

STCE Newsletter

1 Jul 2024 - 7 Jul 2024



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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.

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1. The STCE in 2022

The STCE Annual Report 2022 is now available at <https://www.stce.be/annualReport>

It is a compilation of the activities done in 2022 within the frame of the Solar-Terrestrial Centre of Excellence (STCE). This report continues the style from the previous editions. Hence, as it is targeting a more general public, it presents only a selection of the 2022-activities in easy-to-digest summaries.

These bite-sized articles emphasize the intense collaboration between the institutes at the Space Pole, as well as with our external partners. Aside the usual topics such as the space weather highlights, public outreach, and listings with conference talks and science papers, it covers also contributions on e.g. the Open Doors of 24-25 September, the interactions between the plasmasphere and the radiation belts, the ionospheric effects of the Hunga volcano eruption, the Starlink incident, the forecasting of travelling ionospheric disturbances,... and much more.

We wish you an enjoyable reading experience!



2. e-SWAN newsletter



Dear E-SWAN members,

We are happy to welcome the new E-SWAN Space Weather Policies and Plans working group co-chair Elena Driver. The SW2P (chair: Marina Skender) met on 29 May to discuss how to refine the conducted survey for the future next level survey; how to better motivate respondents to take the survey; and how to advertise this survey that will be presented at the ESWW 2024.

A call was launched for participation in a new committee to work out a criteria and a procedure to name large space weather events, like the Mother's Day event of last month. The E-SWAN Executive Board and its Education and Outreach Committee (EOCOM) proposed to COSPAR, ISES and WMO to initiate a collaborative effort to establish a naming convention for large space weather and space climate events, similar to the approach commonly employed by meteorological agencies for extreme meteorological events like tropical storms. We received positive reactions and a first joint discussion is planned during the COSPAR meeting in a few weeks.

The E-SWAN Executive Board (EB) met on 3 July with the Users Engagement working group (USENG). Veronika Haberle (chair) and Balazs Asztalos (co-chair) presented the paper they wrote summarizing the USENG TDM held in Toulouse (ESWW2023) and its outcome. The initiative was enthusiastically welcomed by the EB who will support the submission of the paper to the JSWSC.

Finally, I want to draw your attention to the recently published paper by Mamoru Ishii et al. about global coordination in SW: <https://doi.org/10.1016/j.asr.2024.06.017>
 Online version: <https://eswan.eu/index.php/newsletter/latest-newsletter>
 Enjoy reading
 Stefaan Poedts,
 President of E-SWAN

3. Review of space weather

Solar Active Regions (ARs) and flares

Solar flaring activity varied between low to moderate. There were 24 active regions visible and 38 C-class flares and 10 M-class flares were recorded. The strongest flare being a M2-flare with peak time 11:02 UTC on July 01, associated with NOAA AR 3730.

Coronal mass ejections

No Earth-directed Coronal Mass Ejections (CMEs) have been seen in coronagraph images.

Coronal Holes

A small positive polarity high-latitude coronal hole crossed the central meridian on Jul 02. The solar wind parameters at L1 were not influenced by this coronal hole. A small positive polarity low latitude coronal hole crossed the central meridian on Jul 04 but it decayed before any high-speed stream emanating from it could impact the Earth. A patchy equatorial positive polarity coronal hole crossed the central meridian on Jul 07.

Proton flux levels

The greater than 10 MeV GOES proton flux remained at nominal levels.

Electron fluxes at GEO

The greater than 2 MeV electron flux measured by GOES-16 was at background levels throughout the week, except for a short period between 17:50 and 19:10 UTC on Jul 03. The 24h electron fluence was at nominal levels.

Solar wind at L1

At the beginning of the week, the solar wind was enhanced under the waning influence on an ICME associated with a CME that erupted on the Sun on Jun 25. For the rest of the week, the solar wind was slow with a speed between 307 km/s and 595 km/s. The interplanetary magnetic (IMF) varied between 0.38 nT and 11.88 nT, with a minimum Bz value of -9 nT. The IMF was mainly directed away from the Sun.

Geomagnetism

The geomagnetic conditions over the past week were quiet to unsettled, both globally and locally (Kp 1-3 and K Bel 1-3) with locally some active periods locally (K Bel 4) on June 30.

