Sun – Solar Activity (Jean C. Santos)

Summary

The Sun showed little activity during the week, with only one region of high magnetic complexity (beta-gamma) present on the solar surface. During this period, two M-class solar flares and twenty-seven CMEs occurred, but none of the halo type (angular width greater than 180 degrees). Two coronal holes with significant area (>2.0% of the solar disk area) were identified on the Sun's surface.

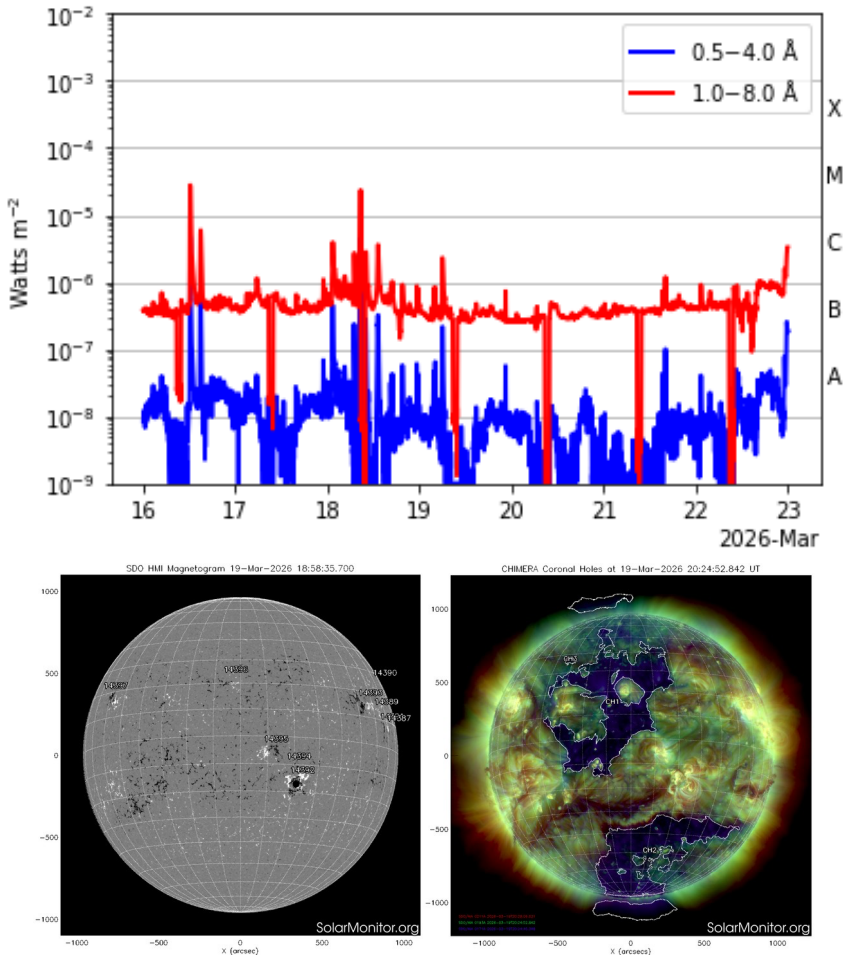

Figure 1 – X-ray flux measured by the GOES satellite (top panel) for the period of March 16-22, magnetic field in the line of sight (bottom left panel) and image at 193 angstroms (bottom right panel) measured on March 19, 2026.

Interplanetary Medium – IM – Daniele da S. F. Medeiros and Paulo R. Jauer
Period: March 16th to 23rd

Summary

Summary of IM conditions for the last week. The interplanetary medium region in the last week showed a moderate level of plasma disturbances due to the possible interaction with the HSS and cross sector identified by the DSCOVR satellite in the interplanetary medium. The interplanetary Kp index obtained by NOAA/SWPC and the modeling.

- The magnitude of the interplanetary magnetic field component peaked on March 21st at 15:30 UT at +37.86 nT.

- The BxBy components presented variations in the analyzed period, keeping both oscillating within the interval [-26.84, +19.99] nT. Showing ten rotations of the By component.

- The Bz component presents negative values for most of the week with a maximum negative -13.47 nT at 20:30 UT on March 20th. It presented positive value of +25.14 nT on March 21st at 14:30 UT.

- The solar wind density maximum peaked on March 20th at 22:30 UT, reaching 31.34 protons/cm^3.

- The solar wind speed fluctuated between 333 to 678 km/s, with an increase beginning at 18:30 UT on March 21st.

- The magnetopause position remained relaxed almost throughout the analyzed period, reaching maximum compression (6.84 RE) at 21:30 UT on March 20th.

