STCE Newsletter

21 Apr 2025 - 27 Apr 2025

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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. Call for Abstracts: Session on Communicating Science Through Aurora

Dear Colleagues,

We are excited to invite you to submit abstracts for the E-SWAN (https://eswan.eu/) session titled "Communicating Science Through Aurora: Engaging the Public in Space Weather", at the upcoming European Space Weather Week 2025 (https://esww.aeronomie.be/).

This session (CD9) aims to explore how we can use the aurora to bridge the gap between complex scientific topics and public understanding. We are seeking contributions from scientists, educators, and outreach professionals who are using the aurora as a tool for public engagement. Topics may include innovative educational initiatives, public outreach programs, citizen science projects, and the role of artistic interpretations in science communication.

The aurora's beauty and cultural significance provide a powerful vehicle for increasing awareness of space weather's relevance to modern society. Through presentations and discussions, we hope to highlight effective methods, challenges, and new opportunities for leveraging this natural wonder to inspire and educate diverse audiences.

If you have an initiative or project that could contribute to this session, we invite you to submit your abstract by 15 May 2025 here (https://esww.aeronomie.be/calls/call-for-abstracts).

We look forward to hearing about your experiences and sharing ideas to strengthen our collective efforts in space weather communication.

Best regards,

The conveners
Lenka ZYCHOVA; Christine VERBEKE; Laure LEFEVRE

2. Review of solar and geomagnetic activity

WEEK 1269 from 2025 Apr 21

Solar Active Regions and flares

Fifteen (15) active regions (ARs) were observed on the side of the Sun facing the Earth, ranging from NOAA 4060 (SIDC 450) to NOAA 4075 (SIDC 458). We observed 2 M-class flares and numerous C-class flares (the X-ray background was at the C level).
The strongest flare of the week was an M1.9 from SIDC sunspot group 473/NOAA AR 4062, peaking at 18:37 UTC on 21 April.

Coronal mass ejections

Numerous CMEs were observed during the week, but no halo, nor one with a clear Earth directed component.

Coronal Holes

A large recurrent positive polarity coronal hole (SIDC Coronal Hole 104) covered most of the southern hemisphere during the week. Additionally, there were three smaller ones, two positive and one with negative polarity in the northern hemisphere.

Proton flux levels

The greater than 10 MeV proton flux was below the threshold level over the week.

Electron fluxes at GEO

The greater than 2 MeV electron flux measured by GOES 18-19 was below the threshold every day, but increasing, until 27 April at 16:00 UTC when it crossed the threshold. It decreased below the threshold before midnight of the same day.
The 24-hour electron fluence was at normal levels at the beginning of the week, and reached moderate levels on 26 April.

