Sun – Solar Activity (Jean C. Santos)

Summary

The Sun exhibited high activity, with four active regions of high magnetic complexity (beta-gamma and beta-gamma-delta) present on the solar disk during the week. Sixty-five M-class and two X-class solar flares occurred during this period. The Cactus software identified 38 CMEs, none of which were 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 crossing the solar disk during this interval.

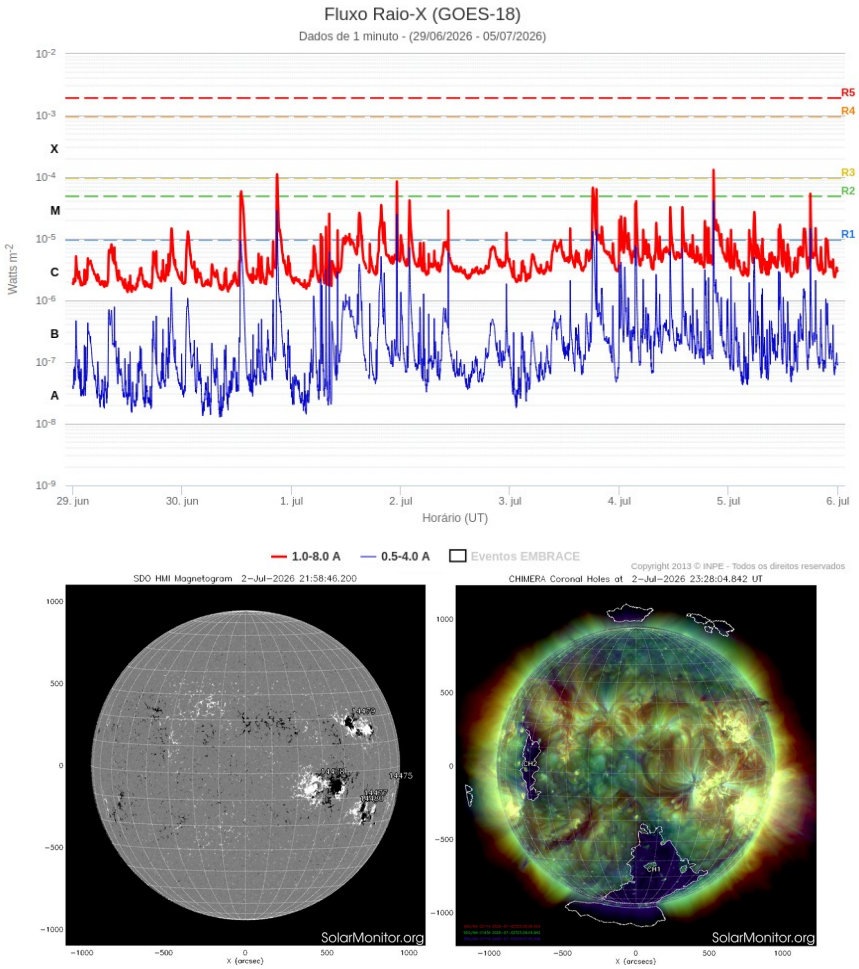

Figure 1 – X-ray flux measured by the GOES satellite (top panel) for the period from June 29 to July 5, line-of-sight magnetic field (bottom left panel), and 193-angstrom image (bottom right panel) measured on July 2, 2026.

Interplanetary Medium – IM – Daniele da S. F. Medeiros and Paulo R. Jauer
Period: June 29th to July 6th

Summary

Summary of interplanetary medium (IM) conditions for the last week. The IM region in the last week showed a moderate level of plasma disturbances due to the possible interaction with CME identified by the SOLAR 1 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 July 4th at 01:53 UT at +21.50 nT.

- The BxBy components presented variations in the analyzed period, keeping both oscillating within the interval [-18.29, +14.20] nT. Showing dez rotations of the By component.

- The Bz component presents negative values for most of the week with a maximum negative -18.74 nT at 04:13 UT on July 4th. It presented positive value of +21.80 nT on July 4th at 00:28 UT.

- The solar wind density maximum peaked on July 4th at 00:46 UT, reaching 35.80 protons/cm^3.

- The solar wind speed fluctuated between 318 to 639 km/s, with an increase beginning at 11:19 UT on July 3rd.

- Due to an issue with the availability of the DSCOVR solar wind data, only the observed Kp index is presented this week, as the model results could not be generated. The Kp index increased on July 4, reaching values above 7 (Kp > 7), corresponding to a indicating a strong geomagnetic storm (G3 level). By the end of the week, geomagnetic activity had decreased, with Kp values ranging between 2 and 4 (Kp < 4).

Figure 1 illustrates a set of parameters observed in the solar wind by the SOLAR 1 satellite. The measured solar wind parameters can be identified in the following order starting: Interplanetary magnetic field modulus (IMF), the Bx, By and Bz component, Solar wind density, speed and temperature.