- During the early part of the week, the measured interplanetary Kp index remained below 3, indicating relatively calm geomagnetic conditions. On March 21st, the index stood at around 7 (Kp = 7), indicating a strong geomagnetic storm (G3 level). The modeled interplanetary Kp index reached values above the scale. On March 22nd, it reached values of approximately 7 (Kp = 7), and the modeled interplanetary Kp index showed a value of 8 (Kp = 8), corresponding to a severe geomagnetic storm (G4 level), ending the week with values ranging between 6 and 7, for the measured Kp index and a decrease for the modeled interplanetary Kp index.

Figure 1 ilustrates a set of parameters observed in the solar wind by the DSCVR satellite. The measured solar wind parameters can be identified in the following order starting in column 1: Interplanetary magnetic field modulus (IMF), the Bx and By components, Bz component, convection electric field Ey. Column 2: Solar wind density, speed, temperature and the last graph represents the position of the subsolar magnetopause.

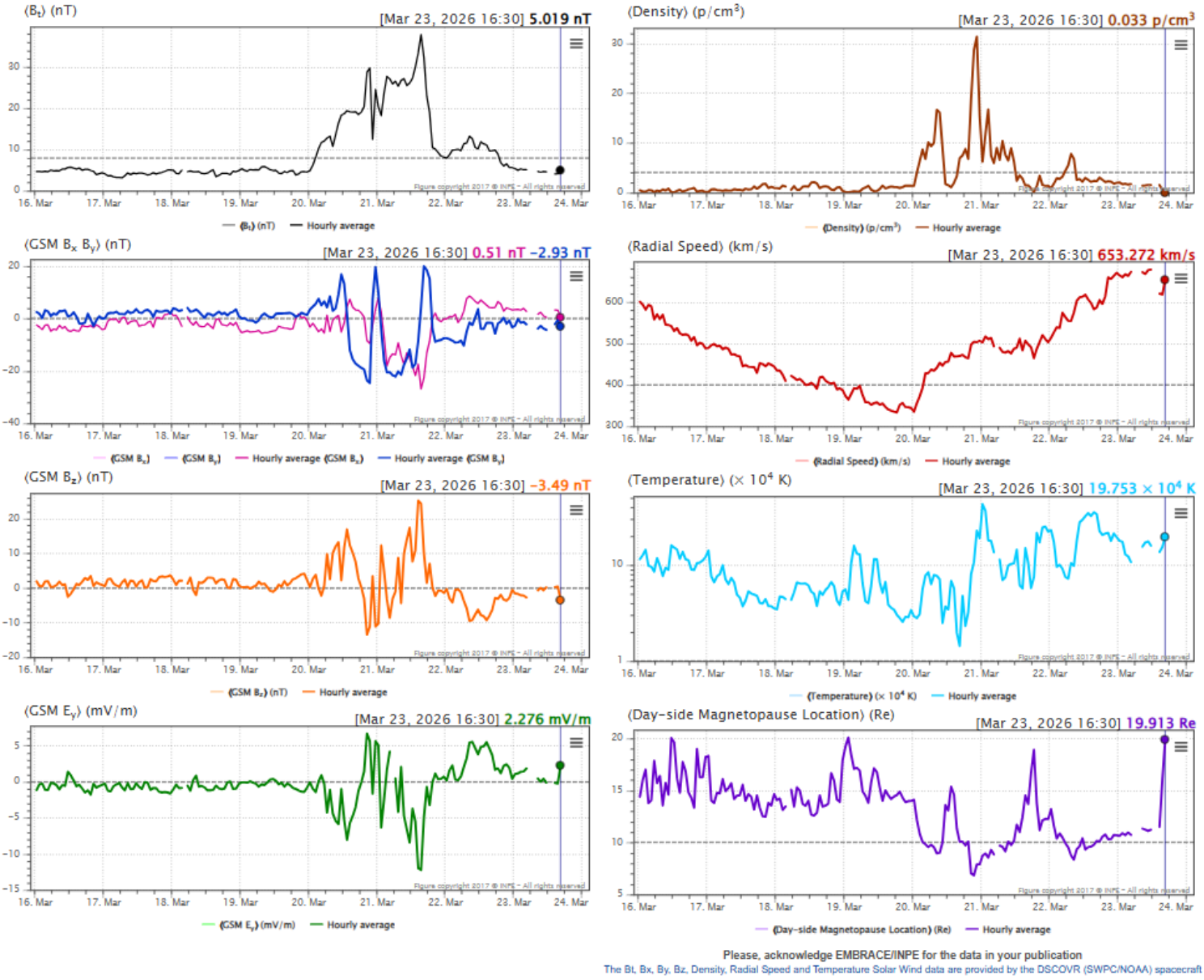

Figure 1: Illustrates a set of parameters observed in the solar wind by the DSCVR satellite.

