STCE Newsletter

5 Aug 2024 - 11 Aug 2024

Published by the STCE - this issue : 16 Aug 2024. Available online at https://www.stce.be/newsletter/ .

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.

Final Editor : Petra Vanlommel
Contact : R. Van der Linden, General Coordinator STCE, Ringlaan - 3 - Avenue Circulaire, 1180 Brussels, Belgium

1. Job opening - Scientific Collaborator in Space Weather at ROB

The Royal Observatory of Belgium seeks a new scientific collaborator for its space weather activity to further develop and support its space weather services.

The successful candidate will contribute to the development and provision of space weather services, particularly in the development and coordination of the ESA S2P projects (https://swe.ssa.esa.int). The successful candidate will be involved in operational surveillance and forecasting of space weather, including on-call operation and shift work, and also contribute to the further development of these forecasting activities. The collaborator will work as part of the ROB/SIDC (Solar Influences Data analysis Centre, https://www.sidc.be), a leading space weather forecast center at the European level.

How to apply: https://www.astro.oma.be/common/pdf/jobs/202406-SpaceWeatherCollaborator_EN.pdf

Dateline: September 01, 2024

Candidates can contact Jennifer O'Hara (jennifer.ohara@oma.be) for additional information

ROYAL OBSERVATORY OF BELGIUM

SOLAR-TERRESTRIAL CENTRE OF EXCELLENCE

2. Review of space weather

Solar Active Regions (ARs) and flares

Solar flaring activity was at moderate to high levels over the week. There was a total of 18 numbered active regions observed on the visible solar disk over the week. Two of the X-class flares were recorded on August 05. The strongest of which was an X1.7 flare peaking 13:39 UTC, which originated from beyond the west solar limb. The second was an X1.1 flare with peak time 15:27 UTC associated with NOAA AR3780. NOAA AR 3780 rotated onto the disk on August 04 and was one of the largest and most complex regions of the week (magnetic field configuration beta-gamma-delta) and also produced M-class flares throughout the week. NOAA AR 3777 produced the third X-class flare with a peak time of 19:35 UTC on August 08. This region and NOAA AR 3774 increased in complexity during the middle of the week and were responsible for multiple M-class flared between August 07 and August 10. Other regions (including NOAA AR 3781, 3782) also contributed to the low-level M-class flaring activity over the week.

Coronal mass ejections

Multiple Coronal Mass Ejections (CMEs) were observed during the week. Of these, five were analysed to have possible Earth-directed components with arrival time predictions for the 5 events ranging between

early on August 10 and early on August 13. Two of the CMEs were observed on August 07, first seen in LASCO-C2 data at 14:36 UTC and 19:00 UTC, respectively. However it was difficult to disentangle these eruptions from additional far side events.
A halo CME was observed on August 08 seen in LASCO-C2 data from 19:48 UTC, associated with the X1.3 flare from NOAA AR3777. And two further CMEs were predicted to have glancing blows at Earth, first seen in LASCO-C2 data at 21:45 UTC on August 09 and 02:54 UTC on August 10. These were associated with M4.5 and M5.3 flares, respectively.

Coronal Holes

A small negative polarity coronal hole and a small positive polarity coronal hole, both of which were in the northern hemisphere and appeared patchy, began to transit the central meridian on August 05 and 07, respectively.

Proton flux levels near Earth

The greater than 10 MeV GOES proton flux was below the 10pfu threshold for the entire week. There was a small increase observed on August 05, related to the X1.7 flare but this quickly returned to background levels and remained below the threshold.

Electron fluxes at GEO

The greater than 2 MeV electron flux remained below the 1000 pfu threshold. The 24h electron fluence was at nominal levels.

