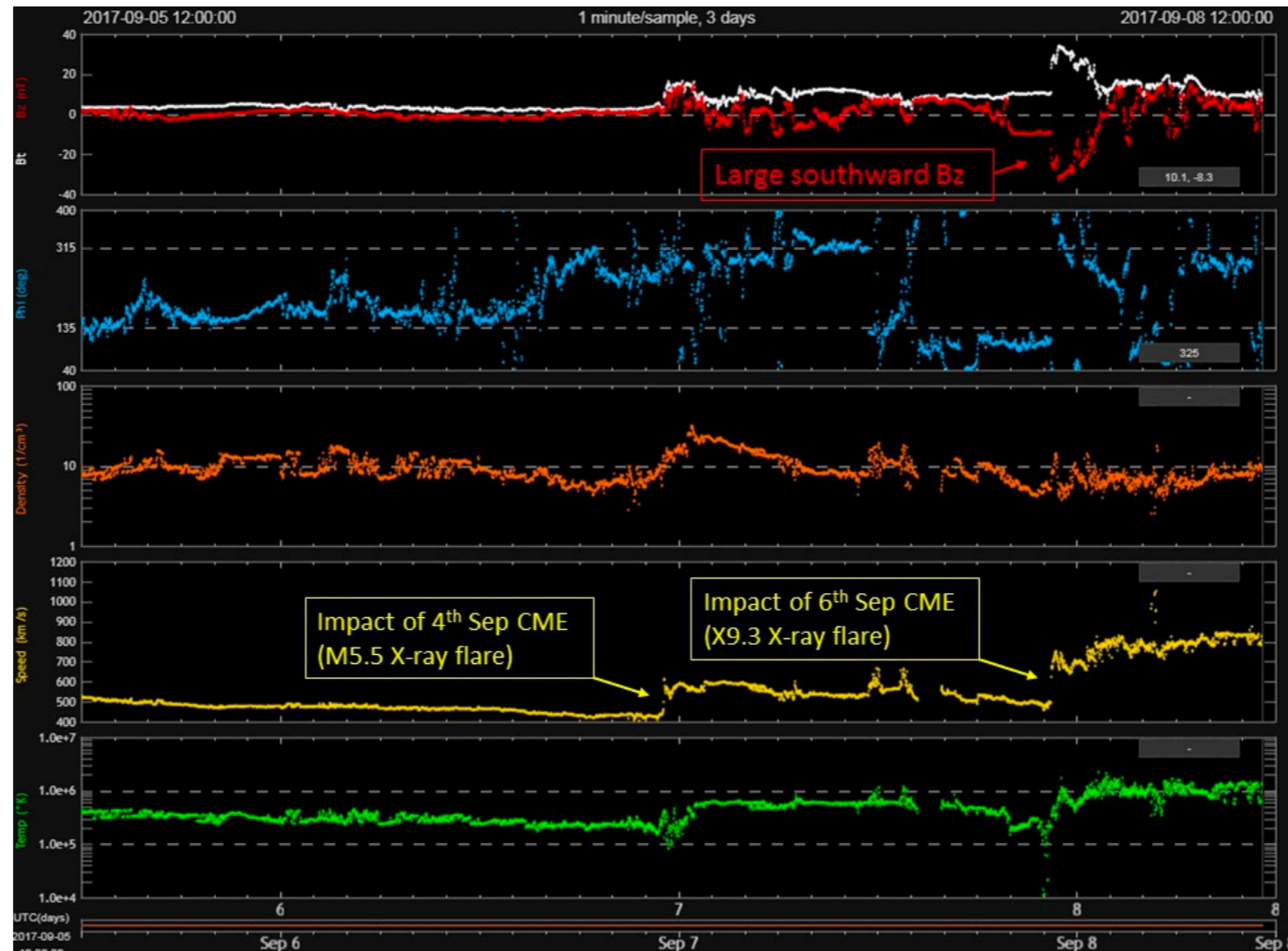
Try to find out whether the halo CME is front-sided or not, by locating the source.