Figure 2 illustrates a set of parameters observed in the solar wind by the DSCOVR satellite. The measured solar wind parameters can be identified in the following order, starting with the panels below: solar wind speed, Bz component of the interplanetary magnetic field (IMF), solar wind density, and the last graph represents the Kp index obtained by NOAA/SWPC and the modeling.

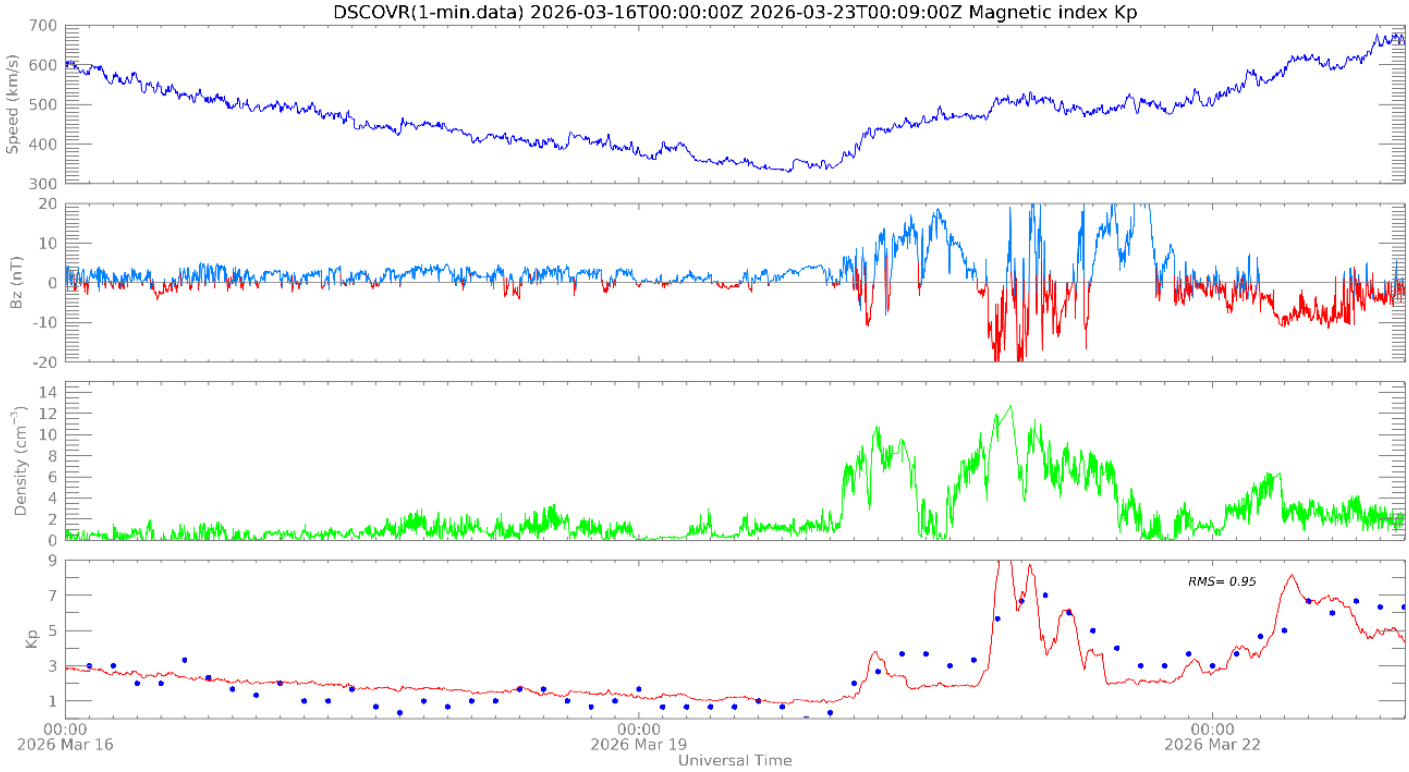

Figure 2: Illustrates a set of parameters observed in the solar wind by the DSCVR satellite and the Kp index by NOAA/SWPC, blue dot, and the modeling, red line.