Solar wind

The solar wind conditions reflected an ICME passage on August 04 and 05, likely from the glancing blow predicted from the August 01 CME. The interplanetary magnetic field reached 21 nT with a minimum value of -18nT. The solar wind speed reached a maximum of around 545 km/s around midday on August 05. Between August 06 and 09, the solar wind reflected a return to a slow solar wind regime. On August 10 a small jump in the interplanetary magnetic field strength from 5 to 10 nT and a jump in the solar wind speed from 350 km/s to 410 km/s indicated another ICME arrival. During August 10 and 11 (until 12:00 UTC) the interplanetary magnetic field strength and solar wind speed continued to gradually increase reaching values of 21nT and 480 km/s, respectively. This was likely due to the combined influence of the August 07 and 08 CMEs. The Bz component was mostly positive at this time with only short intervals of negative Bz (with minimum Bz of -14nT).

Geomagnetism

Geomagnetic conditions reached major storm conditions on August 04 (NOAA Kp 7- and local K Bel 5), due to the ICME passage. Between August 06 and 10, the geomagnetic conditions returned to quiet to unsettled levels. On August 11, minor storm conditions were reached (NOAA Kp 5- and Local K Bel 5) due to the ICME influence and periods of negative Bz.

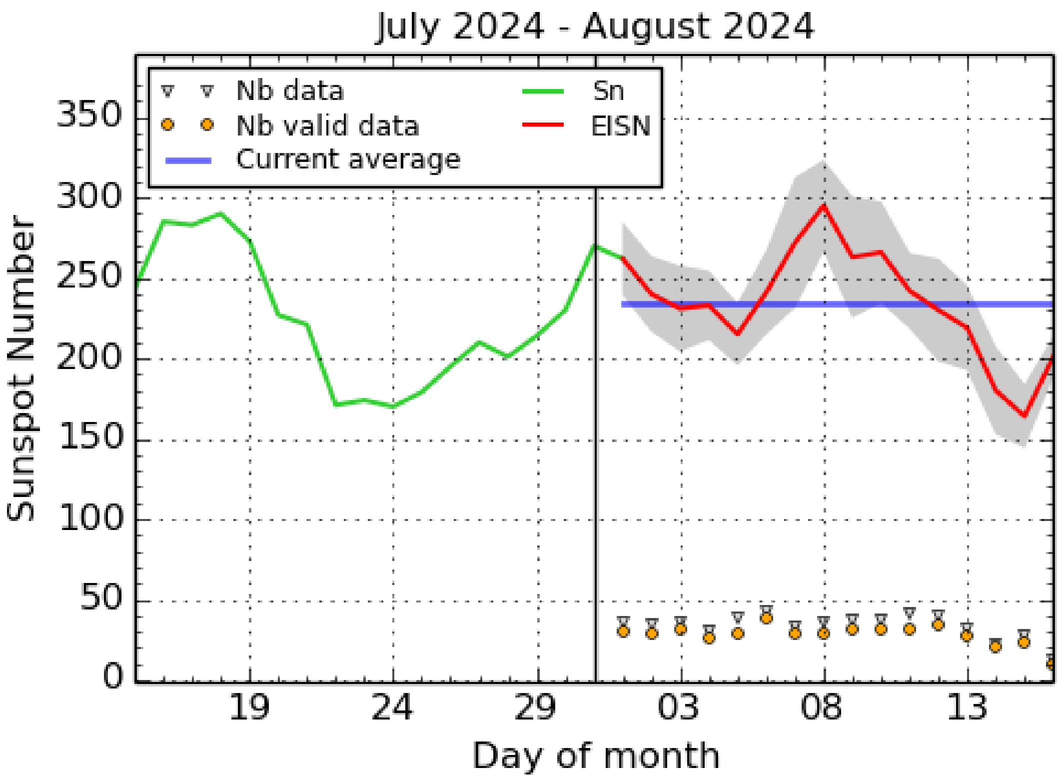
3. Noticeable Solar Events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
05	0222	0231	0235	S11E63	M1.1	SF		II/2		3780
05	0513	0523	0527	S11E62	M6.1	1N		III/3VII/3II/3		3780
05	0949	1001	1009		M1.7					
05	1324	1340	1354	S0E0	X1.7	SF		III/1II/2VI/2		3767
05	1518	1527	1532	S8E55	X1.1	2		V/3II/2		3780
05	1756	1802	1809		M1.0					
05	1820	1837	1842	S12E60	M1.2	1F		III/2VI/2		3780
06	0250	0303	0308		M1.1					3781

