Briefing Space Weather

2023/04/19

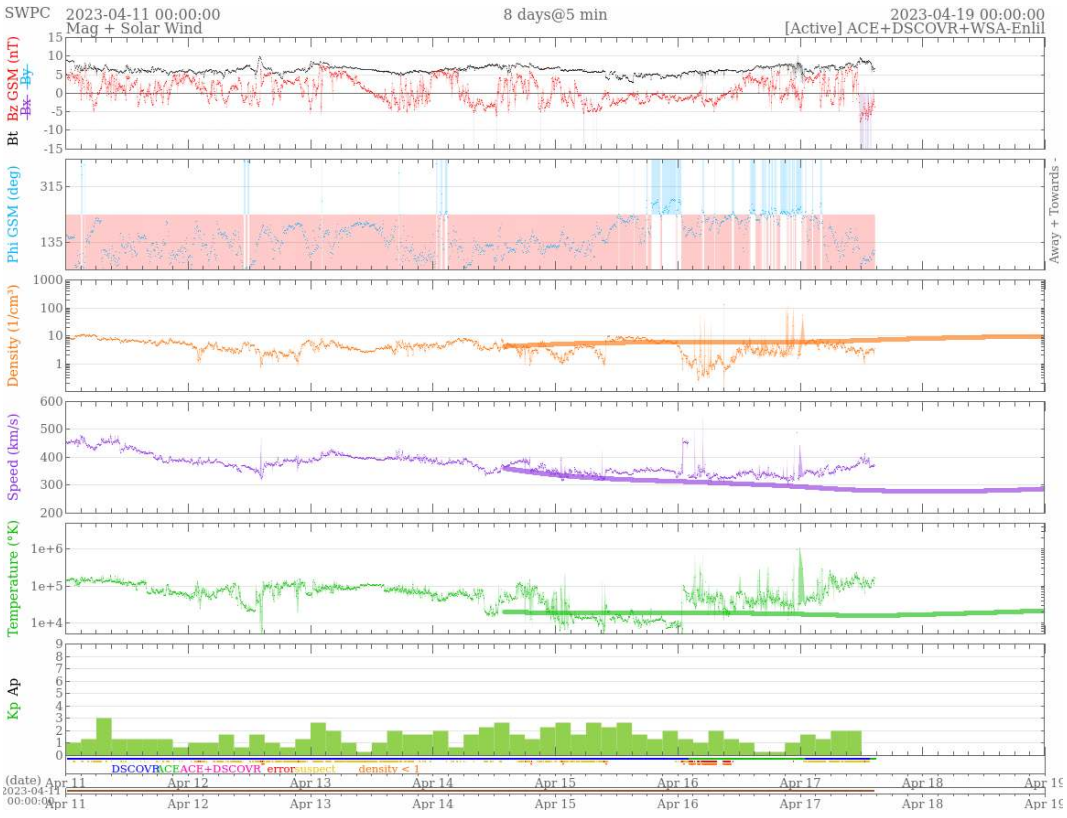
1 Sun

1.1 Responsible: José Cecatto

04/10 – M2.8 flare; Fast wind stream (=< 550 km/s); 1 CME c.h.c. toward the Earth;
04/11 – M1.3 flare; Fast wind stream (=< 450 km/s); 6 CME c.h.c. toward the Earth;
04/12 – No flare; No fast wind stream; 3 CME c.h.c. toward the Earth;
04/13 – No flare; Fast wind stream (=< 450 km/s); 8 CME c.h.c. toward the Earth;
04/14 – M1.1, M1.5 flares; No fast wind stream; 4 CME c.h.c. toward the Earth;
04/15 – No flare; No fast wind stream; 3 CME c.h.c. toward the Earth *;
04/16 – No flare; No fast wind stream; 4 CME c.h.c. toward the Earth;
04/17 – No flare; Since noon time fast wind stream (>= 400 km/s); 3 CME c.h.c. toward the Earth;
Prev.: Fast wind stream for the next 01-02 days; for the next 2 days (50% M, 10% X) probability of M / X flares; also,
occasionally other CME can present component toward the Earth.
c.h.c. – can have a component; * partial halo; ** halo

2 Interplanetary Medium

2.1 Responsible: Paulo Jauer



- The interplanetary medium region in the last week showed a low/moderate level of plasma perturbations due to the possible interaction of CME and HSS-like structures identified by the DSCOVR satellite in the interplanetary medium.
- The modulus of the interplanetary magnetic field component showed a peak of 12.8 nT on Apr/10 at 7:30 am during the analyzed period.
- The BxBy components presented variations in the analyzed period, keeping both oscillating within the interval [+5, -5] nT, with the presence of a sector boundary crossing on 10/Apr at 06:30 UT.
- The bz field component showed a minimum value of -6.02nT on Apr/10 at 05:30 UT and a maximum positive value of 7.92 nT on Apr/10 at 08:30 UT. In the remainder of the period, the bz component fluctuated in the interval [+5, -5] nT.
- The solar wind density had a maximum peak on 10/Apr at 05:30 of 26 p/cm^3, however the density remained on average below 10 p/cm^3 for the remainder of the period.
- The solar wind speed remained on average above 400 km/s with a maximum peak on Apr/10 at 13:30 UT of 529 km/s, and a minimum value on Apr/10 at 05:30 UT of 327 km/s.
- The position of the magnetopause was oscillating with a minimum value recorded on 10/Apr at 05:30 UT of 8.4 Re. On average, the position of the magnetopause was above the equilibrium position.