EARTH'S RADIATION BELT

Responsible: Ligia Da Silva

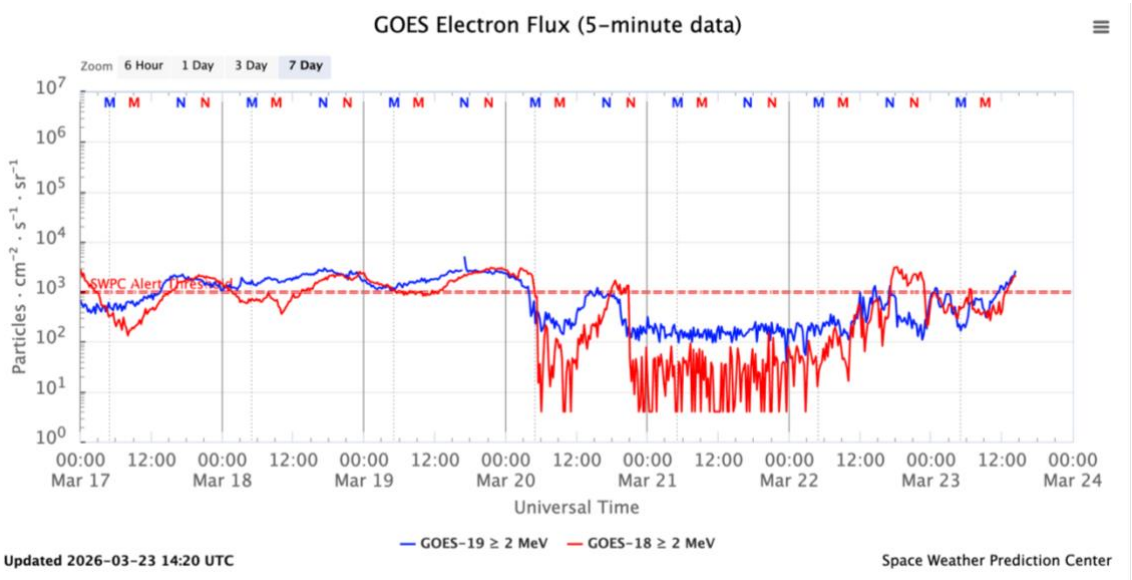

Figure 1: High-energy electron flux (> 2MeV) obtained from GOES-18 and GOES-19 satellite. Source: https://www.swpc.noaa.gov/products/goes-electron-flux

Summary

The high-energy electron flux (>2 MeV) in the outer boundary of the outer radiation belt obtained from the GOES-18 and GOES-19 geostationary satellites (Figure 1) is close to the alert threshold (10^3 particles/(cm^2 s sr)) in the first days of the analyzed period. Two dropouts are observed starting on March 20th, which confined the electron flux below the alert threshold for more than 36 consecutive hours.

Geomagnetic field

Responsible: Karen Sarmiento /Lívia Alves/Sony Su Chen

Summary

The period from March 17 to 23 was characterized by a transition from predominantly quiet geomagnetic conditions to a scenario of geomagnetic storms, with intensities ranging from G1 (minor) to G2 (moderate) and G3 (strong).

Between March 17 and 19, geomagnetic activity was predominantly quiet, with indices fluctuating near their nominal values. During this period, the Kp index ranged from 0o to 2o, while the Ksa index recorded values between 2- and 4o. In the auroral region, the AE index remained below 250 nT, and the Dst index ranged between -9 nT and 21 nT.

Starting on March 20, instabilities began to be observed in the geomagnetic activity indices, with the onset of a geomagnetic storm toward the end of the day. The Kp index reached 4- in the 09-12UT interval, while the Ksa index recorded 4+ during the same period, indicating disturbances in the geomagnetic field. In the auroral region, the AE index exceeded 500 nT around 06UT. Later that day, around 18UT, the onset of a geomagnetic storm was recorded, which rapidly intensified from G1 (minor) to G3 (strong). The main phase began at 22UT, reaching the event minimum around 02UT on March 21 (Dst=-85 nT; dHsa=-134 nT). The recovery phase began shortly thereafter, with the storm weakening from G3 level (Kp=7o) to G1 levels (Kp between 5+ and 5o) during the intervals 03-06UT and 06-09UT.

Even before the geomagnetic field had fully recovered from the G3 storm, a new storm was recorded, beginning at 09UT on March 22. The minimum occurred at 23UT (Dst=-101 nT), with a minimum dHsa of -148 nT at 18UT. A notable feature of this second event was the prolonged period of geomagnetic activity fluctuating between G1 (Kp=5o) and G2 (Kp=7-) levels from 06UT on March 22 to 03UT on March 23, subsequently returning to below G1 levels.