07	0221	0230	0238	S8W18	M1.8	1N	II/3I/2 3	3774
07	0452	0457	0501	N13E53	M1.1	1N	I/2	3781
07	1330	1350	1358		M4.5		II/2II/3I/2 3	3774
07	1831	1854	1908	S7W7	M5.0	2B	II/2I/2 7	3777
08	0049	0106	0115	S13W3	M2.1	SF	I/2	3777
08	0327	0441	0509	S3W15	M1.3	SF	I/2II/2TM/1	3777
08	1124	1142	1152	S8W19	M1.6	1N		3777
08	1256	1300	1304	N14E35	M1.0	SF		3781
08	1336	1343	1352	N15E34	M1.5	S		3777
08	1901	1935	1957	S3W23	X1.3	2B	II/2I/2 1	3777
08	2246	2251	2256		M1.2			3780
09	1041	1117	1124	S9W28	M1.2	S		3777
09	1156	1206	1213	S8E8	M1.4	1F	III/3II/2	3780
09	1238	1243	1251	N15E22	M1.0	SF		3781
09	1251	1259	1303		M1.0			3780
09	2027	2037	2100	S9W55	M1.0	S	III/2	3779
09	2110	2123	2150		M4.5		III/2VI/2II/2	3774
09	2343	2350	2355	S12E2	M1.1	SN	IV/1III/2	3780
10	0052	0102	0107	N11E64	M1.3	SF	VI/3	3780
10	0214	0237	0252	S10E1	M5.3	2N	VI/3	3780
10	0403	0411	0421	S13W3	M1.6	SF		3780
10	1511	1516	1520	N2E34	M1.2	SN		3782
11	0022	0031	0046		M1.0		VI/2	3780
11	0523	0528	0537	S14W16	M1.6	1N		3780
10	1405	1439	1510	S13W4	M1.3	SF		3780
11	1957	2018	2036	S9W58	M1.6	1F		3777
11	2340	2358	0026		M1.2			3780

LOC: approximate heliographic location
XRAY: X-ray flare class
OP: optical flare class
10CM: peak 10 cm radio flux
TYPE: radio burst type
Cat: Catania sunspot group number
NOAA: NOAA active region number

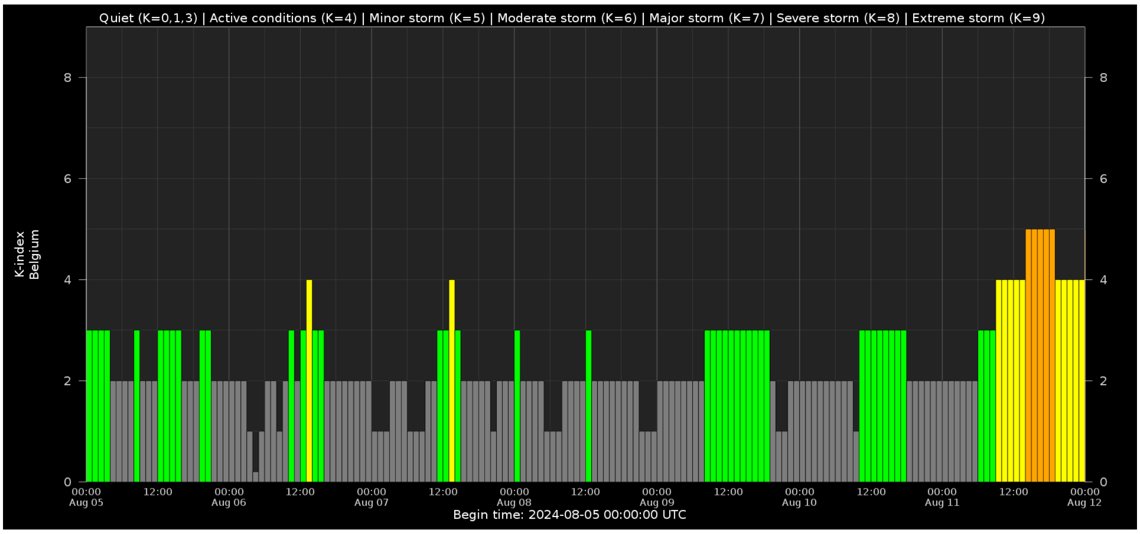
4. International Sunspot Number by SILSO