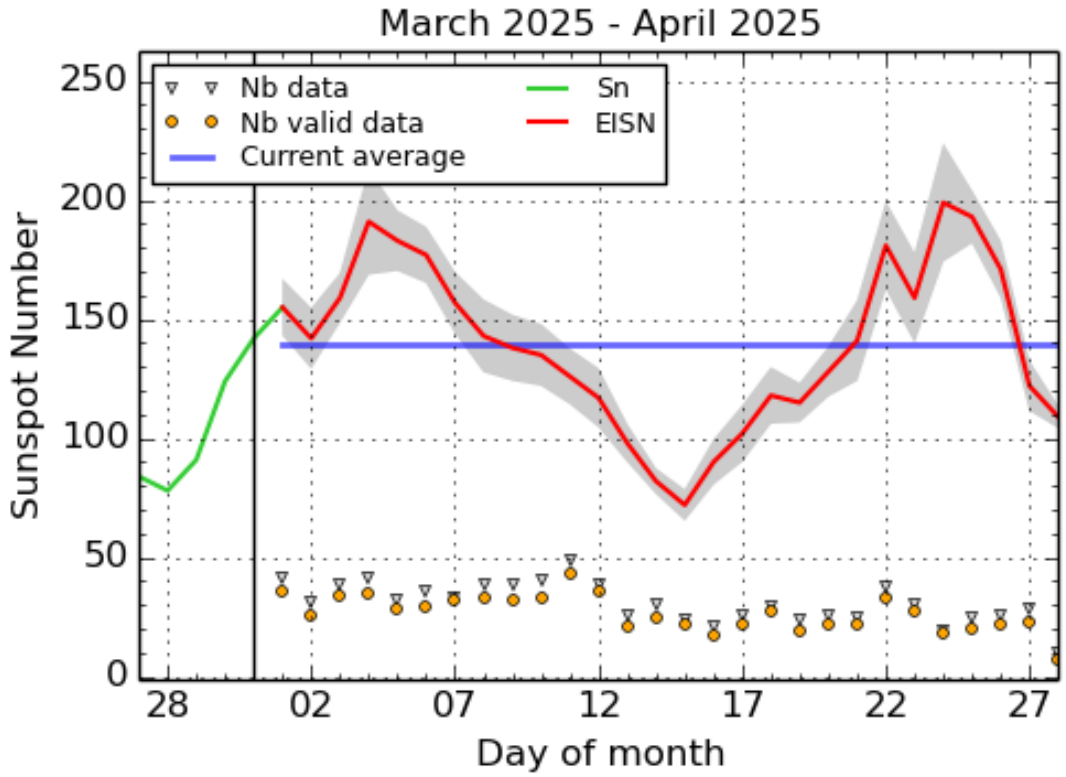
Solar wind

The week started with the Earth entering a fast solar wind stream from SIDC Coronal Hole 104. The solar wind speed reached 750 km/s with an interplanetary magnetic field up to 18 nT (-14 nT in Bz). This lasted until 22 April when the solar wind speed decreased to 500 km/s, and to 400 km/s two days later. On April 24 at 06:12 UTC, a shock was observed in the solar wind. It was probably associated with a CME on 22 April, that passed south of the ecliptic but due to its high speed, was driving a shock that reached the ecliptic plane.

Geomagnetism

The week saw mostly quiet to unsettled levels both locally and globally (Kp and K_Bel up to 3), except for a few periods with active conditions (Kp and K_Bel up to 4) related to the shock arrival on 24 April and minor storm periods (Kp up to 5.33 and K_Bel up to 5) on April 21, due to the HSS that influenced the Earth at the beginning of the week.

3. International Sunspot Number by SILSO



SILSO graphics (http://sidc.be/silso) Royal Observatory of Belgium, 2025 April 28

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.

4. PROBA2 Observations

Solar Activity

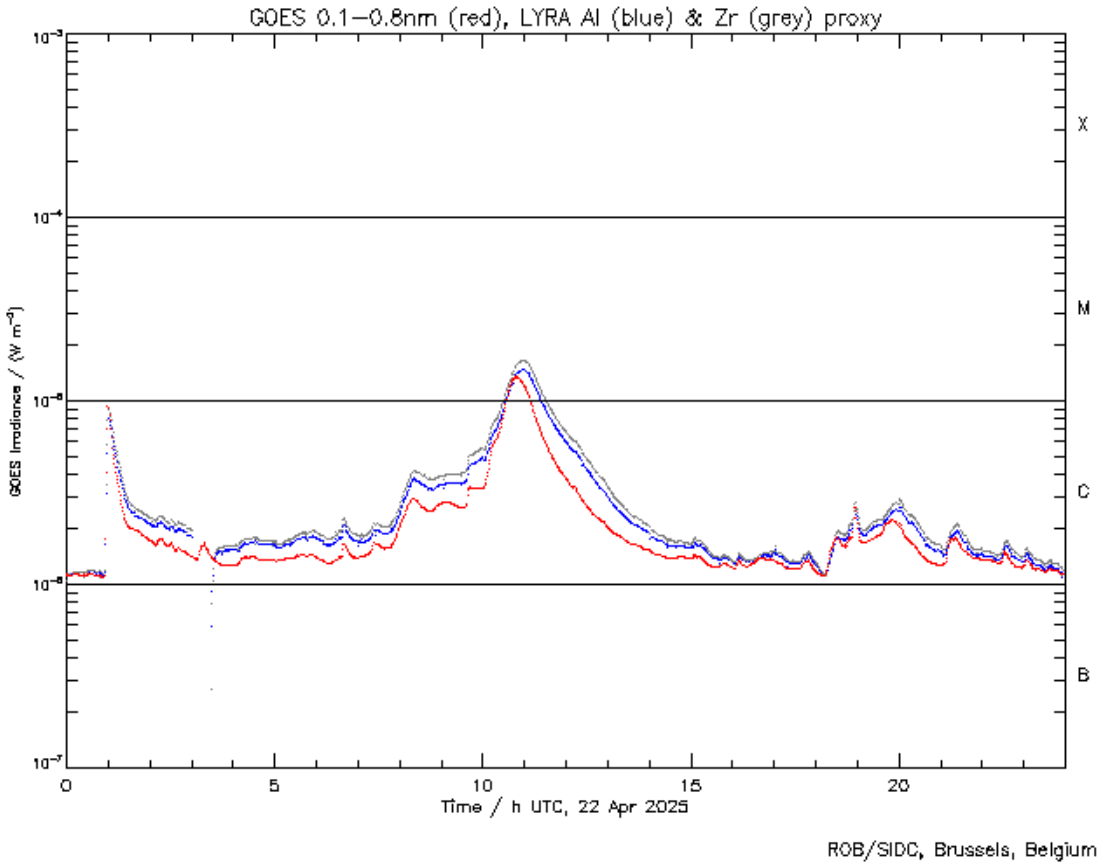
Solar flare activity fluctuated from low to moderate during the week.
In order to view the activity of this week in more detail, we suggest to go to the following website from which all the daily (normal and difference) movies can be accessed: https://proba2.oma.be/ssa
This page also lists the recorded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