From March 20 to 23, auroral activity remained elevated, with the AE index intermittently exceeding 500 nT. Intervals with AE>1000 nT were observed between 19UT on March 20 and 03UT on March 21, and between 09-24UT on March 22, with peaks exceeding 2000 nT.

Over the past 24 hours, geomagnetic activity has remained unstable, although the storm is currently transitioning into the recovery phase.

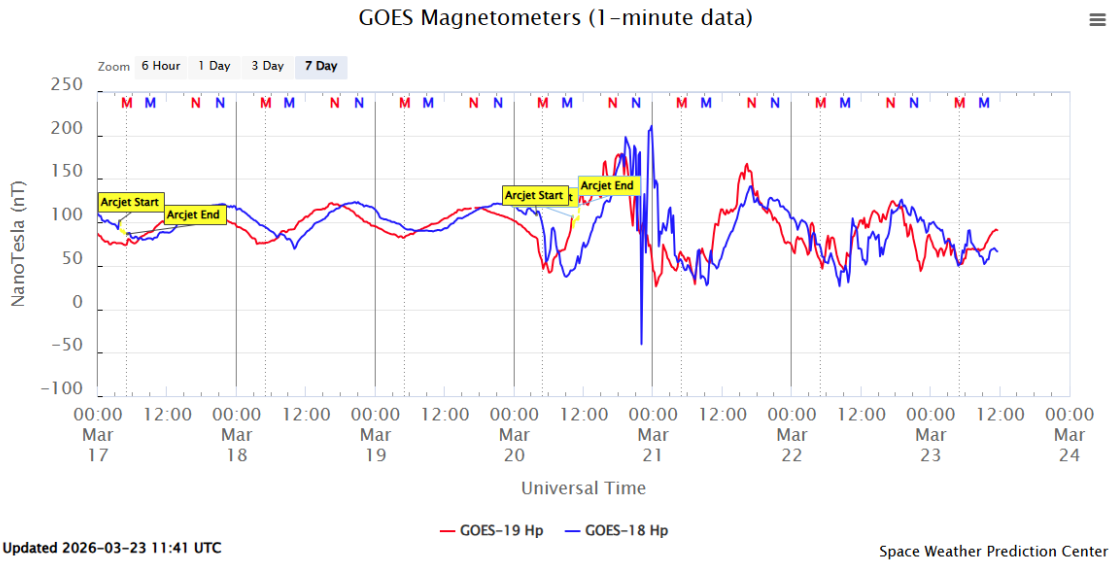

Figure 1 - Magnetic field measurement at the GOES satellite position.

