STCE Newsletter

9 Mar 2026 - 15 Mar 2026

Published by the STCE - this issue : 19 Mar 2026. 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.

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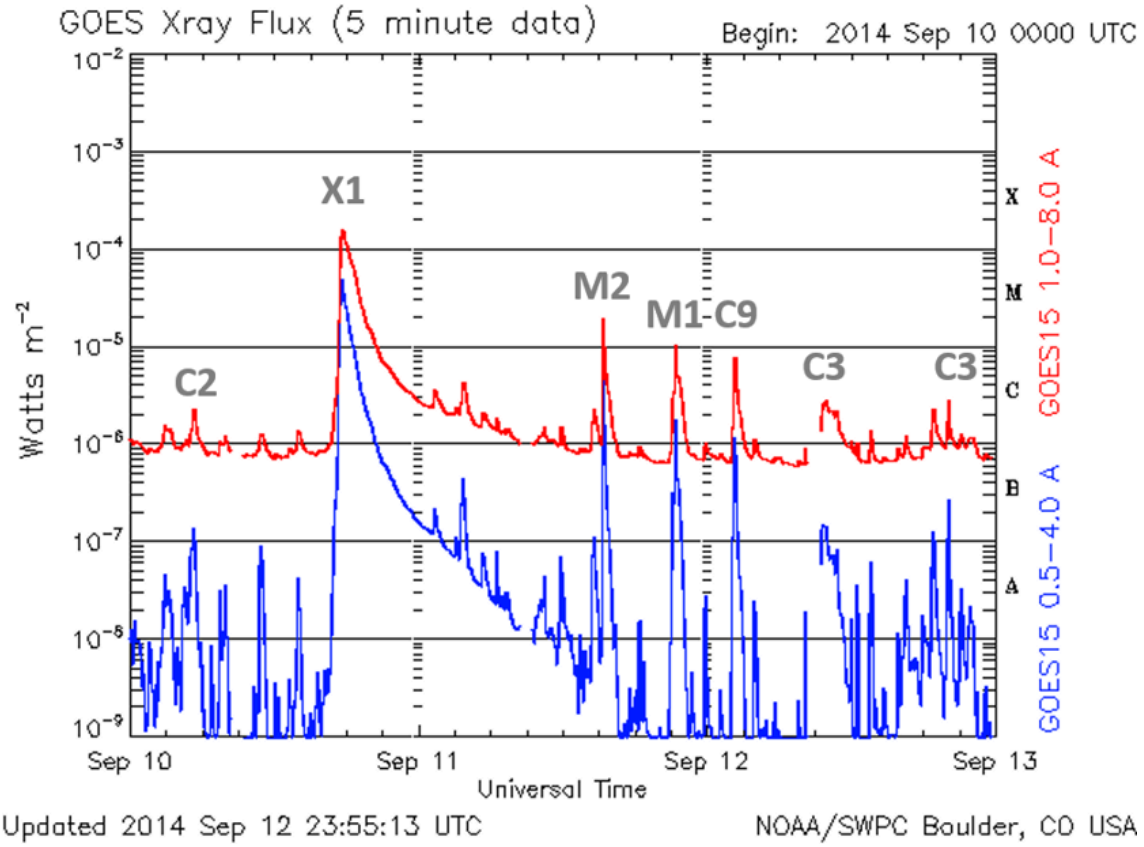
1. Proba-3's Coronagraph is alive!

A month after an anomaly onboard the Proba-3 mission caused ground control to lose contact with the Coronagraph spacecraft, the mission team shares great news: the spacecraft has phoned home, re-establishing the lost connection.

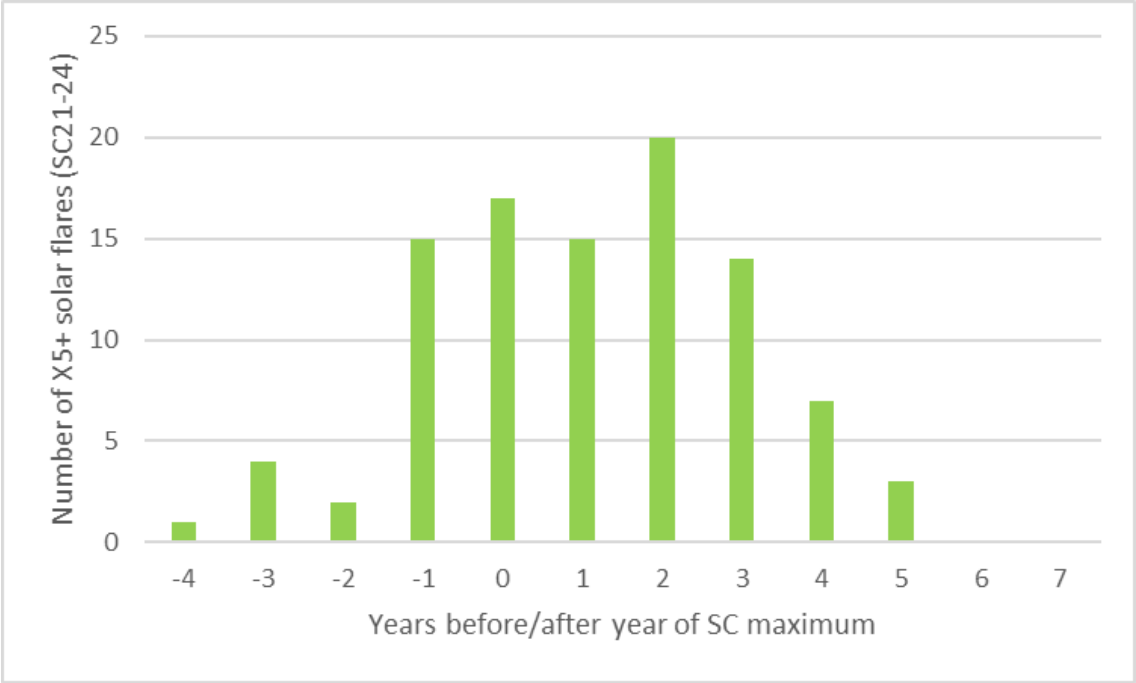
More info from ESA here: https://www.esa.int/Enabling_Support/Space_Engineering_Technology/Proba-3_s_Coronagraph_is_alive#msdynmkt_trackingcontext=4f15eff4-6b94-4f92-a46a-a7f9d9490200