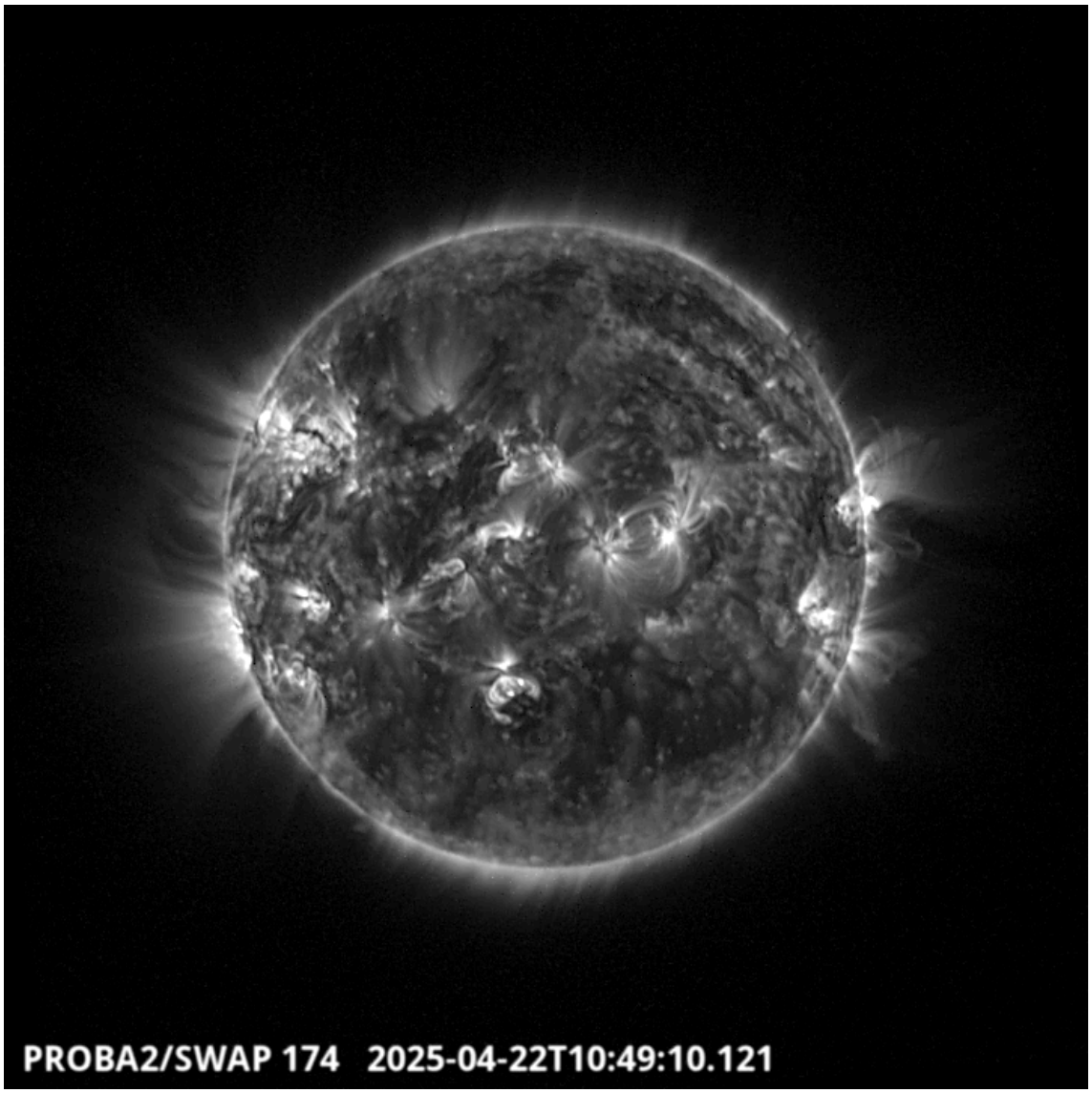
A weekly overview movie (SWAP week 787) can be found here: https://proba2.sidc.be/swap/data/mpg/movies/weekly_movies/weekly_movie_2025_04_21.mp4.