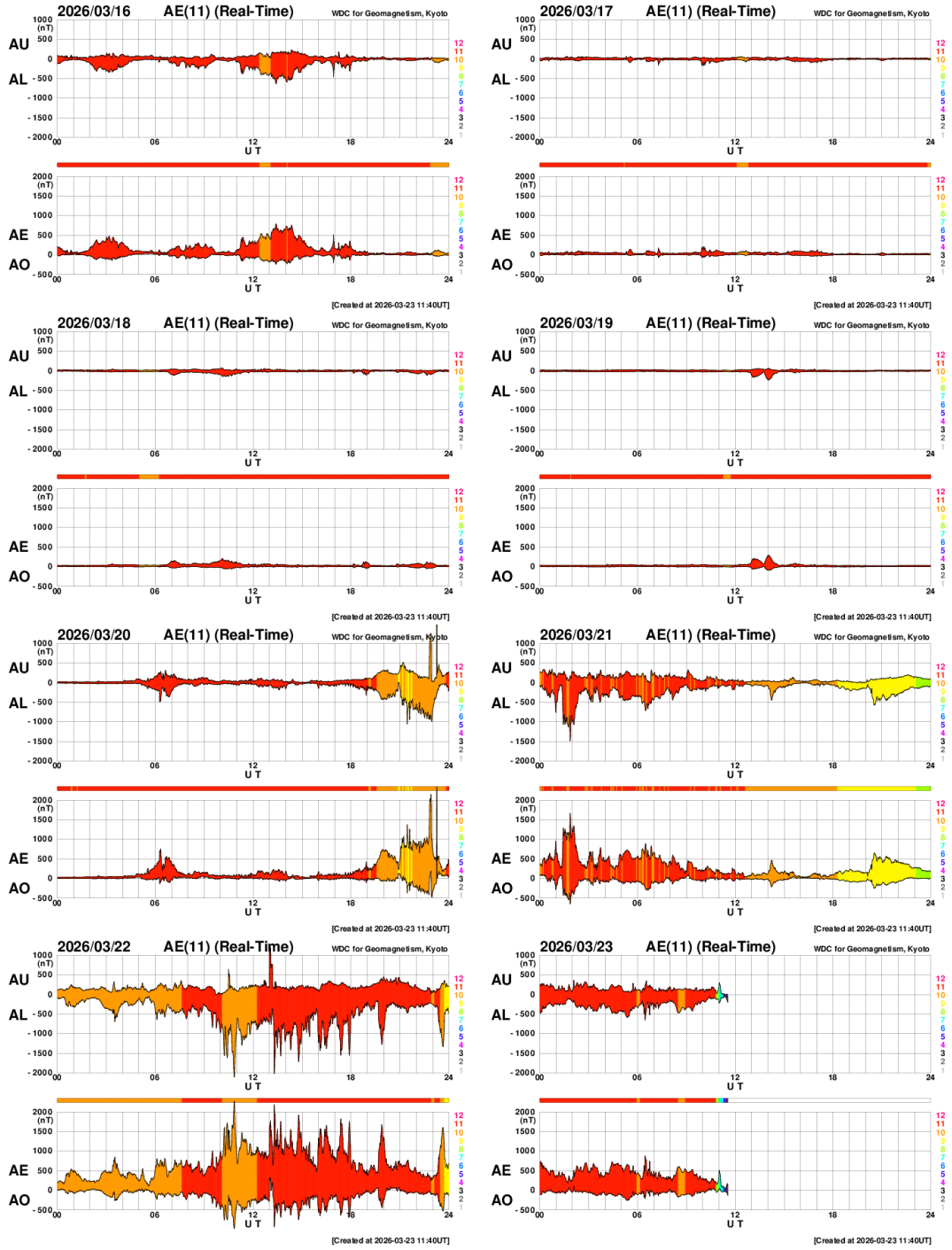

Figure 2 - AE index for the days of the week.

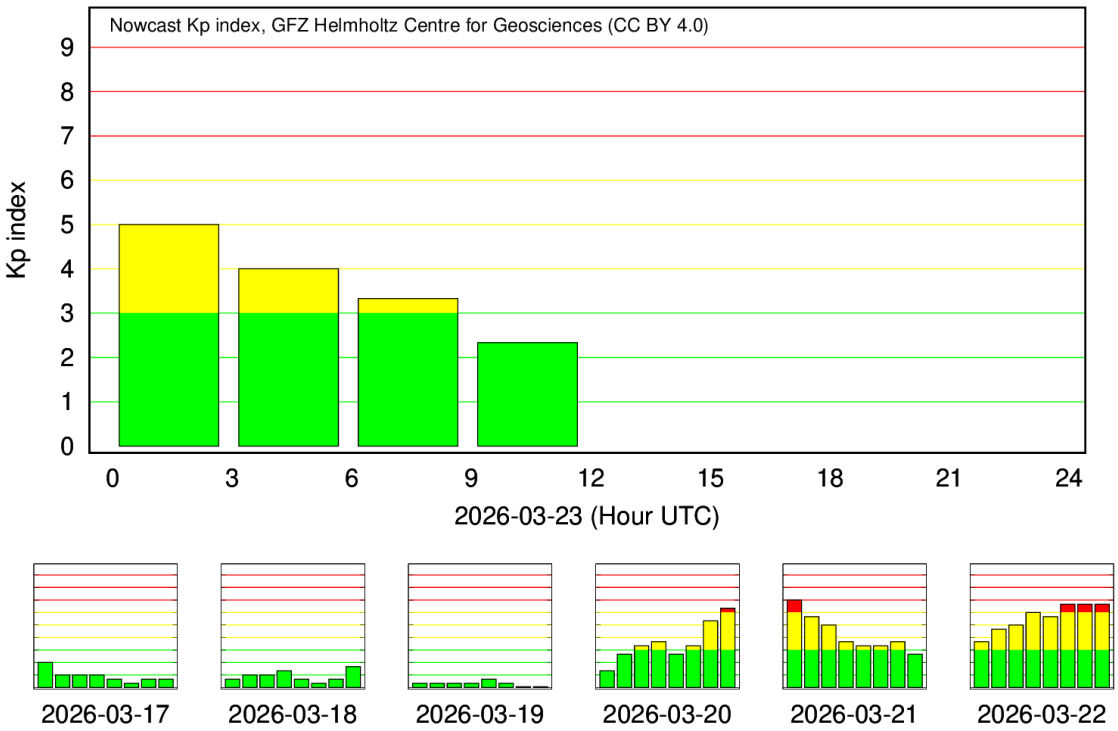

Figure 3 - Kp index on a logarithmic scale.