2. We're not done yet!

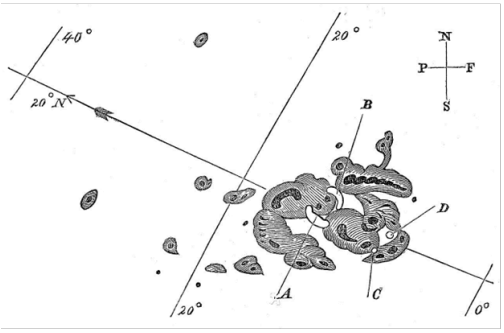
The maximum of the current solar cycle (SC25) took place in October 2024 (SILSO - https://www.sidc.be/article/solar-cycle-25-reached-its-maximum-october-2024). That is already 1.5 years ago, with the smoothed monthly sunspot numbers declining since then. This does not mean that there can't be any more complex sunspot groups and strong solar flares during this solar cycle!



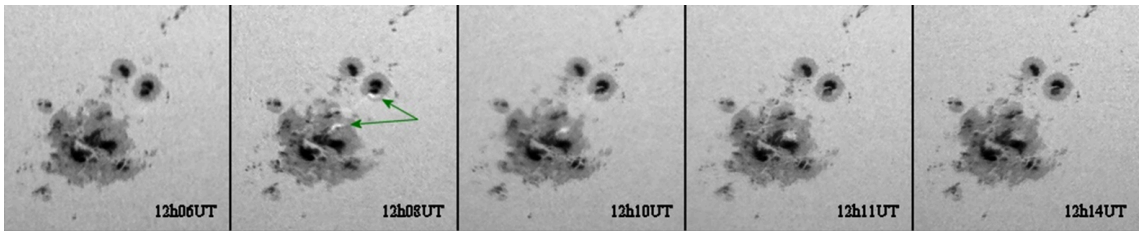
Solar flares can be ranked according to the peak energy output in soft x-ray (see annotated graph above). These measurements have been systematically carried out since 1976 by the GOES satellites in the wavelength band from 1 to 8 Angstrom (0.1-0.8 nm). The scheme uses the letters A, B, C, M, and X, with C, M, and X standing for small (or "Common"), Medium, and large (or "eXtreme") flares. The range is logarithmic, each class being 10 times stronger than the previous one, and within each category ranging from 1 to 9 (e.g. a C9 flare, an M3 flare,...). The strongest flares so far in SC25 were an X9.0 flare produced by NOAA 13842 on 3 October 2024, an X8.7 produced by NOAA 13664 on 14 May 2024, and an X8.1 flare produced by NOAA 14366 on 1 February 2026. More details and a table with the Top 10 of strongest flares so far in SC25 can be found on the STCE's SC25 Tracking webpage (https://www.stce.be/content/sc25-tracking#flares).



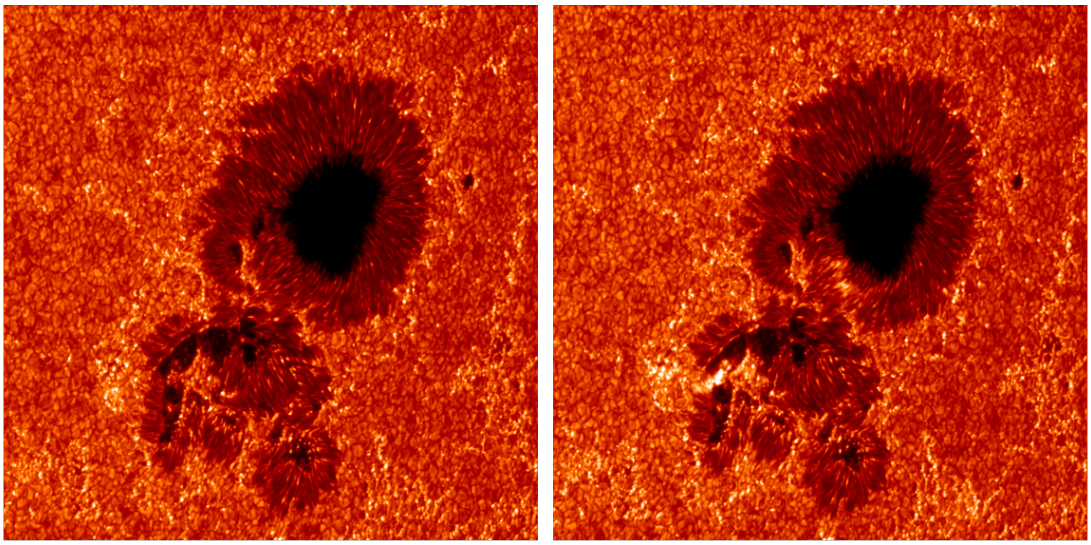
The GOES satellite fleet has been observing solar flares since 1976, so over the last half century. Analysis of the really strong flares -taken here to be X5 or stronger- indicates that most of these strong solar flares do not happen around the time of solar cycle maximum, but rather during the declining phase of the solar cycle. The graph above covers solar cycles 21 to 24. The horizontal axis indicates the time in years with respect to the solar cycle maximum. On the vertical axis is the total number of X5 (or stronger) flares summed over the 4 solar cycles. So, for the year "0", i.e. the year of solar cycle maximum, the green column indicates the number of X5+ flares that occurred from a half year before to a half year after the month with the maximum smoothed sunspot number. For the year "-1", it's the total number of X5+ flares that took place from 0.5 to 1.5 years prior to the cycle maximum, and so on. Clearly, there's an abundance of strong solar flares in the year "2" after solar cycle maximum, even lingering into year "3". For the ongoing SC25, this year "2" still has to start, running from May 2026 until April 2027! It's difficult to say how many can be expected, because there's a large cycle-to-cycle variation. On the average, 5 X5+ flares can be expected during year "2", which would be more than the 4 X5+ flares already recorded during the year "0" of SC25.