PRESTO

A presto alert needs to be sent ASAP:

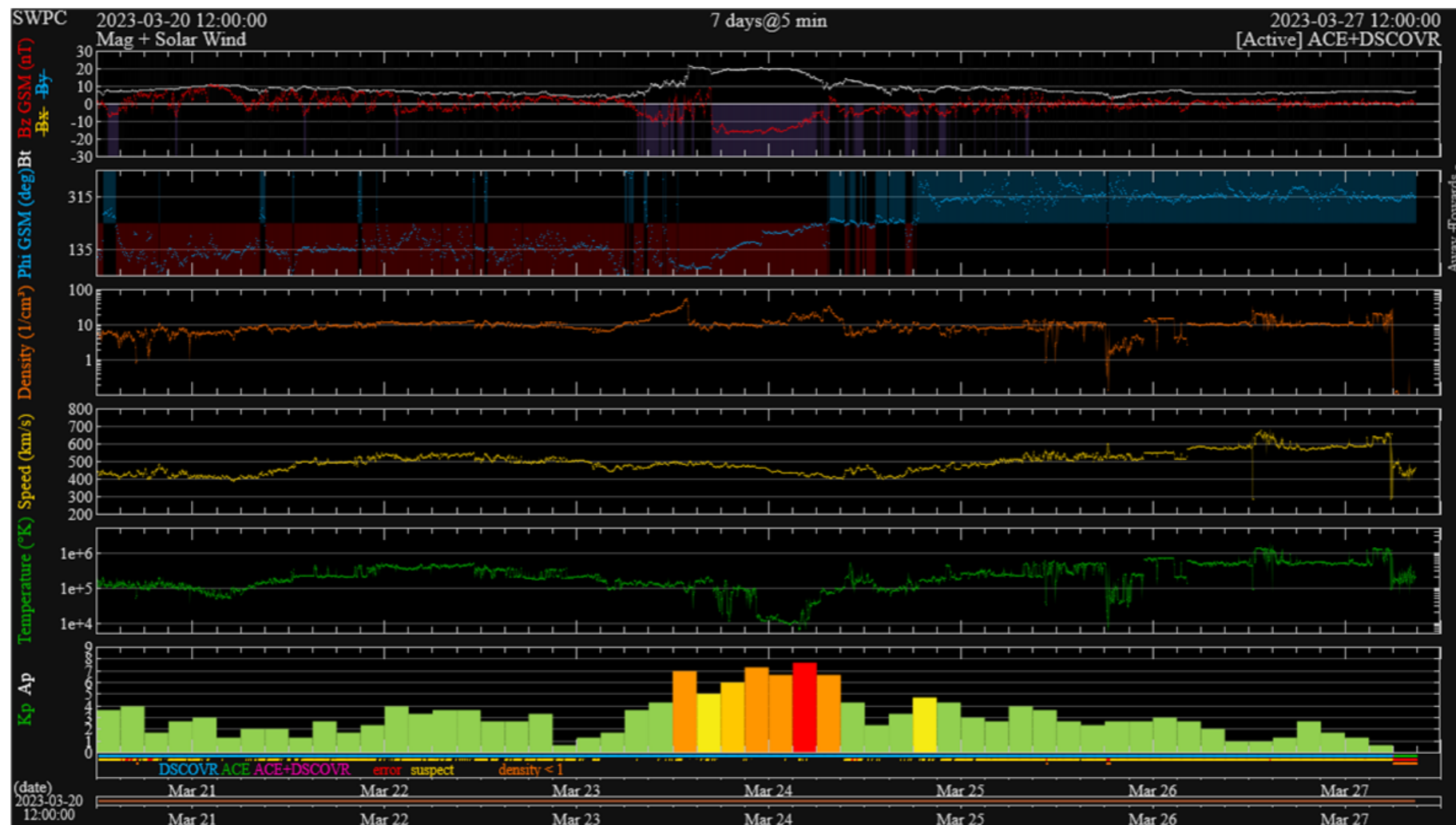
- In case you observe a **fast forward shock** in the solar wind speed.
($\Delta v > 20 \text{ km/s}$, $\text{ratio}_n > 1.2$ and $\text{ratio}_B > 1.2$)