SILSO graphics (http://sidc.be/silso) Royal Observatory of Belgium, 2024 August 16

The daily Estimated International Sunspot Number (EISN, red curve with shaded error) derived by a simplified method from real-time data from the worldwide SILSO network. It extends the official Sunspot Number from the full processing of the preceding month (green line), a few days more than one solar rotation. The horizontal blue line shows the current monthly average. The yellow dots give the number of stations that provided valid data. Valid data are used to calculate the EISN. The triangle gives the number of stations providing data. When a triangle and a yellow dot coincide, it means that all the data is used to calculate the EISN of that day.

5. Geomagnetic Observations in Belgium



Local K-type magnetic activity index for Belgium based on data from Dourbes (DOU) and Manhay (MAB). Comparing the data from both measurement stations allows to reliably remove outliers from the magnetic data. At the same time the operational service availability is improved: whenever data from one observatory is not available, the single-station index obtained from the other can be used as a fallback system.
Both the two-station index and the single station indices are available here: http://ionosphere.meteo.be/geomagnetism/K_BEL/

6. The SIDC Space Weather Briefing

The forecaster on duty presented the SIDC briefing that gives an overview of space weather from Aug 4 to 11.
The pdf of the presentation can be found here: https://www.stce.be/briefings/20240812_SWbriefing.pdf