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/.

Tuesday April 22





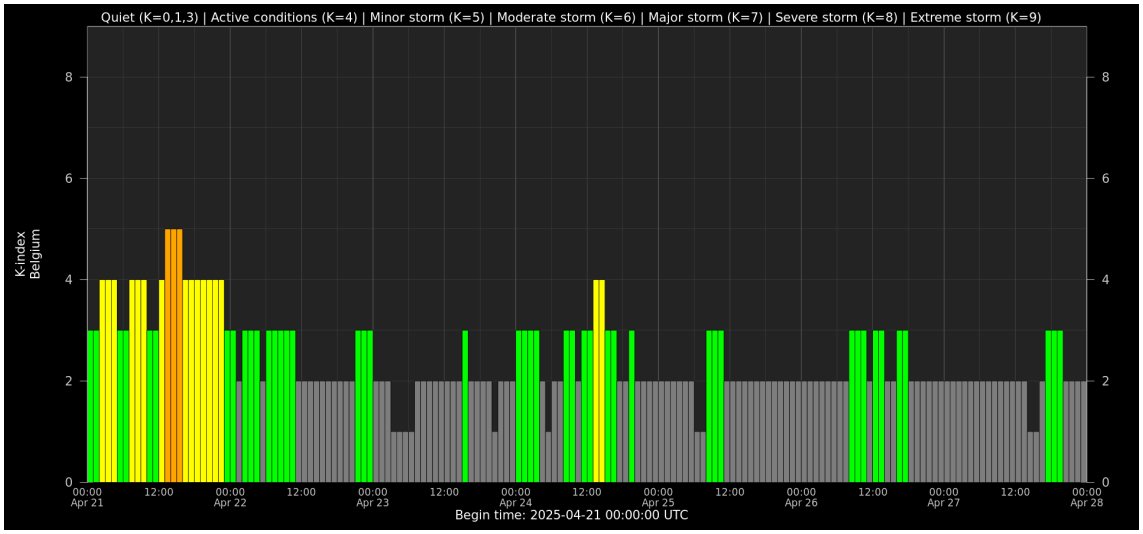
During this fairly calm solar activity week there were only two small M flares recorded, an M1.9 and an M1.3, their associated eruptions having almost no impact on Earth. The M1.3 flare was observed by LYRA (top panel) and SWAP (bottom panel). The flare peaked on 2025-Apr-22 at 10:49 UT and occurred at the western limb of the Sun, originating from active region NOAA4063.
Find a SWAP movie of the event here: https://proba2.sidc.be/swap/movies/20250422_swap_movie.mp4.