4. Noticeable Solar Events

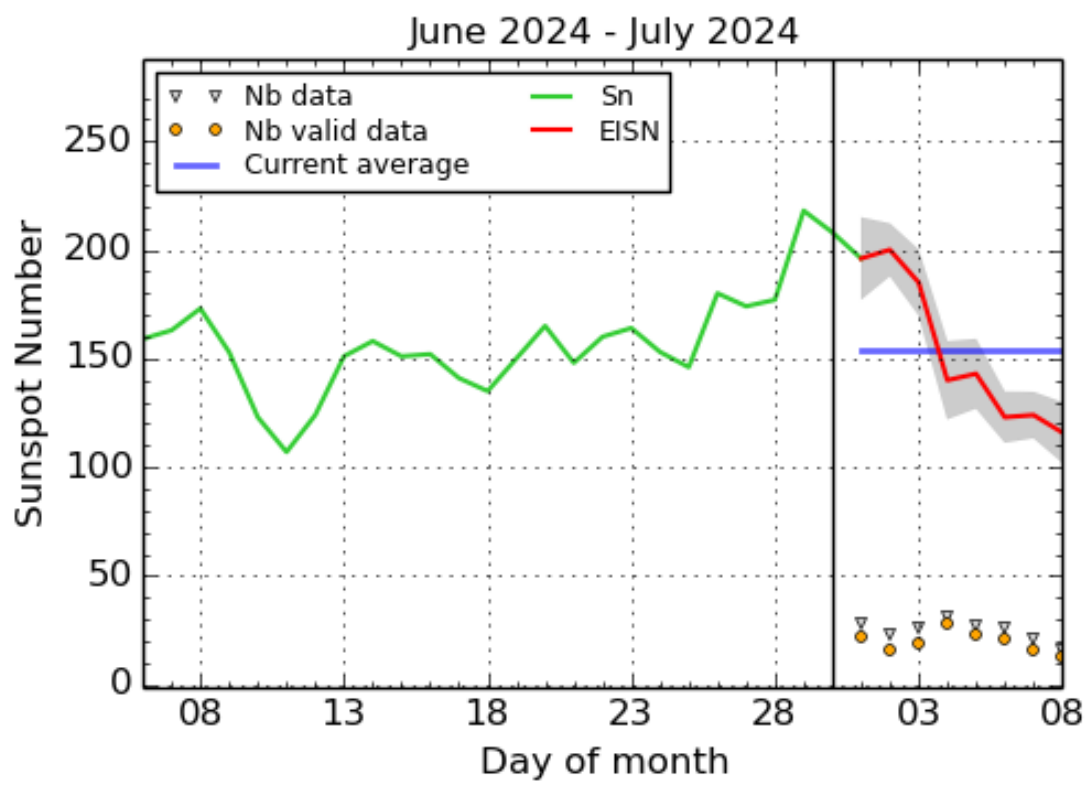
DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
01	1051	1102	1107	S19W38	M2.1	1N		III/2	75	3730
03	0729	0741	0755	S3W10	M1.5	1F		III/1VI/2II/374		3729
04	1406	1425	1443	S20W73	M1.0	SF		II/2		3723
04	1954	2005	2013		M1.4			III/2II/1		3730
06	2252	2315	2335		M1.0				85	3738
07	1938	1956	2010		M1.0					