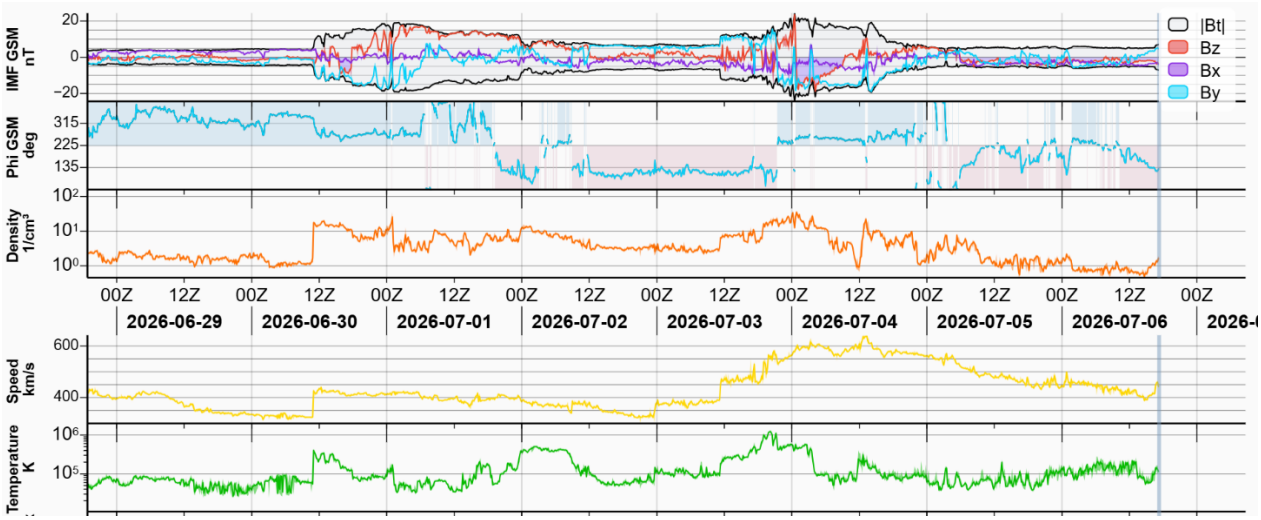

Figure 1: Illustrates a set of parameters observed in the solar wind by the SOLAR 1 satellite.

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.

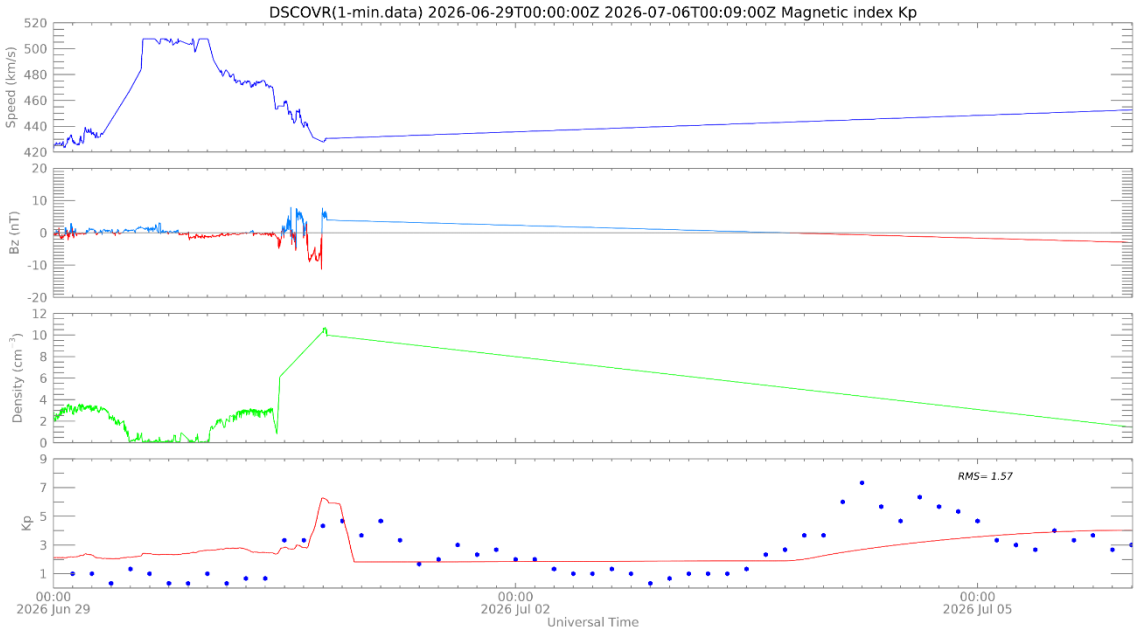

Figure 2: Illustrates a set of parameters observed in the solar wind by the DSCVR satellite and the Kp index by NOAA/SWPC, blue dot, and the modeling, red line.