The famous sunspot group of 1 September 1859, as sketched by Richard Carrington. A and B mark the initial positions of the intensely bright white-light flare, which moved over the course of five minutes to C and D before disappearing. The kernels were so bright that Carrington initially thought there was a crack in his telescope, allowing direct sunlight on the projection screen. *(Description of a singular appearance seen in the Sun on September 1, 1859, R.C. Carrington, MNRAS 19-20, 1858-1860)*

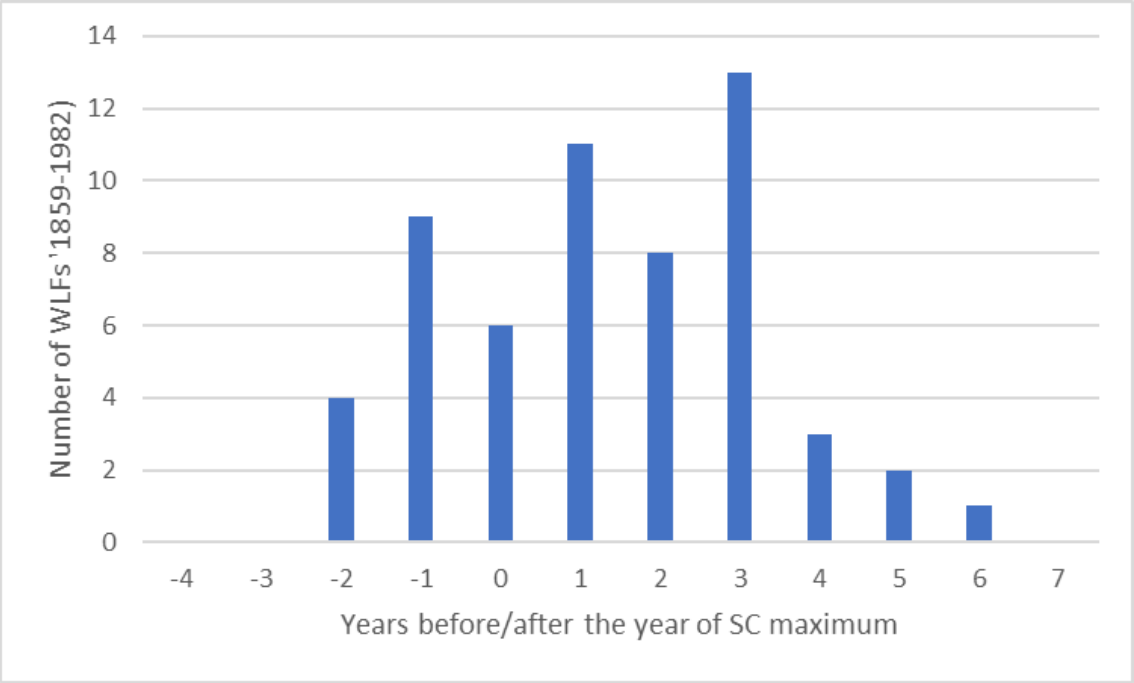


Thierry Legault - http://www.astrophoto.fr/s031028.html (X24.4 (rescaled) on 28 October 2003)



X2.0 flare on 14 Dec 2006 / 22:07 and 22:09 UTC – Credits: Hinode (NASA/JAXA)

The abundance of strong flares during the declining phase of the solar cycle is not a surprise, following studies from white-light flares (WLF) a few decades ago. A WLF is any flare that becomes visible in white light (no H-alpha filter, no x-rays,...) against the background of the solar disk. Thus, such bright WLFs become only visible when extremely strong solar flares take place, and thus they are very rare. The first flare ever observed was such a rare WLF and observed by Richard Carrington while he was making his daily solar observations on 1 September 1859 (see the figures above). Other famous example involve the major solar flares of 28 October 2003 -as imaged by Thierry Legault- and of 14 December 2006 as imaged by the Hinode Solar Optical Telescope (NASA/JAXA). A study by Neidig and Cliver for the period 1859-1982 (1983 - https://ui.adsabs.harvard.edu/abs/1983STIN...8424521N/abstract) shows a diagram when these WLFs occur in the course of a solar cycle. The set-up of this diagram is similar to the one discussed earlier. The horizontal axis indicates the time in years with respect to the solar cycle maximum, while on the vertical axis is the total number of WLFs summed over the period 1859-1982. Sure enough, peaks at resp. 1 and 3 years after the year of solar cycle maximum are prominently present (see the chart underneath). All this means that for the next 1 to 2 years, we may still be in for occasional periods of very enhanced space weather conditions.