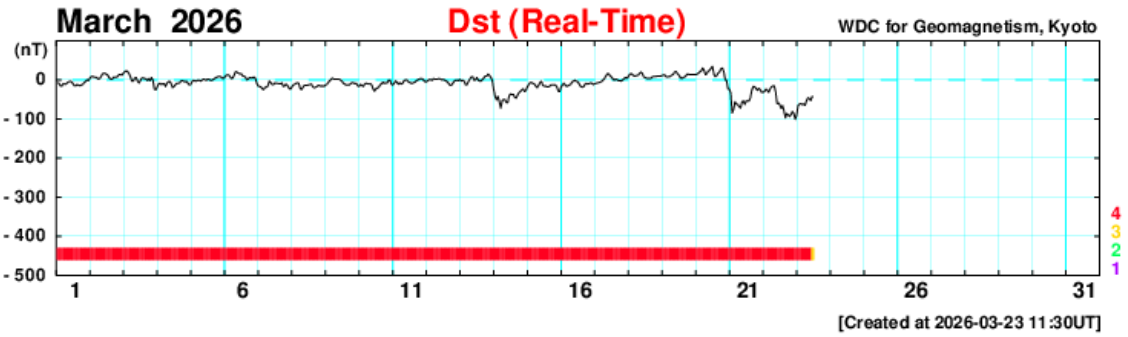

Figure 4 - Dst index.

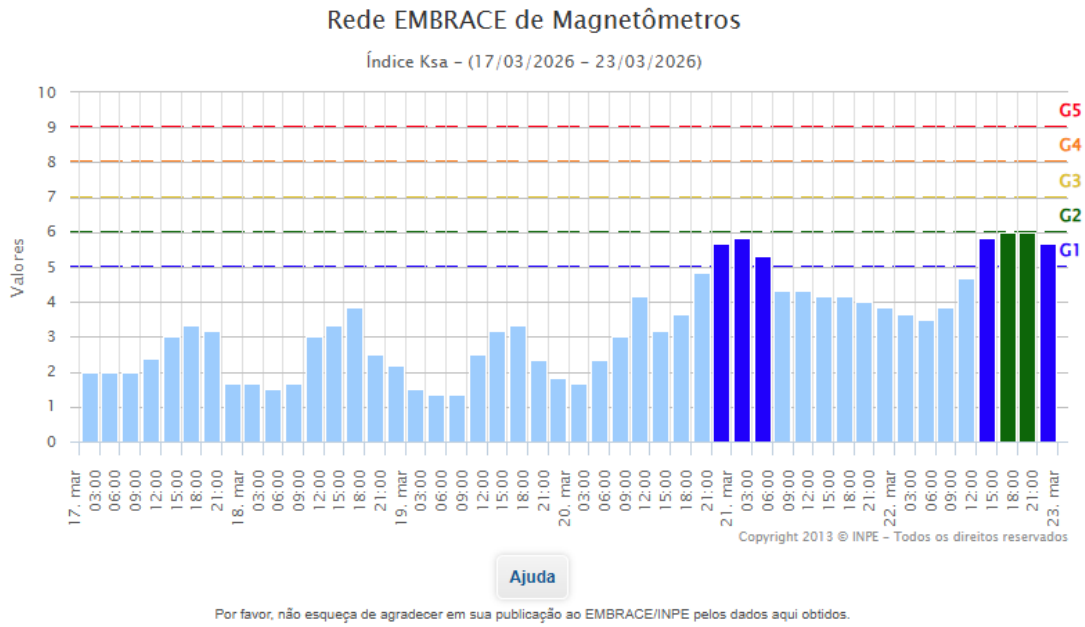

Figure 5 - Geomagnetic index in South America - Ksa Index.