EARTH'S RADIATION BELT

Responsible: Ligia Da Silva

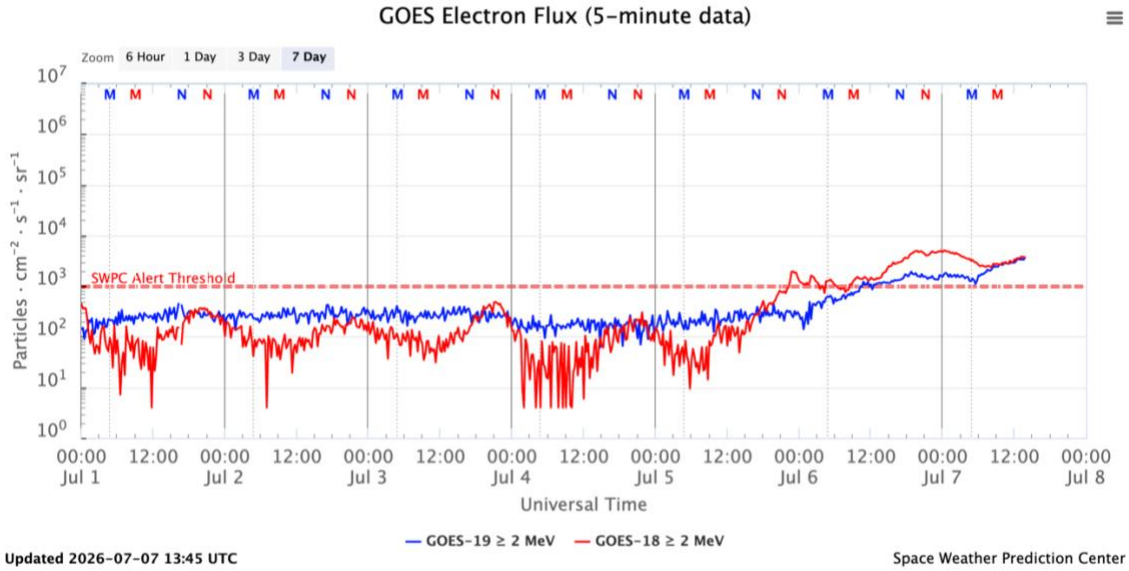

Figure 1: High-energy electron flux (> 2MeV) obtained from GOES-18 and GOES-19 satellite. Source: https://www.swpc.noaa.gov/products/goes-electron-flux

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) remains below the minimum alert threshold [10^3 particles/(cm² s sr)] until the end of July 5. A dropout is observed starting late on July 3, followed by an increase in flux that exceeded the alert threshold early on July 6.

Geomagnetic field

Responsible: Karen Sarmiento /Lívia Alves/Sony Su Chen

Summary

The period from 30 June to 6 July was marked by episodes of instability in the Earth's magnetic field, including the issuance of a G3 (Strong) geomagnetic storm warning.

Between 30 June and 1 July, geomagnetic activity exhibited periods of instability that did not develop into a G1 (Minor) geomagnetic storm. During this interval, the Kp index reached a maximum value of 5- between 15:00 UT and 21:00 UT on 30 June. The Ksa index recorded a maximum value of 4+ between 15:00 UT and 18:00 UT on the same day. In the auroral region, the AE index showed enhancements above 500 nT beginning at 12:00 UT on 30 June, with the most significant intensifications occurring between 17:00 UT and 20:00 UT. The Dst index reached a minimum value of -19 nT around 20:00 UT, while the dHsa index recorded a minimum of -46 nT on the same day.

Between 1 and 3 July, geomagnetic activity remained predominantly quiet, with only isolated periods of instability.

According to the geomagnetic storm forecast issued by NOAA/SWPC, the predominantly quiet geomagnetic conditions were expected to change from 3 July onward with the anticipated arrival of an interplanetary coronal mass ejection (ICME), which had the potential to trigger a geomagnetic storm.

The period from 3 to 6 July was characterized by a transition from predominantly quiet geomagnetic conditions to a geomagnetic storm, with intensity ranging from G1 (Minor) to G3 (Strong).

Magnetometers from the EMBRACE/INPE Program detected the arrival of a first interplanetary structure at approximately 12:00 UT on 3 July, although no geomagnetic storm developed at that time. A second structure reached Earth at 22:00 UT on the same day, triggering a G3 (Strong) geomagnetic storm (Kp=7+). In the South American sector, the Ksa index reached a maximum value of 6o (G2). The storm reached its minimum phase around 08:00 UT on 4 July, with Dst=-150 nT and dHsa=-139 nT.

On 4 July, additional interplanetary magnetic structures were detected. During this period, geomagnetic activity intensified again between 12:00 UT and 15:00 UT, reaching Kp=7-, although it did not exceed the maximum intensity previously observed. Auroral activity remained enhanced throughout much of 4 July, with the AE index remaining above 500 nT and reaching peaks above 1000 nT during the intervals 02:00-10:00 UT and 14:00-17:00 UT.