3. Review of Solar and Geomagnetic Activity

WEEK 1315 from 2026 Mar 09

Solar Active Regions and flares

Solar flaring activity has been low to moderate, with a few M-class flares. The strongest flare was a M1.2 flare (SIDC Flare 7174) peaking on March 13 at 09:55 UTC, which was produced by SIDC Sunspot Group 805 (NOAA Active Region 4384). There was a total of 15 numbered active regions (ARs) on the visible disk, all with simple magnetic types alpha and beta.

Coronal Mass Ejections

There were no Earth-directed Coronal Mass Ejections (CMEs) observed this week.

The Coronal Mass Ejection (CME) first detected in SOHO/LASCO-C2 data on 00:48 UTC March 13, associated with a filament eruption, was mainly directed southwards, and passed south of Earth.

Coronal Holes

A large positive polarity trans equatorial coronal hole (SIDC Coronal Hole 154) has been crossing the central meridian since the 11th March, first with a equatorial component, later with midlatitude extensions.

Proton flux levels

The greater than 10 MeV proton flux was below the 10 pfu threshold.

Electron fluxes at GEO

The greater than 2 MeV electron flux as measured by GOES 18 and GOES 19 was fluctuating around the 1000 pfu threshold during the week.

The 24-hour electron fluence was fluctuating between normal and moderate levels.

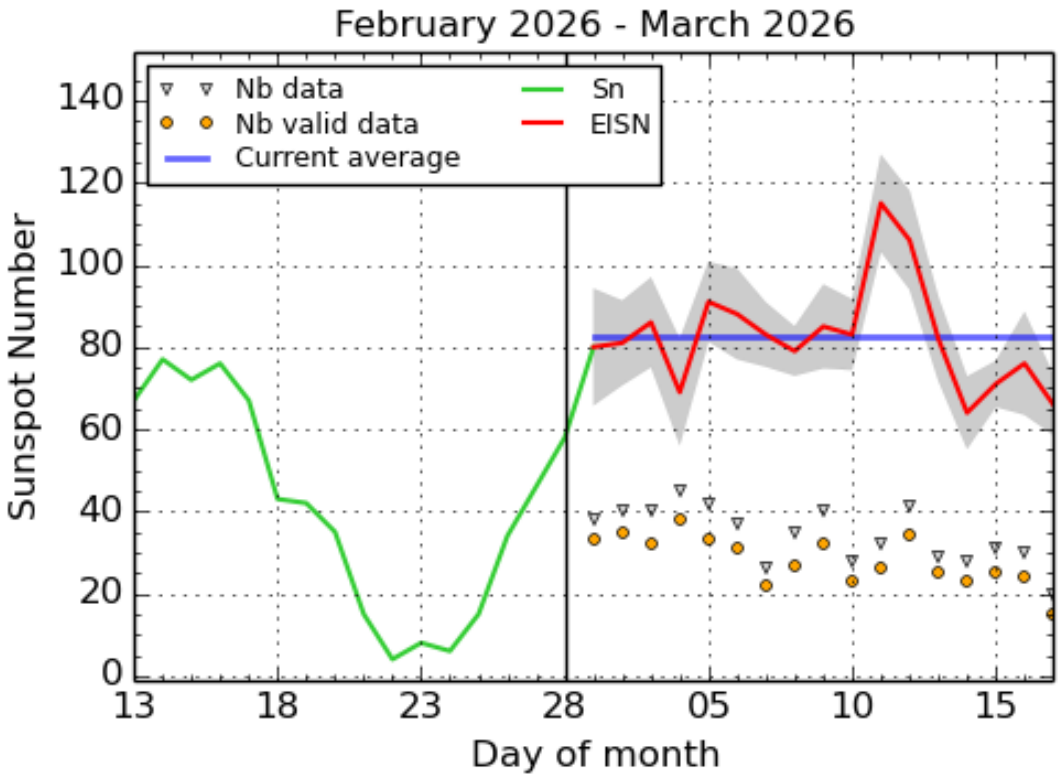
Solar wind

The solar wind conditions have been enhanced for almost the entire week. In the beginning of the week, due to the waning influence of the High Speed Stream (HSS) of Coronal Hole 142 (negative polarity), and since 13 March following the HSS of SIDC Coronal Hole 154 (positive polarity), the solar wind speed reached up to 750km/s and the magnetic field reached 13nT, with the Bz reaching a maximum of -10nT.

Geomagnetism

Geomagnetic conditions reached minor storm levels starting March 13 12:00 UTC and reached moderate storm levels (Kp6) between 03:00 UTC and 06:00UTC on March 14. Then mainly active to minor storm conditions were observed.