07	2114	2127	2142	M1.3	III/1
07	2142	2151	2154	M1.1	
07	2154	2159	2204	M1.4	
07	2204	2230	2245	M2.4	

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

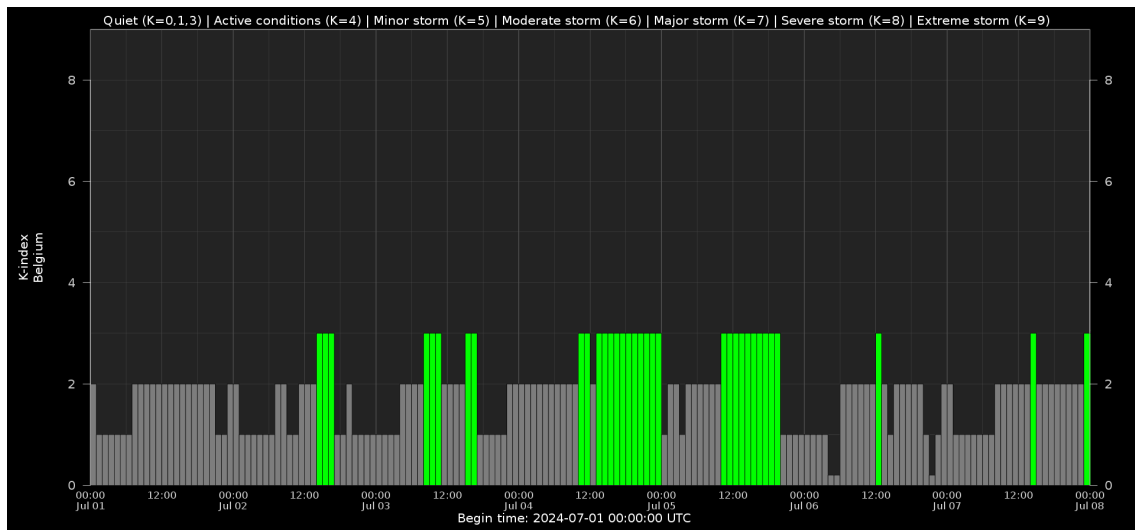
5. International Sunspot Number by SILSO



SILSO graphics (<http://sidc.be/silso>) Royal Observatory of Belgium, 2024 July 8

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.

6. 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/

7. The SIDC Space Weather Briefing

The forecaster on duty presented the SIDC briefing that gives an overview of space weather from June 30 to July 7.

The pdf of the presentation can be found here: https://www.stce.be/briefings/20240708_SWbriefing.pdf

SIDC Space Weather Briefing

30 June 2024-07 July 2024

Vansintjan Robbe

& the SIDC forecaster team



Solar Influences
Data analysis Centre
www.sidc.be

8. PROBA2 Observations (1 Jul 2024 - 7 Jul 2024)

Solar Activity

Solar flare activity fluctuated from low to moderate during the week.

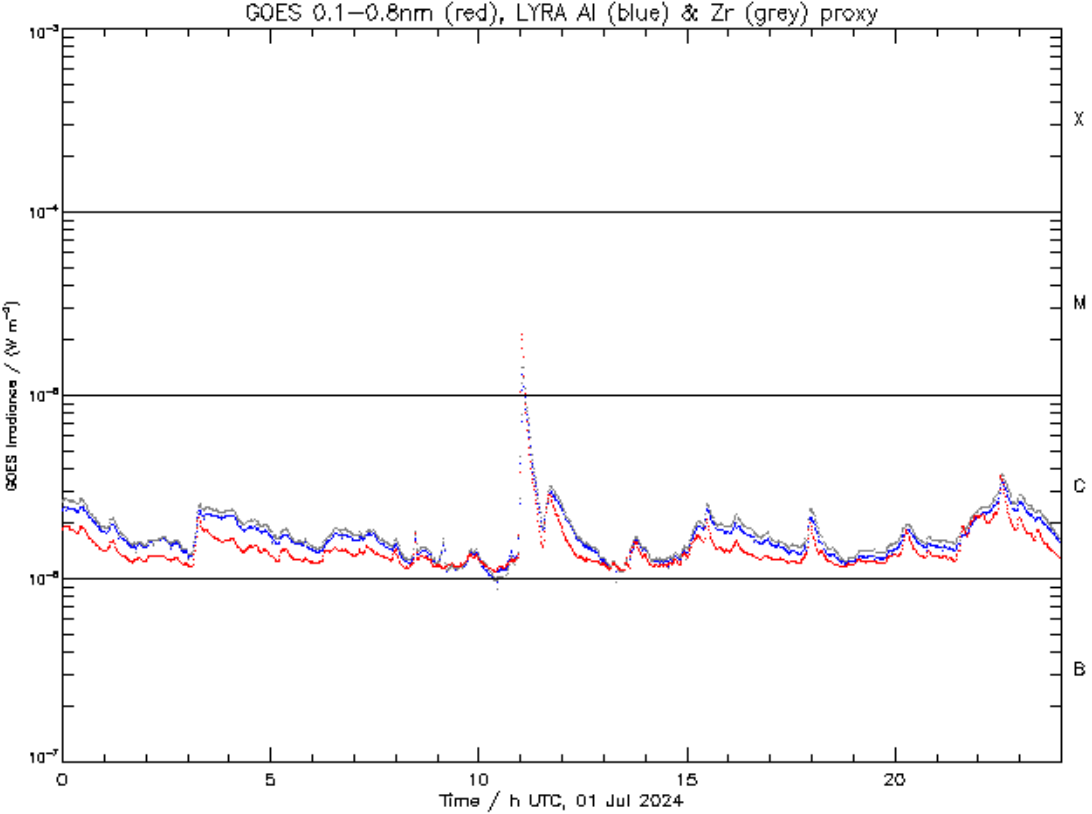
In order to view the activity of this week in more detail, we suggest to go to the following website from which all the daily (normal and difference) movies can be accessed: <https://proba2.oma.be/ssa>
This page also lists the recorded flaring events.