Following the storm peak, the geomagnetic field entered its recovery phase. During the last 24 hours, geomagnetic activity has remained below the G1 storm threshold (Kp=5o), although occasional periods of instability are still being observed.

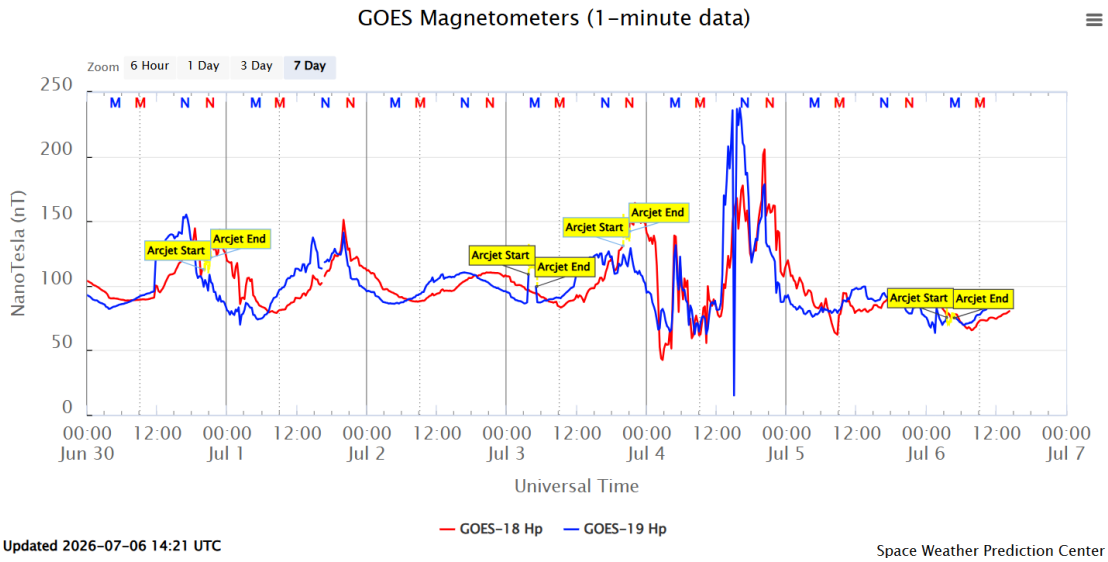

Figure 1 - Magnetic field measurement at the GOES satellite position.