4. International Sunspot Number by SILSO



SILSO graphics (http://sidc.be/silso) Royal Observatory of Belgium, 2026 March 17

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. PROBA2 Observations

Solar Activity

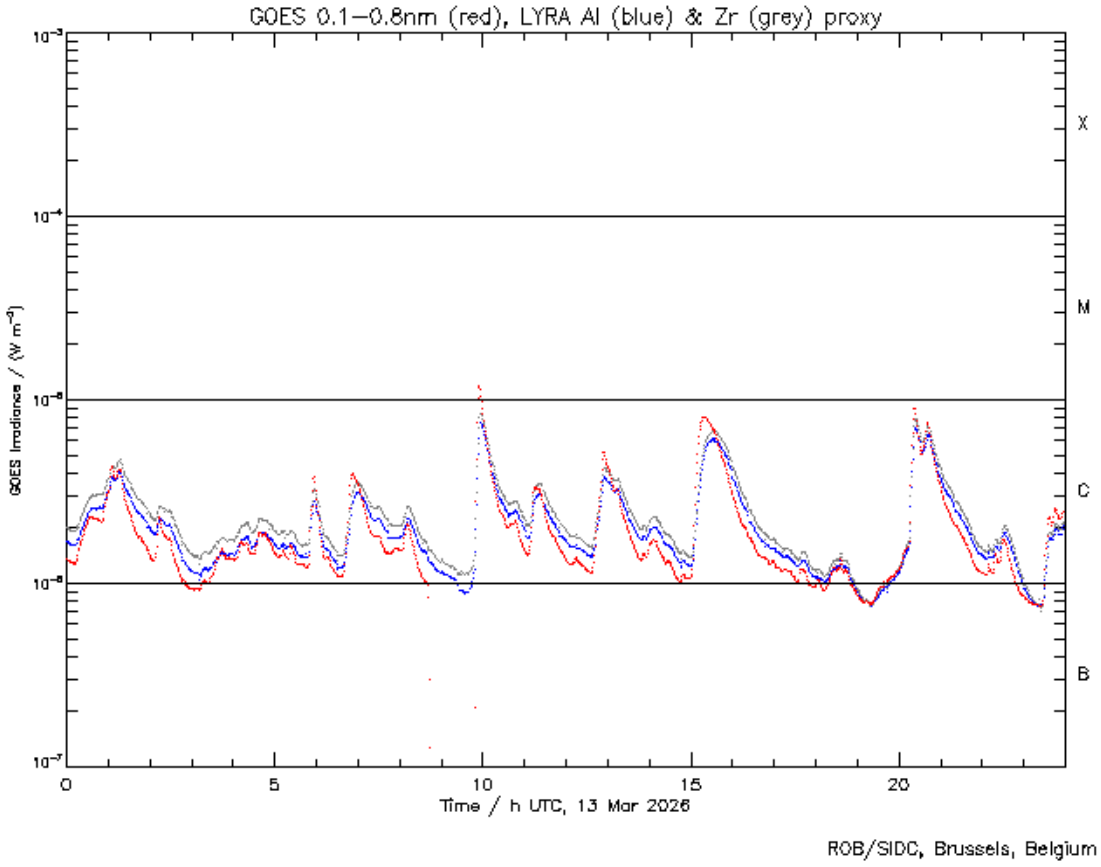
Solar flare activity fluctuated from low to moderate during the week.
In order to view the activity of this week in more detail, we suggest to go to the following website from which all the daily (normal and difference) movies can be accessed: https://proba2.oma.be/ssa
This page also lists the recorded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

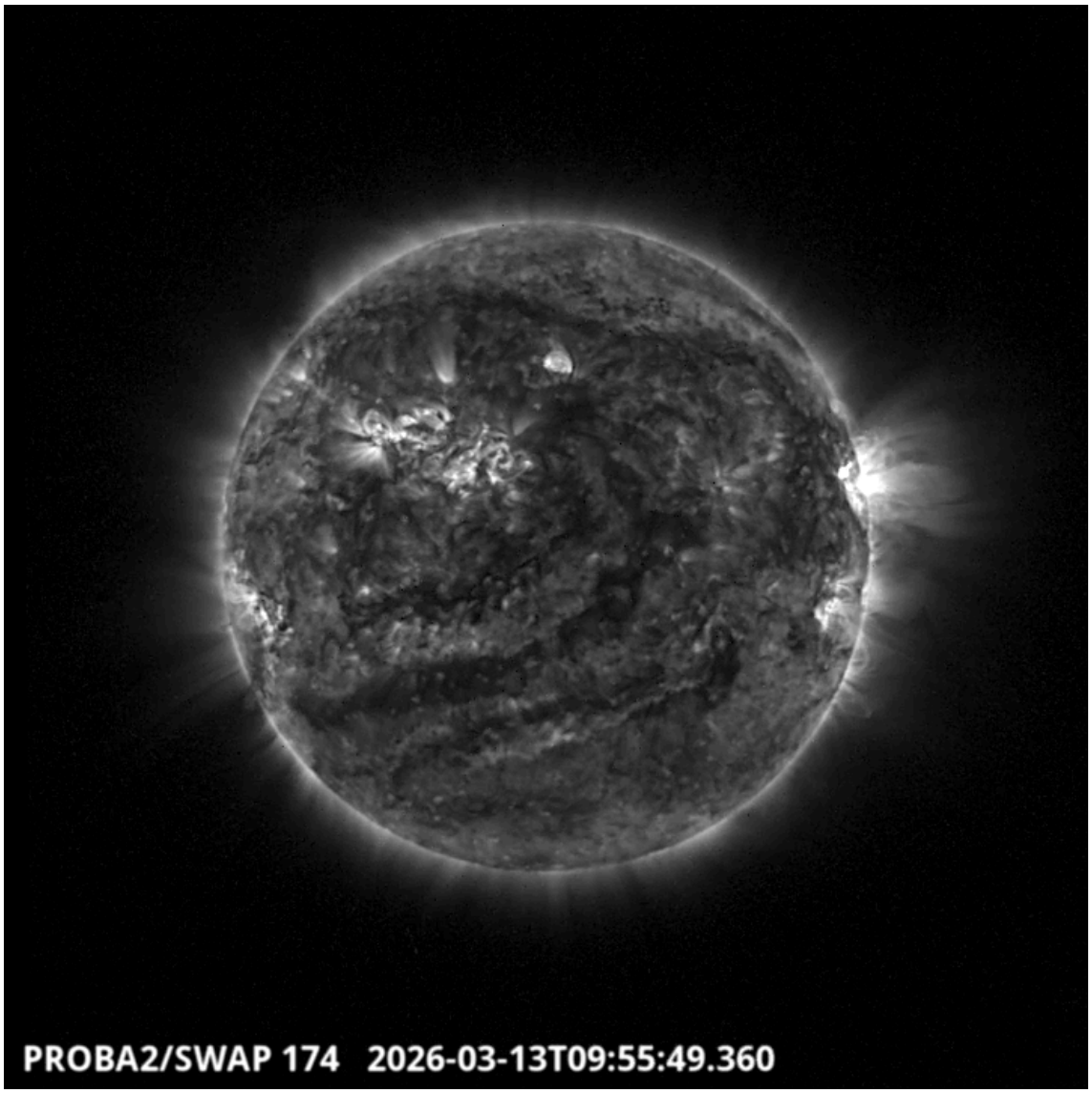
A weekly overview movie (SWAP week 833) can be found here: https://proba2.sidc.be/swap/data/mpg/movies/weekly_movies/weekly_movie_2026_03_09.mp4.