5. Noticeable Solar Events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
21	1824	1837	1841	N1W14	M1.9	1N			39	4062
22	0838	1049	1134	S30E9	M1.3	S		VI/1	38	4063

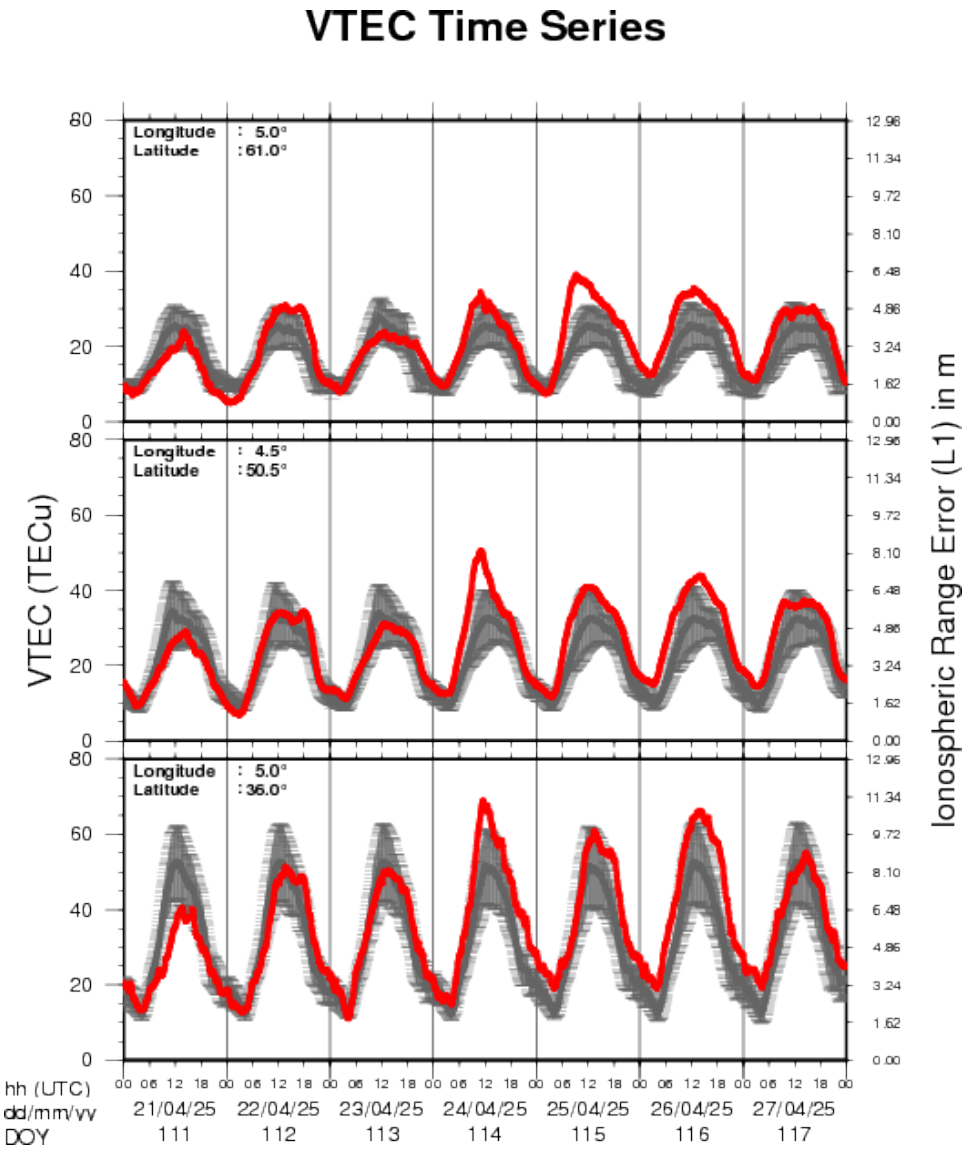
LOC: approximate heliographic location
XRAY: X-ray flare class
OP: optical flare class
10CM: peak 10 cm radio flux
TYPE: radio burst type
Cat: Catania sunspot group number
NOAA: NOAA active region number