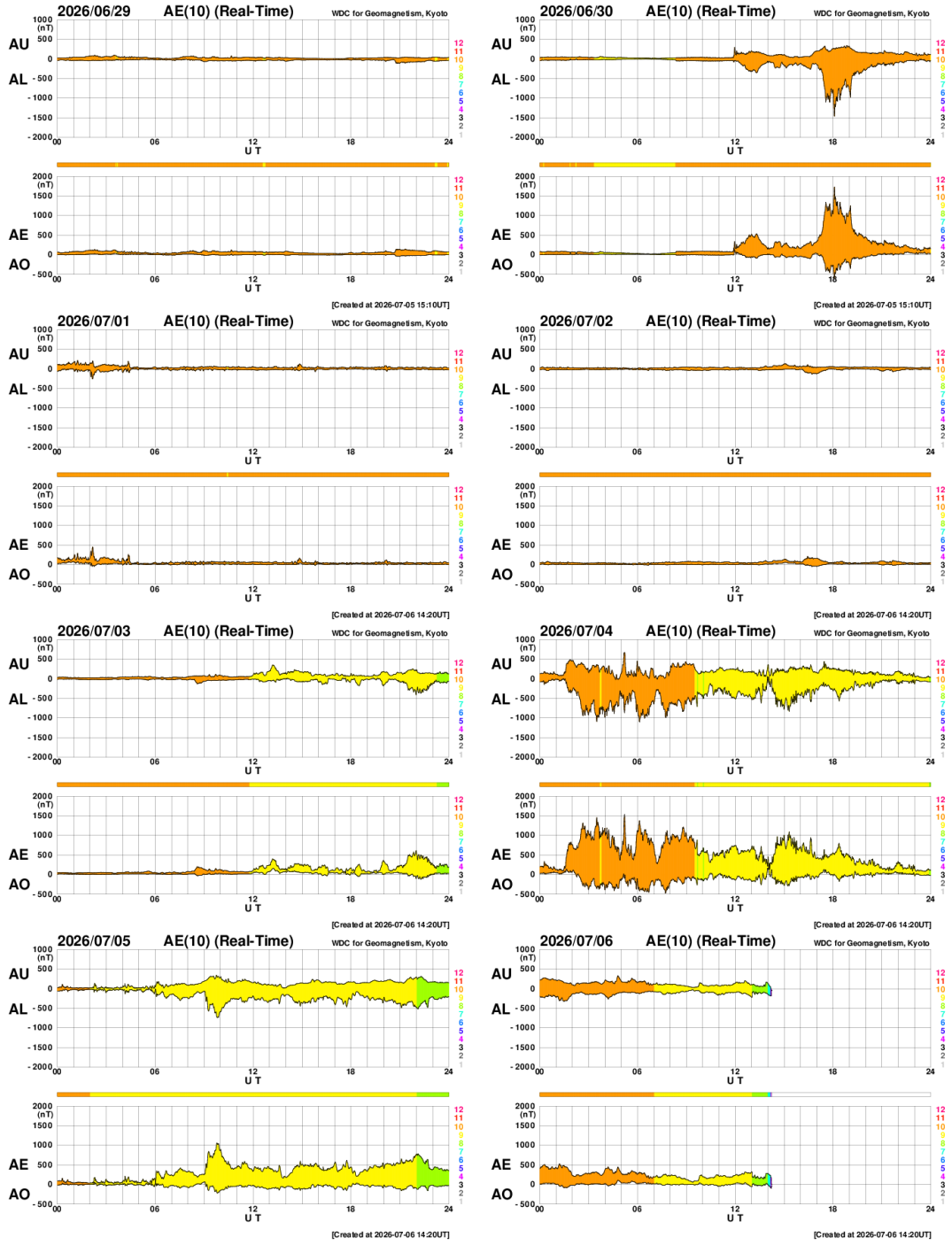

Figure 2 - AE index for the days of the week.

Figure 3 - Kp index on a logarithmic scale.

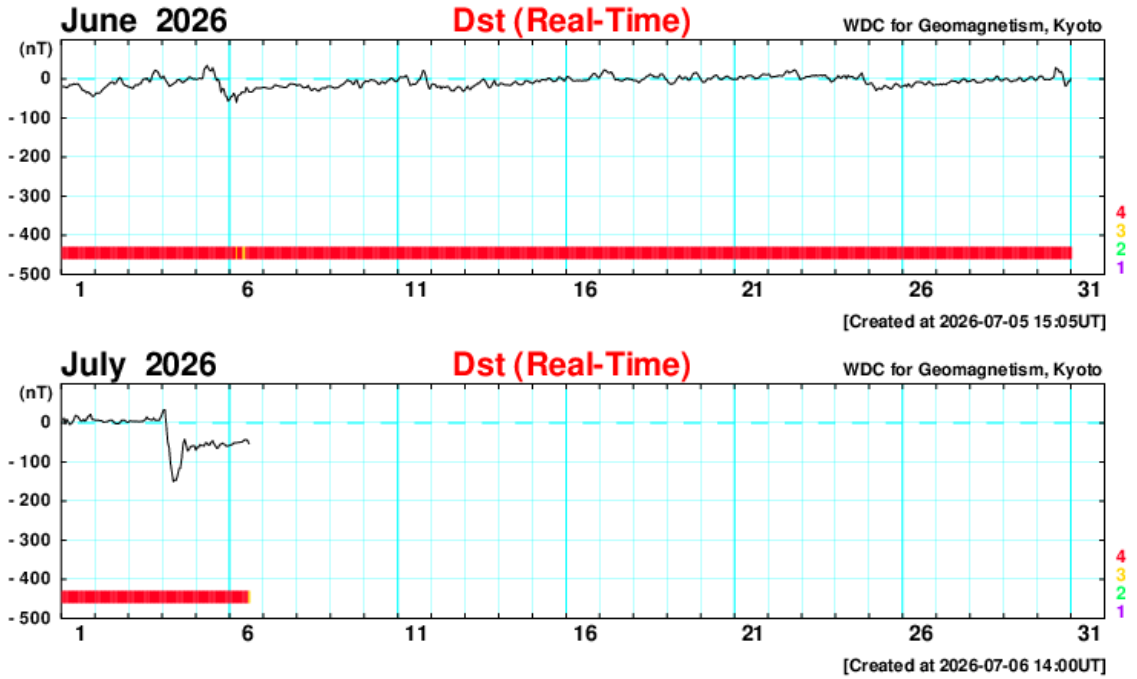

Figure 4 - Dst index.