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/.

Friday March 13





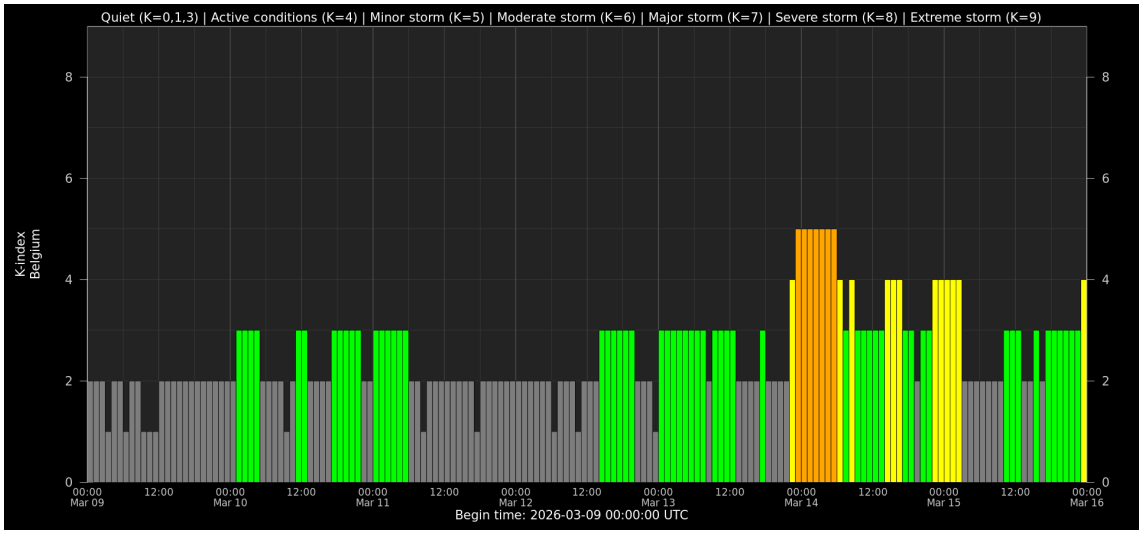
The largest flare of this week was an M1.2, and it was observed by LYRA (top panel) and SWAP (bottom panel). The flare peaked on 2026-Mar-13 at 09:55 UT and occurred at the western limb of the Sun, originating from active region NOAA4384 (SIDC 805).
Find a SWAP movie of the event here: https://proba2.sidc.be/swap/movies/20260313_swap_movie.mp4.

6. Noticeable Solar Events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
13	0940	0955	1005	N11W67	M1.2	SF		II/2	42	4384
15	0921	0939	0952	S16E33	M1.0	SF		III/2	54	4392