SIDC Space Weather Briefing

04 August 2024-11 August 2024

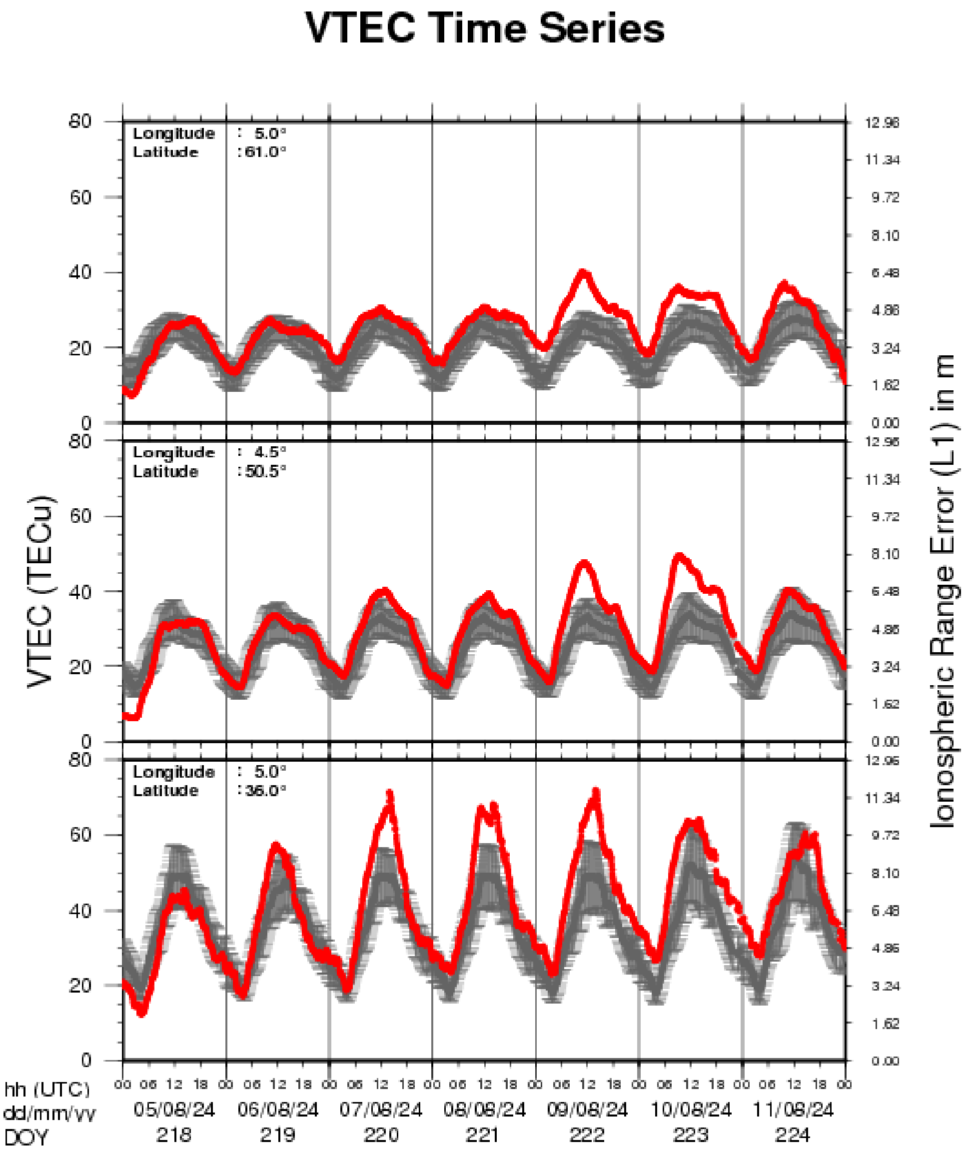
Jennifer O'Hara

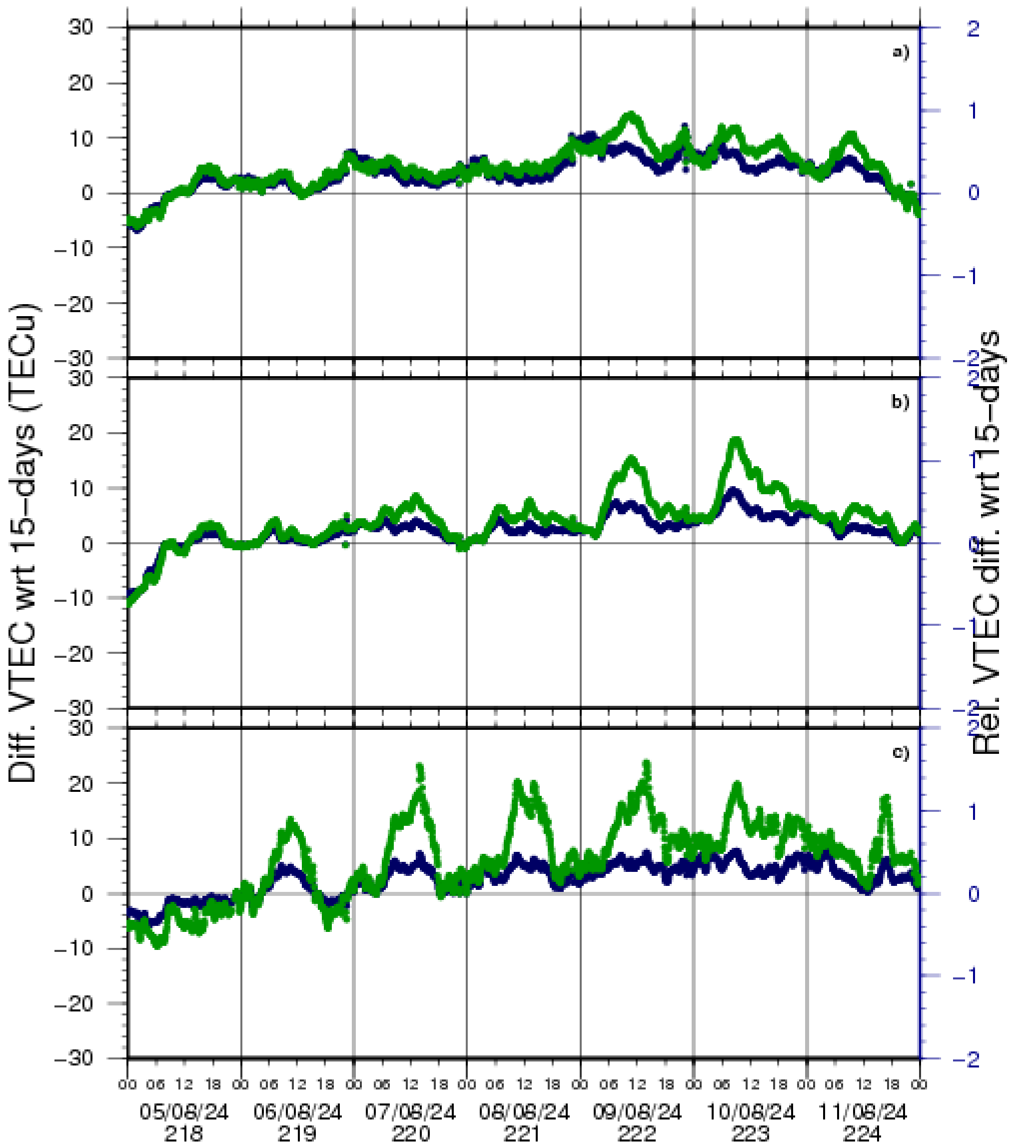
& the SIDC forecaster team

Royal Observatory *of* Belgium

Solar Influences
Data analysis Centre
www.sidc.be

7. Review of Ionospheric Activity





VTEC time series at 3 locations in Europe from 5 Aug 2024 till 11 Aug 2024

The top figure shows the time evolution of the Vertical Total Electron Content (VTEC) (in red) during the last week at three locations:
a) in the northern part of Europe(N 61deg E 5deg)
b) above Brussels(N 50.5deg, E 4.5 deg)
c) in the southern part of Europe(N 36 deg, E 5deg)
This top figure also shows (in grey) the normal ionospheric behaviour expected based on the median VTEC from the 15 previous days.

The time series below shows the VTEC difference (in green) and relative difference (in blue) with respect to the median of the last 15 days in the North, Mid (above Brussels) and South of Europe. It thus illustrates the VTEC deviation from normal quiet behaviour.

The VTEC is expressed in TECu (with TECu=10^16 electrons per square meter) and is directly related to the signal propagation delay due to the ionosphere (in figure: delay on GPS L1 frequency).