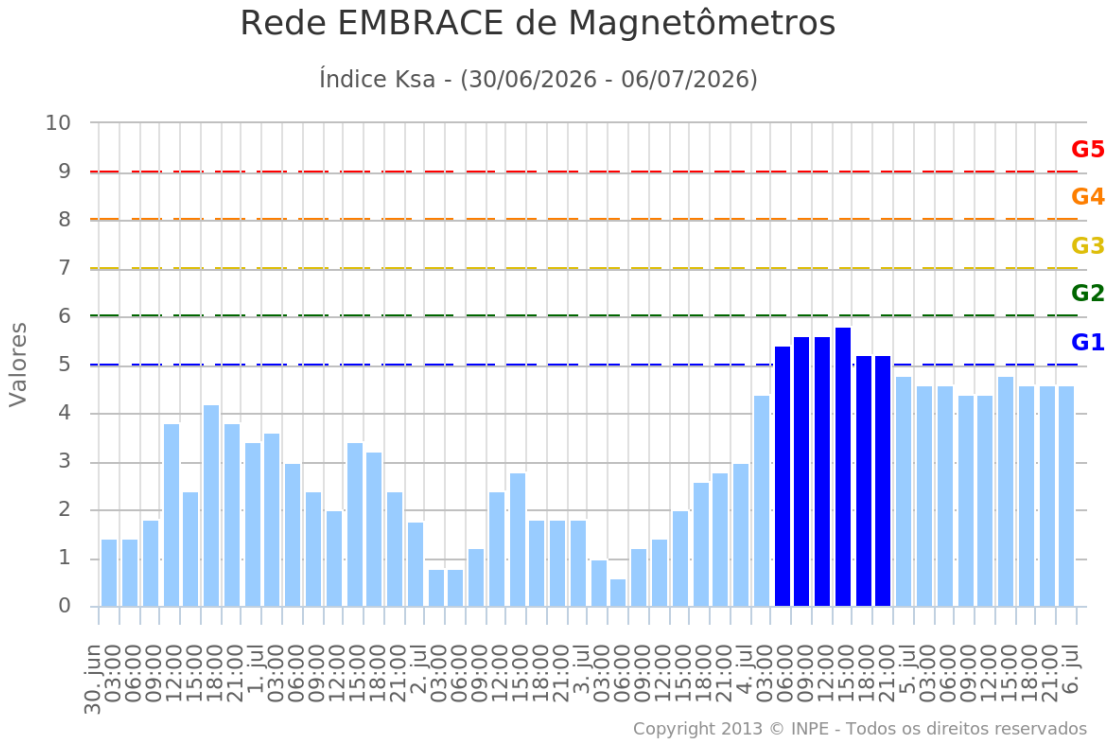

Figure 5 - Geomagnetic index in South America - Ksa Index.