A weekly overview movie (SWAP week 745) can be found here: https://proba2.sidc.be/swap/data/mpg/movies/weekly_movies/weekly_movie_2024_07_01.mp4.

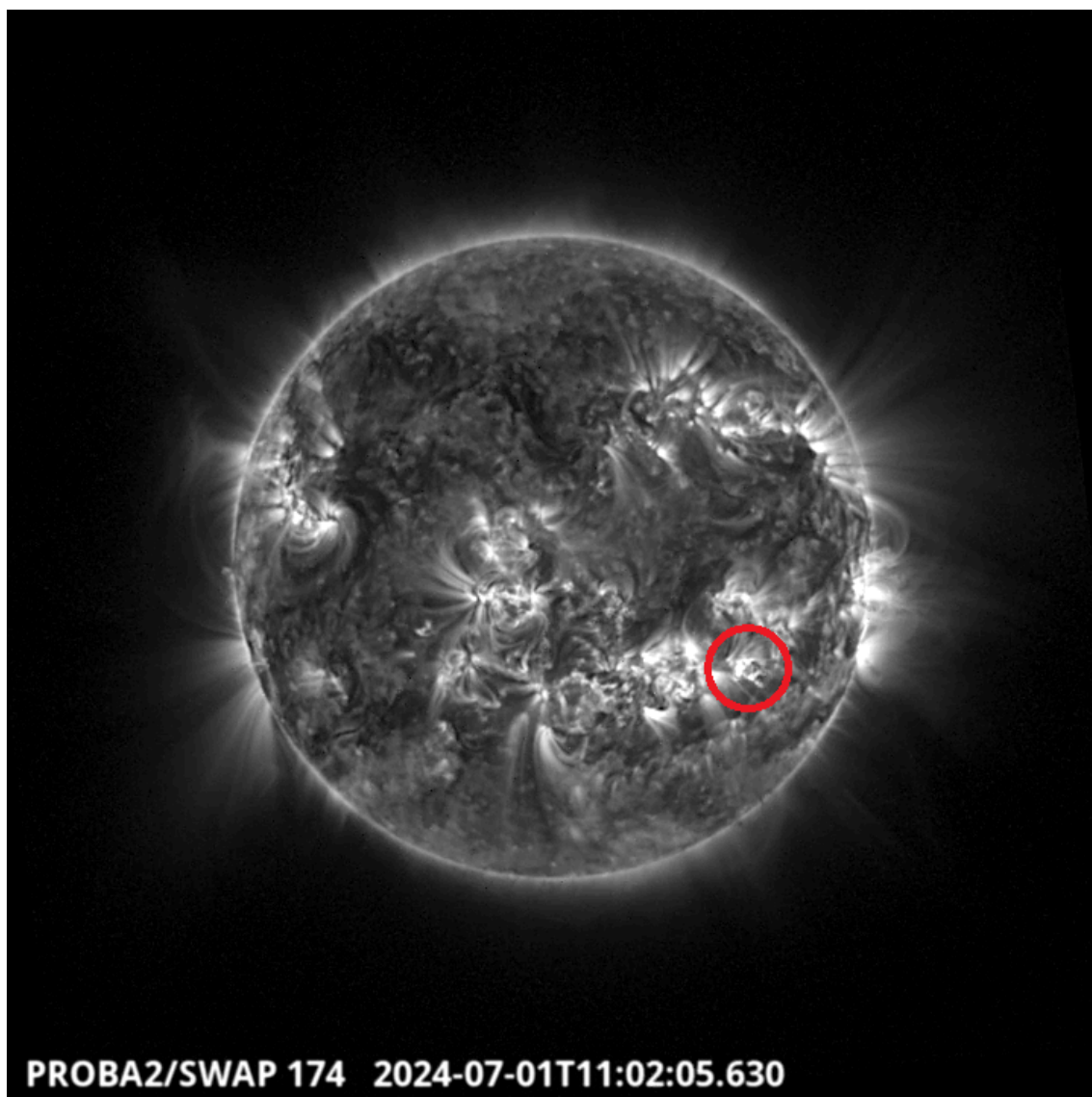
Details about some of this week's events can be found further below.