The Sun's radiation ionizes the Earth's upper atmosphere, the ionosphere, located from about 60km to 1000km above the Earth's surface.The ionization process in the ionosphere produces ions and free electrons. These electrons perturb the propagation of the GNSS (Global Navigation Satellite System) signals by inducing a so-called ionospheric delay.

See http://stce.be/newsletter/GNSS_final.pdf for some more explanations; for more information, see https://gnss.be/SpaceWeather

8. Courses and events

Courses and presentations with the Sun-Space-Earth system and Space Weather as the main theme. We provide occasions to get submerged in our world through educational, informative and instructive activities.
* Aug 25, public lecture 'Help! Het stormt in de ruimte!?', ATB Natuurvrienden, Aarschot, Belgium
* Sep 27, STCE at the Wisenight Science festival in the Planetarium, Brussel, https://wisenight.eu/
* Sep 30 - Oct 3, STCE Space Weather Introductory Course, Brussels, Belgium - Registrations are open https://events.spacepole.be/event/204/
* Nov 25 - 27, STCE course: Space Weather impacts on ionospheric wave propagation, focus on GNSS and HF, Brussels, Belgium - Registrations are open, https://events.spacepole.be/event/206/
* Dec 5-6, STCE Course Space Weather impacts on aviation, Brussels, Belgium - Registrations are open, https://events.spacepole.be/event/205/

To register for a course or lecture, check the page of the STCE Space Weather Education Center: https://www.stce.be/SWEC
If you want your event in the STCE newsletter, contact us: stce_coordination at stce.be