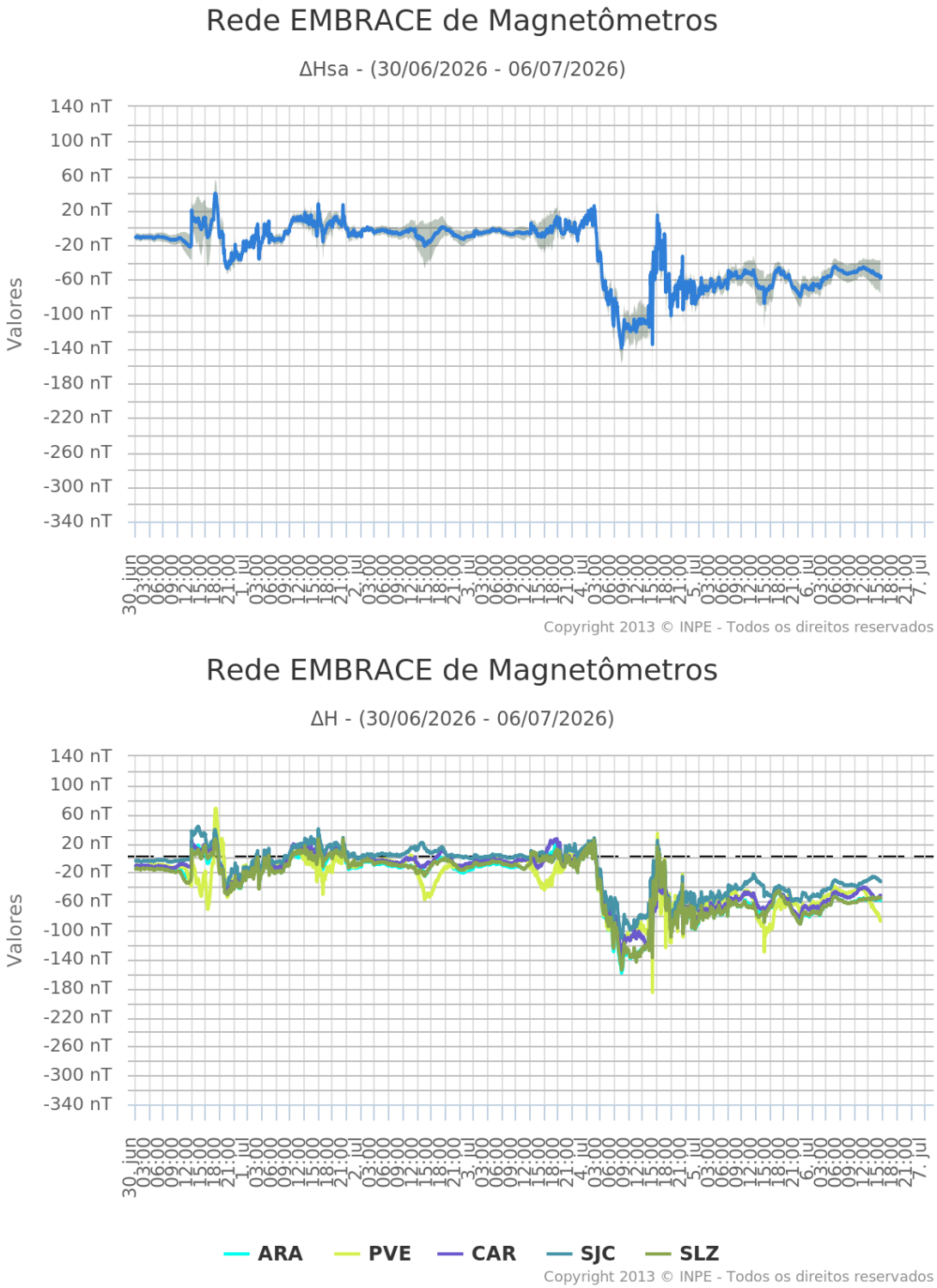

Figure 6 - Geomagnetic index in South America - ΔH index and at magnetic stations of the EMBRACE Program.

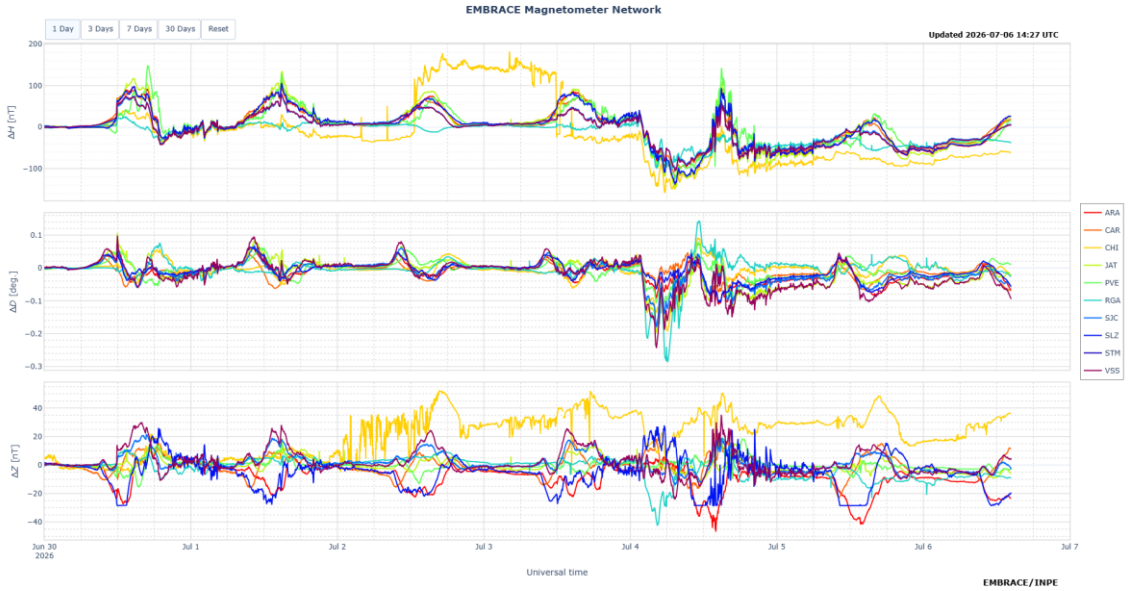

Figura 7 – Variation of the geomagnetic field at the magnetic stations of the EMBRACE Program.

Ionosfera – Digisonde (Laysa Resende)

Summary

This week, spread F and an F3 layer were observed over Boa Vista. Sporadic E (Es) layers reached scale 4 over Boa Vista on July 1 (Figure 1).

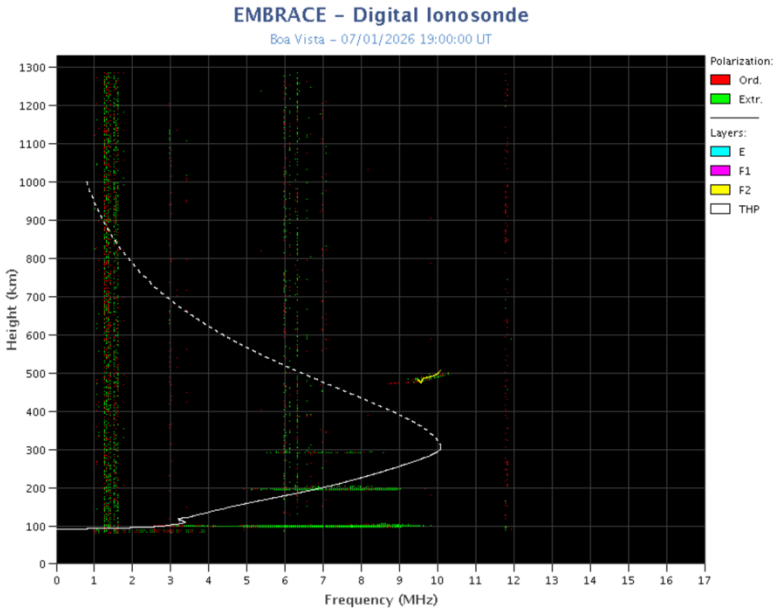

Figure 1 –Ionogram over Boa Vista, showing the Es layer on scale 4.