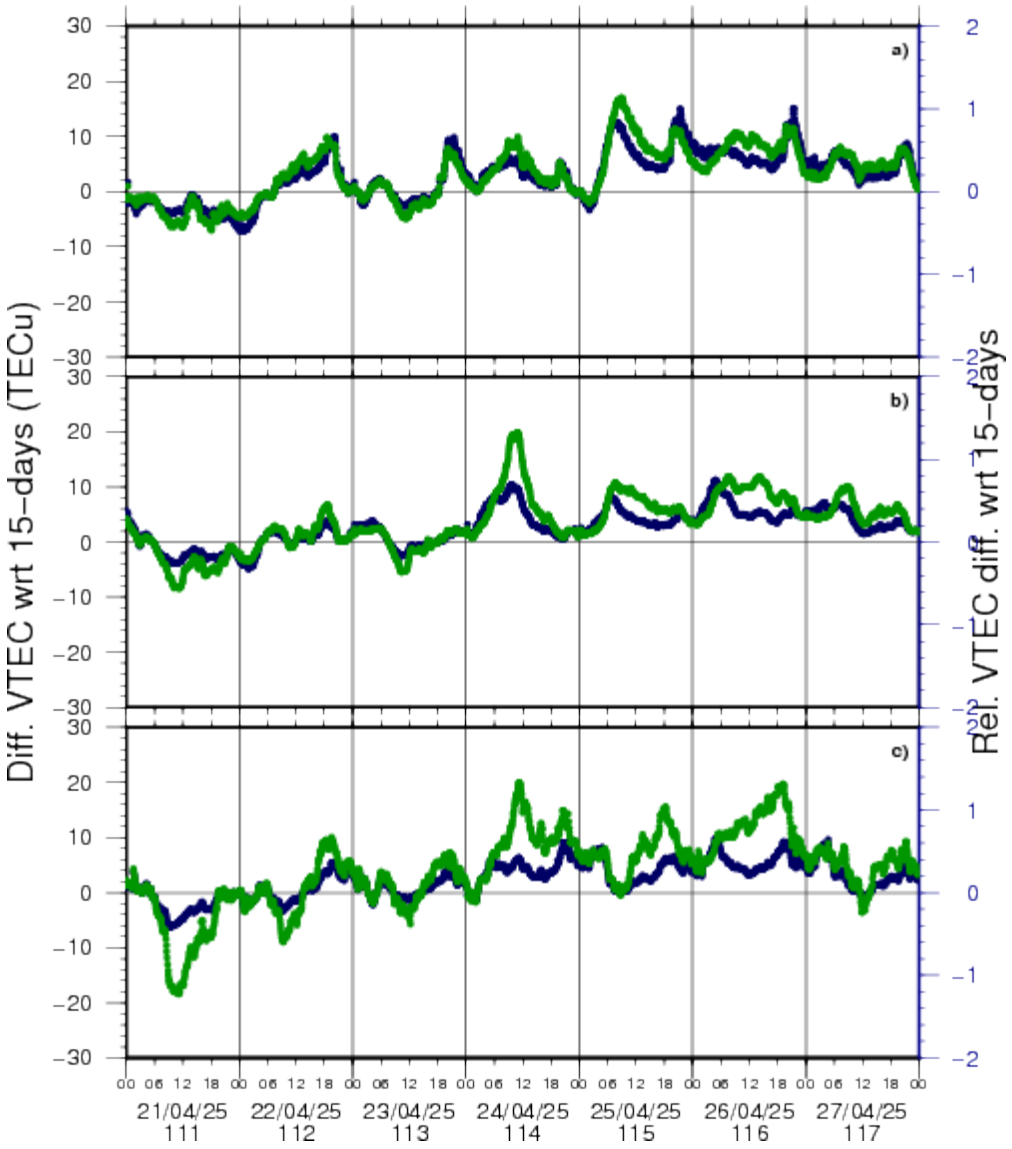
6. Geomagnetic Observations in Belgium



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. Review of Ionospheric Activity





VTEC time series at 3 locations in Europe from 21 Apr 2025 till 27 Apr 2025

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.