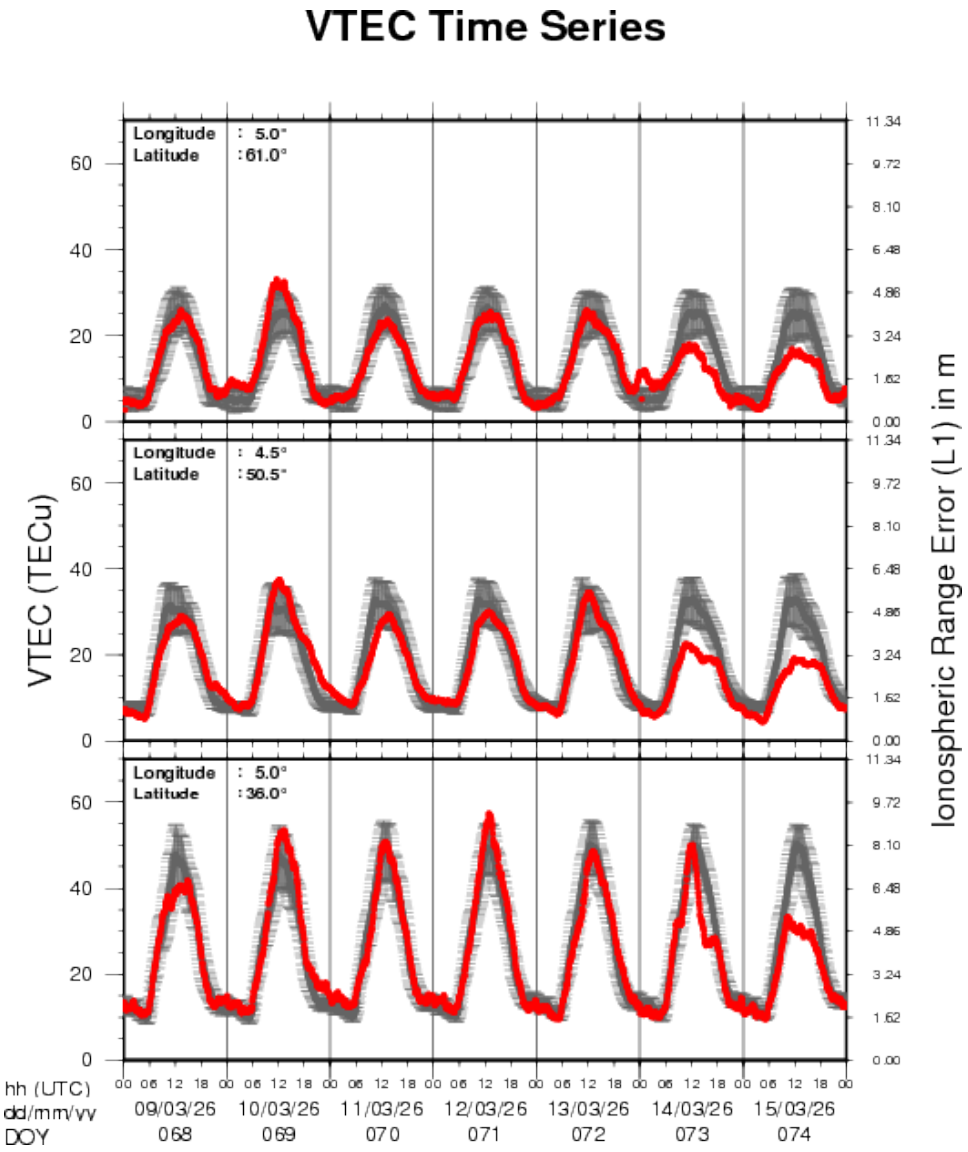
LOC: approximate heliographic location
XRAY: X-ray flare class
OP: optical flare class
10CM: peak 10 cm radio flux
TYPE: radio burst type
Cat: Catania sunspot group number
NOAA: NOAA active region number