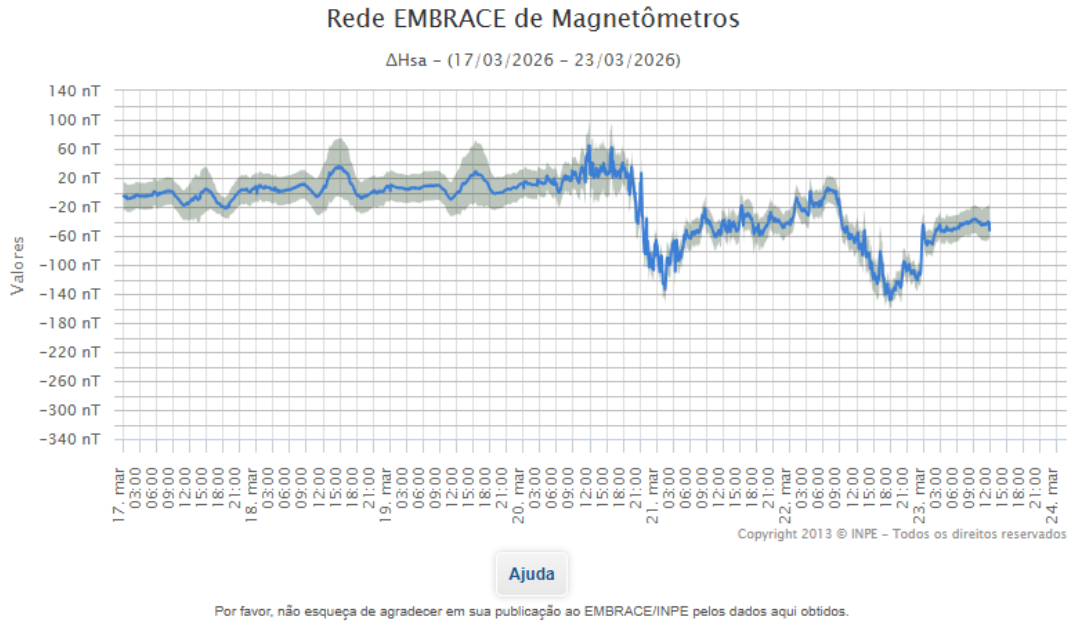

Figure 6 - Geomagnetic index in South America - ΔH index at magnetic stations of the EMBRACE Program.

Ionosfera – Digisonde (Laysa Resende)

Summary

During this week, spread F was observed at several Brazilian stations located near the magnetic equator and in the equatorial region, including Boa Vista and São Luís. However, no spread F was detected on March 21 and 22, which is likely related to the magnetic storm (Figure 1). Strong sporadic E (Es) layers were also recorded, reaching the maximum intensity level (index 4) over Boa Vista. In contrast, variations in the Maximum Usable Frequency (MUF) remained below the threshold required to classify the ionospheric conditions as moderate.

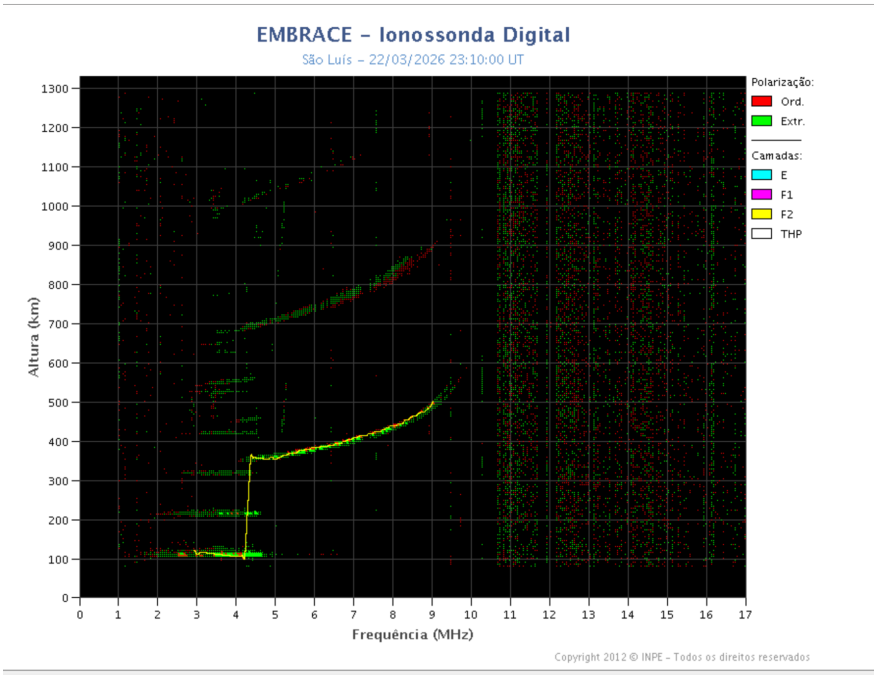

Figure 1 – Ionograms over São Luís showing the absence of spread F.