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

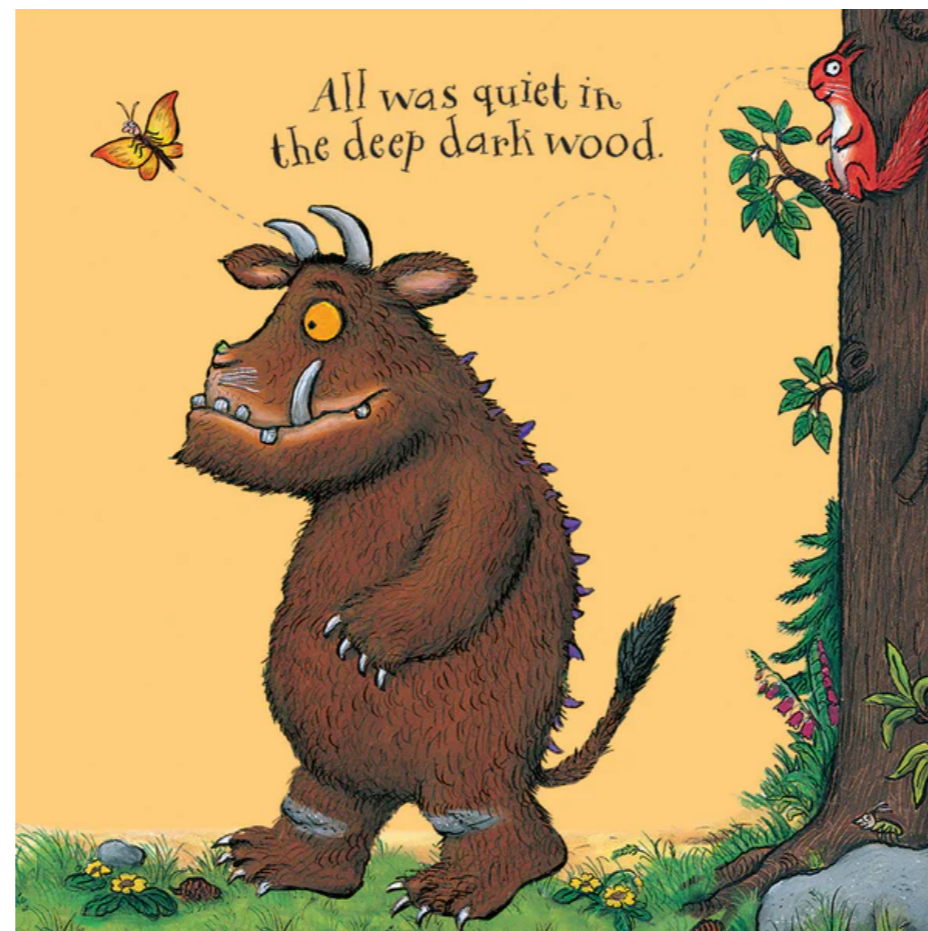
A **shock** in the solar wind at 19:54 UTC on 24 September marks the **arrival** of the ICME from 21 September (and probably that of the 22 September too). The **speed** jumped from 315 km/s to 440 km/s and the interplanetary **magnetic field** from 7 to 19 nT. The speed later reached 470 km/s and the 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: 2023-10-04T12:48:04Z

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

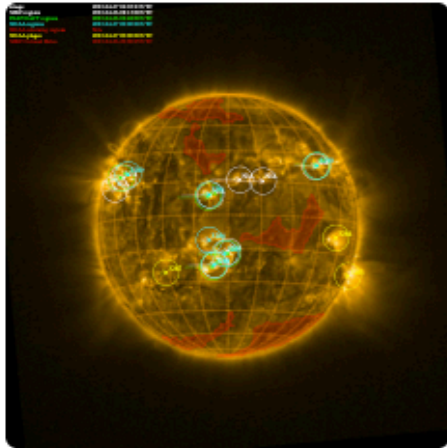
2023-04-27 02:51 B8 flare

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 reach 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 : 1 Mar 2024.

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Table of Content | 1.Wuthering Heig... | 2.Review of spac... | 3.PROBA2 Observa... | 4.Noticeable Sol... | 5.International ... | 6.G geomagnetic Ob... | 7.The SIDC 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 SIDC space weather briefing
8. Review of Ionospheric Activity
9. Courses, lectures and presentations



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