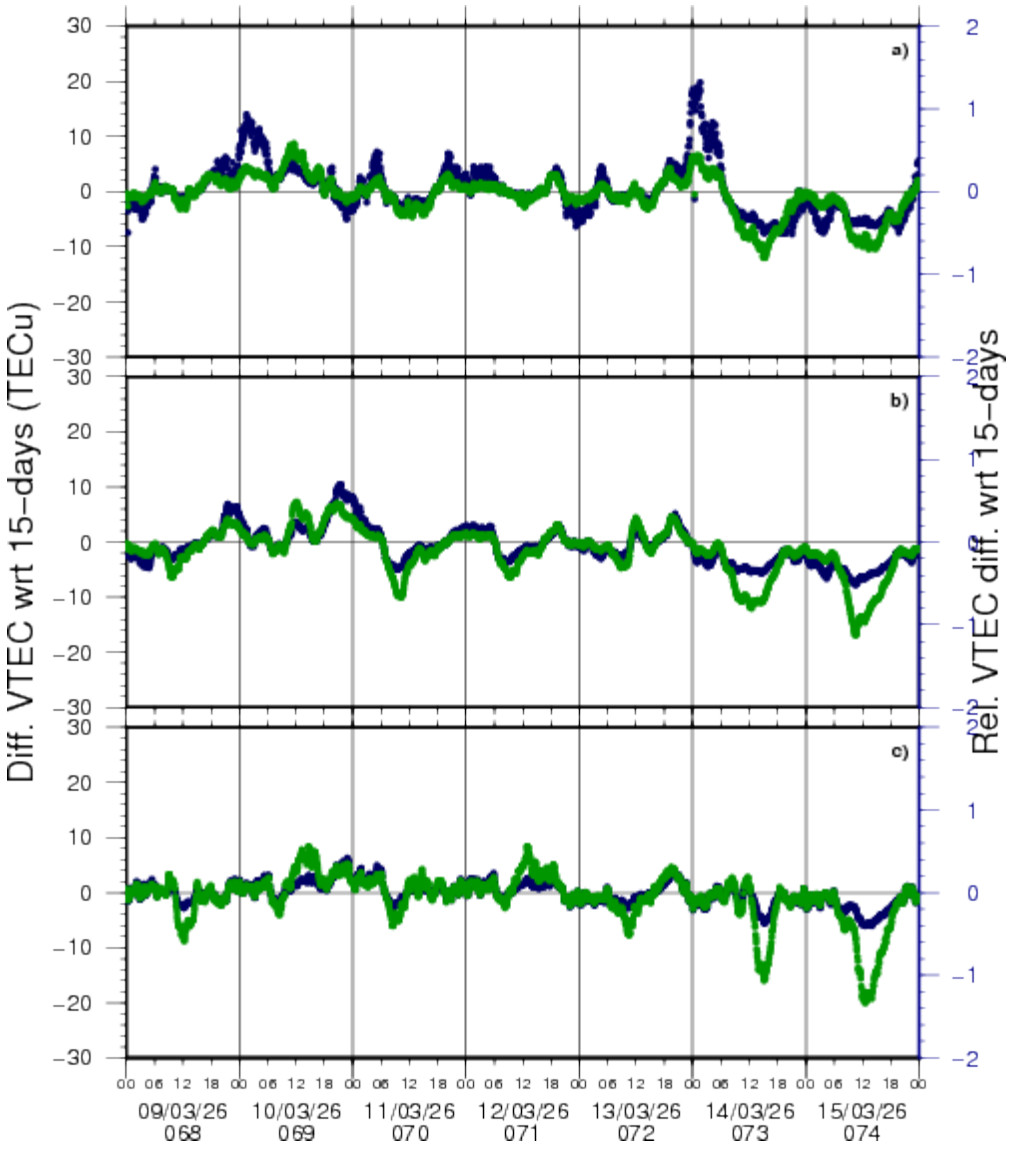
7. Geomagnetic Observations in Belgium



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/

8. Review of Ionospheric Activity





VTEC time series at 3 locations in Europe from 9 Mar 2026 till 15 Mar 2026

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.

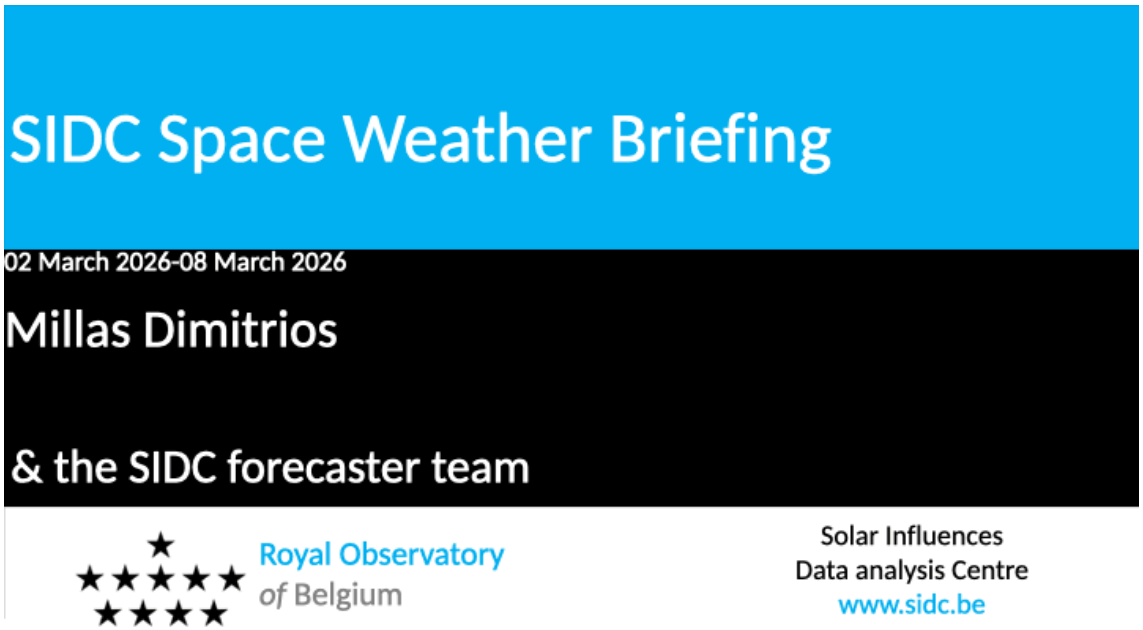
The VTEC is expressed in TECu (with TECu=10^16 electrons per square meter) and is directly related to the signal propagation delay due to the ionosphere (in figure: delay on GPS L1 frequency).

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

9. The SIDC Space Weather Briefing

The forecaster on duty presented the SIDC briefing that gives an overview of space weather from March 9 to 15.
The pdf of the presentation: https://www.stce.be/briefings/20260309_SWbriefing.pdf



10. Upcoming Activities

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.

* Mar 23, 2026, STCE lecture: From physics to forecasting, Space Weather course by ESA Academy, Redu, Belgium
* Mar 25, 2026, The Belgian Space Weather centre, Space Weather course by ESA Academy, Brussels, Belgium
* Apr 20-21, 2026, STCE cursus: inleiding tot het ruimteweer, voor leden van volkssterrenwachten, Brussels, Belgium - register: https://events.spacepole.be/event/260/
* Jun 15-17, 2026, STCE Space Weather Introductory Course, Brussels, Belgium - register: https://events.spacepole.be/event/256/
* Oct 12-14, 2026, STCE Space Weather Introductory Course, Brussels, Belgium - register: https://events.spacepole.be/event/257/ - Reserved

* Nov 23-25, 2026, STCE course: Role of the ionosphere and space weather in military communications, Brussels, Belgium - register: https://events.spacepole.be/event/259/
* Dec 7-9, 2026, STCE Space Weather Introductory Course for Aviation, Brussels, Belgium - register: https://events.spacepole.be/event/262/

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