If any of the linked movies are unavailable they can be found in the P2SC movie repository here: <https://proba2.oma.be/swap/data/mpg/movies/>.

Monday July 01



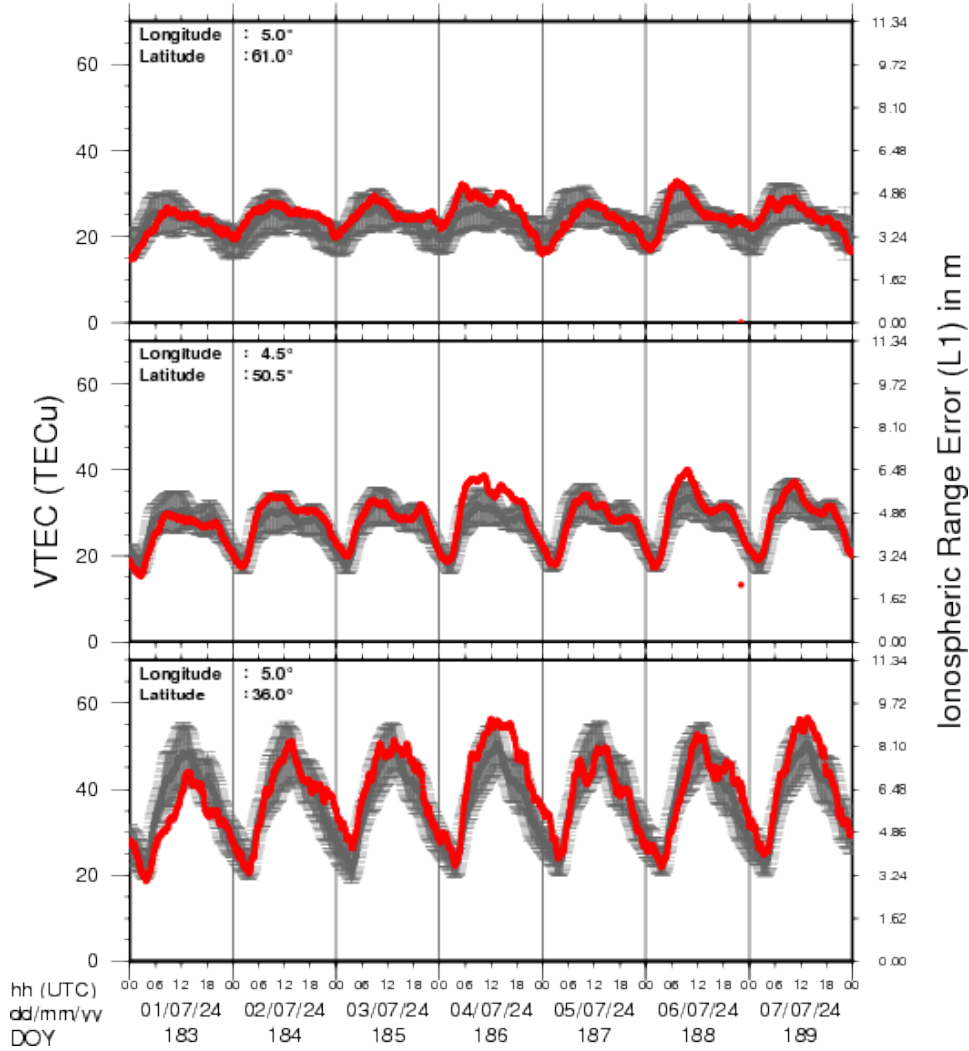
ROB/SIDC, Brussels, Belgium

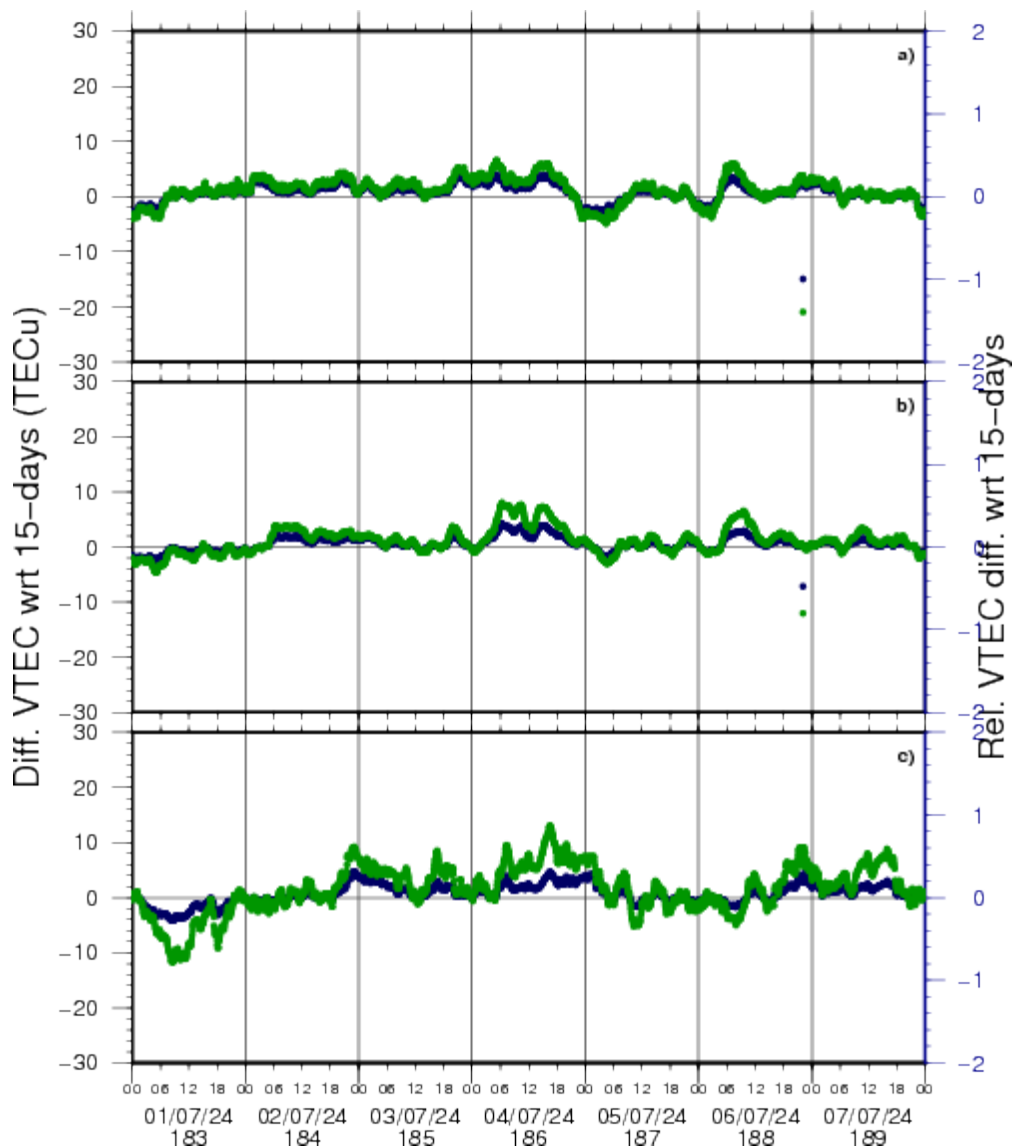


The largest flare of this week with a clear source region was an M2.1, and it was observed by LYRA (top panel) and SWAP (bottom panel). The flare peaked on 2024-Jul-01 at 11:02 UT. It originated from NOAA AR3730 encircled in red and was associated with a narrow CME. Find a SWAP movie of the event here: https://proba2.sidc.be/swap/movies/20240701_swap_movie.mp4.

9. Review of Ionospheric Activity

VTEC Time Series





VTEC time series at 3 locations in Europe from 1 Jul 2024 till 7 Jul 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 $\text{TECu} = 10^{16}$ 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>

10. Lectures and courses

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.

* 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@stce.be