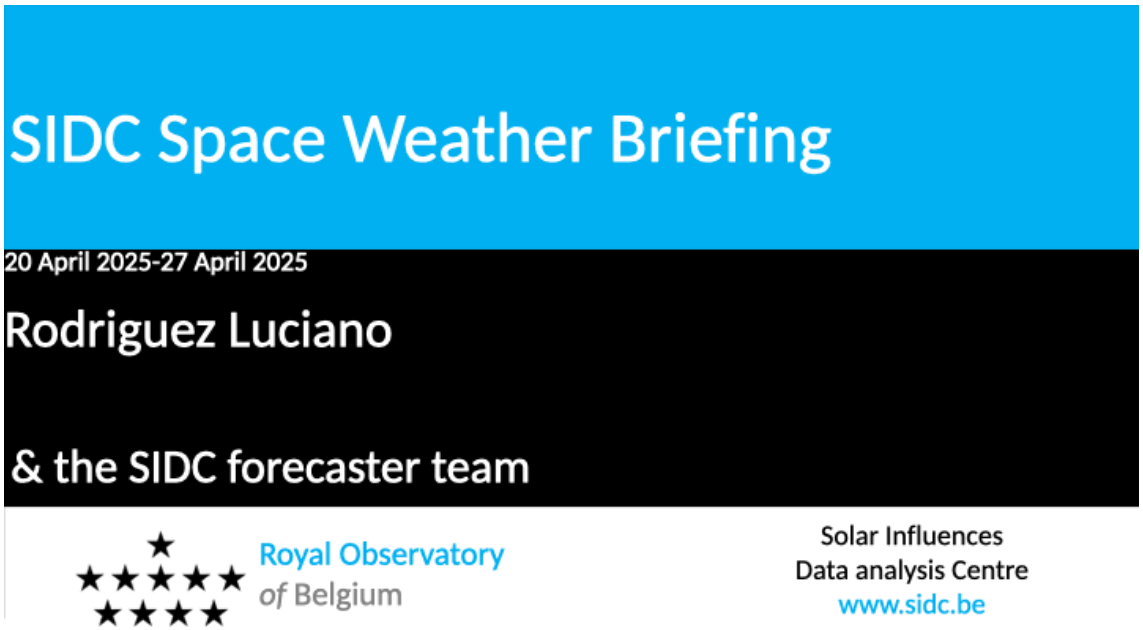
The VTEC is expressed in TECu (with TECu=10^16 electrons per square meter) and is directly related to the signal propagation delay due to the ionosphere (in figure: delay on GPS L1 frequency).

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. The SIDC Space Weather Briefing

The forecaster on duty presented the SIDC briefing that gives an overview of space weather from to 20 to 27 April.
The pdf of the presentation can be found here: https://www.stce.be/briefings/20250428_SWbriefing.pdf



9. Upcoming Activities at the STCE

Courses, seminars, presentations and events 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.
* May 5, 2025, STCE seminar, Space Weather at FMI
* MAy 14, 2025, STCE Seminar, Stratospheric ozone: retrieval, merging and analysis of satellite limb observations
* May 26-27, 2025, STCE Course Space Weather impacts on aviation, online - register: https://events.spacepole.be/event/215/
* Jun 7-9, STCE stand: Dichtbij de Zon, Nerdland Festival, Wachtebeke, Belgium, https://www.nerdlandfestival.be/nl/
* Jun 20, 2025, STCE seminar: The Vigil mission to L5
* Jun 23-25, 2025, STCE Space Weather Introductory Course, Brussels, Belgium - register: https://events.spacepole.be/event/216/
* Sep 15-16, 2025, STCE Course Space Weather impacts on aviation, online - register: https://events.spacepole.be/event/218/

* Oct 23-25, ESWW Space Weather Course by Umea University and STCE, Kiruna, Sweden
* Oct 27-31, European Space Weather Week, Umea, Sweden - https://esww.eu/
* Nov 17-19, 2025, STCE Space Weather Introductory Course, Brussels, Belgium - register: https://events.spacepole.be/event/217/

To register for a course and check the seminar details, navigate to 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

Website: https://www.stce.be/SWEC