Ionospheric F2-Layer Irregularities

Summary

During the period from June 28 to July 04, 2026, the parameters of F2-layer height (derived from the mean ionosonde fixed frequencies in the 3–10 MHz range), vertical drift velocity, total electron content (TEC), ionospheric scintillation index (S4), and images of the atomic oxygen red-line emission (OI 630 nm) were analyzed in order to monitor F2-layer ionospheric irregularities over South America.

The maximum F2-layer height associated with the pre-reversal enhancement ranged from 468 to 497 km, while the vertical drift velocity varied between 14 and 33 m/s (Figure 1).

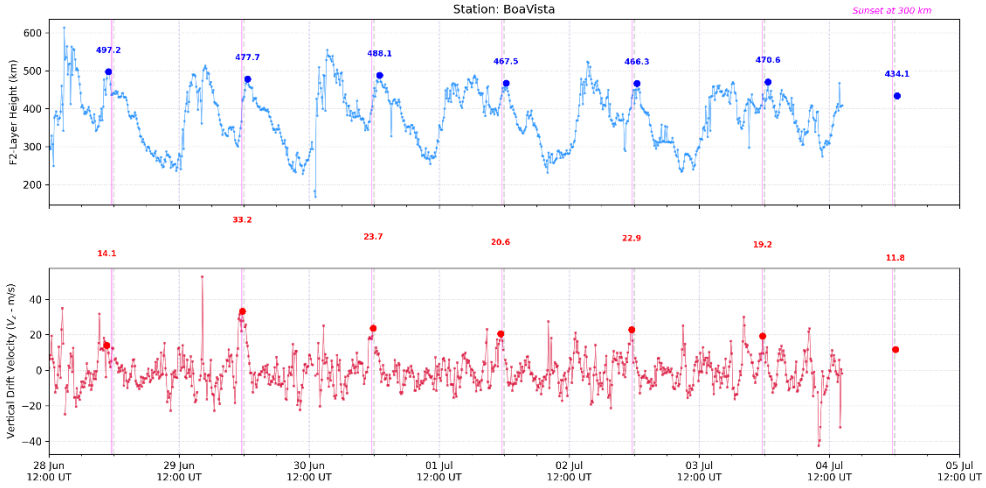

Figure 1 – F2-layer height (upper panel) and vertical drift velocity (lower panel).

The Equatorial Ionization Anomaly (EIA) was observed only on July 4. TEC reached maximum values of approximately 65 TECU at the southern crest of the EIA. S4 values remained low throughout the week (S4 < 0.5), indicating quiet conditions. Furthermore, no signatures of equatorial plasma bubble (EPB) events were detected in the observations (Figure 2).

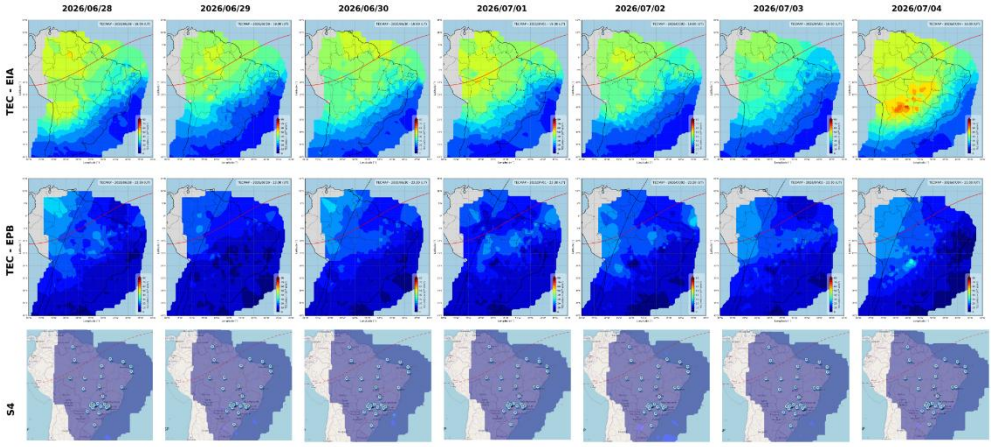

Figure 2 – Total electron content (TEC) maps (upper and middle panels) and S4 index (lower panel).

No OI 630.0 nm images of sufficient quality were available for analysis throughout the week.