3 Radiation Belts

3.1 Responsible: Ligia Alves da Silva

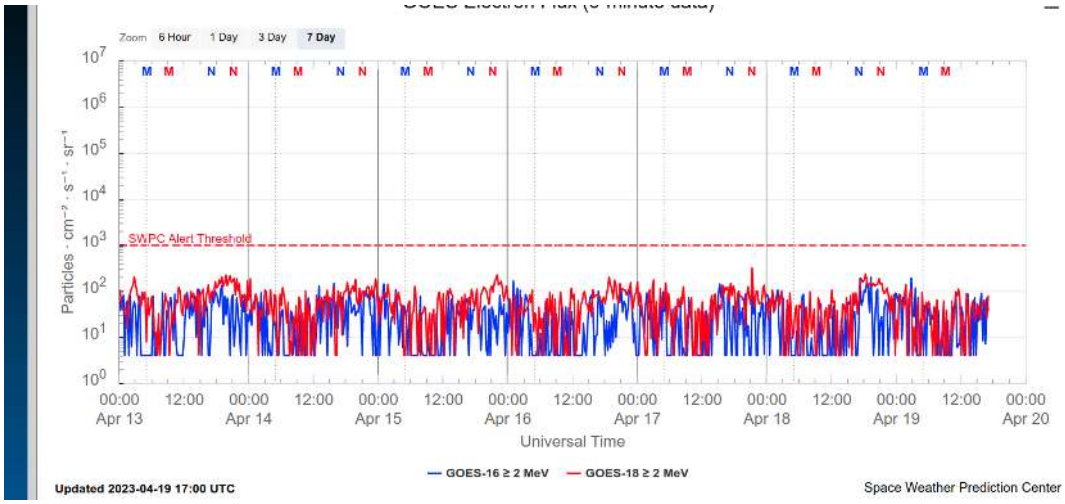


Figura 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-18 satellite. Source: `https://www.swpc.noaa.gov/products/goes-electron-flux`

High-energy electron flux (> 2 MeV) in the outer boundary of the outer radiation belt obtained from geostationary satellite data GOES-16 and GOES-18 (Figure 1) is close to 10^2 particles/$(cm^2 ssr)$ on April 13rd-20th, indicating that it did not show significant variability in the analyzed period.

4 ULF waves

4.1 Responsible: Graziela B. D. Silva

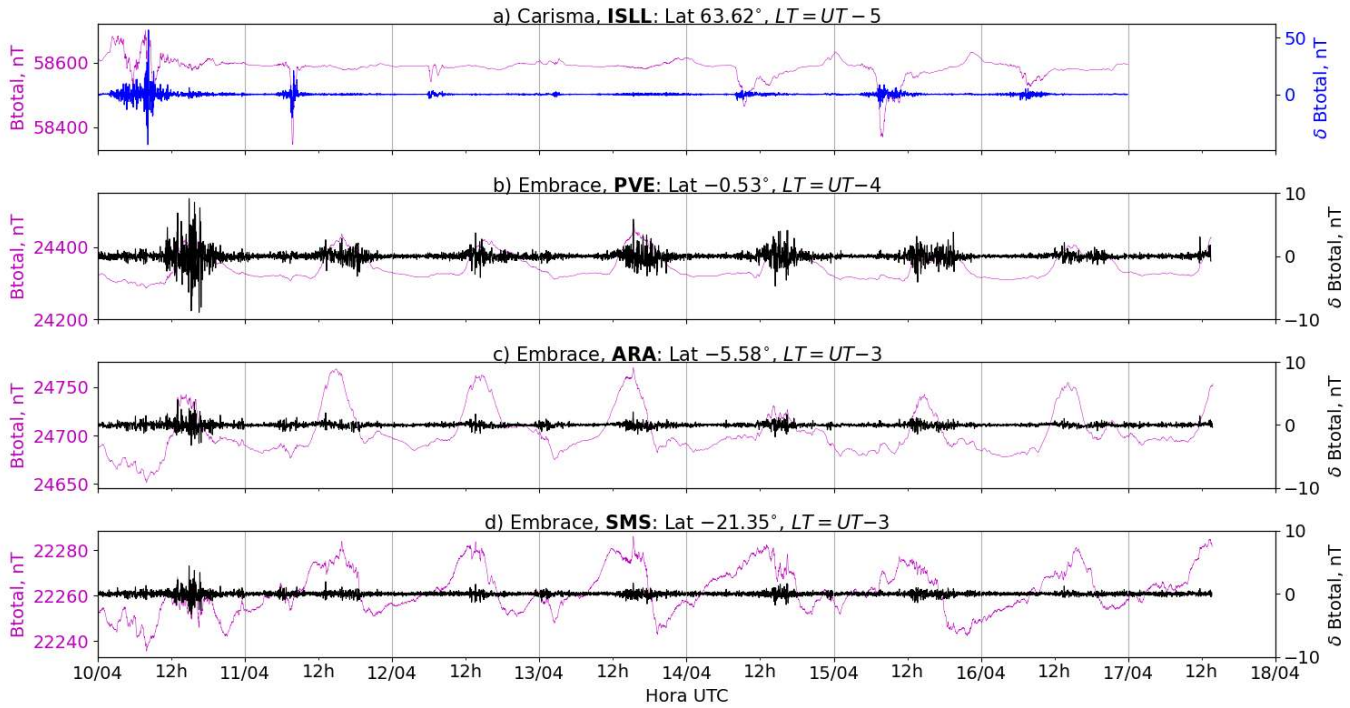


Figura 2: a) Timeseries of the geomagnetic field total component measured at ISLL station (Island Lake) of the CARISMA magnetometer network in magenta, along with the associated perturbation in the Pc5 band shown in blue. b-d) timeseries of the geomagnetic field total component measured at stations PVE (Porto Velho), ARA (Araguatins), and SMS (São Martinho da Serra) of the EMBRACE network in magenta, along with the Pc5 perturbation in blue.

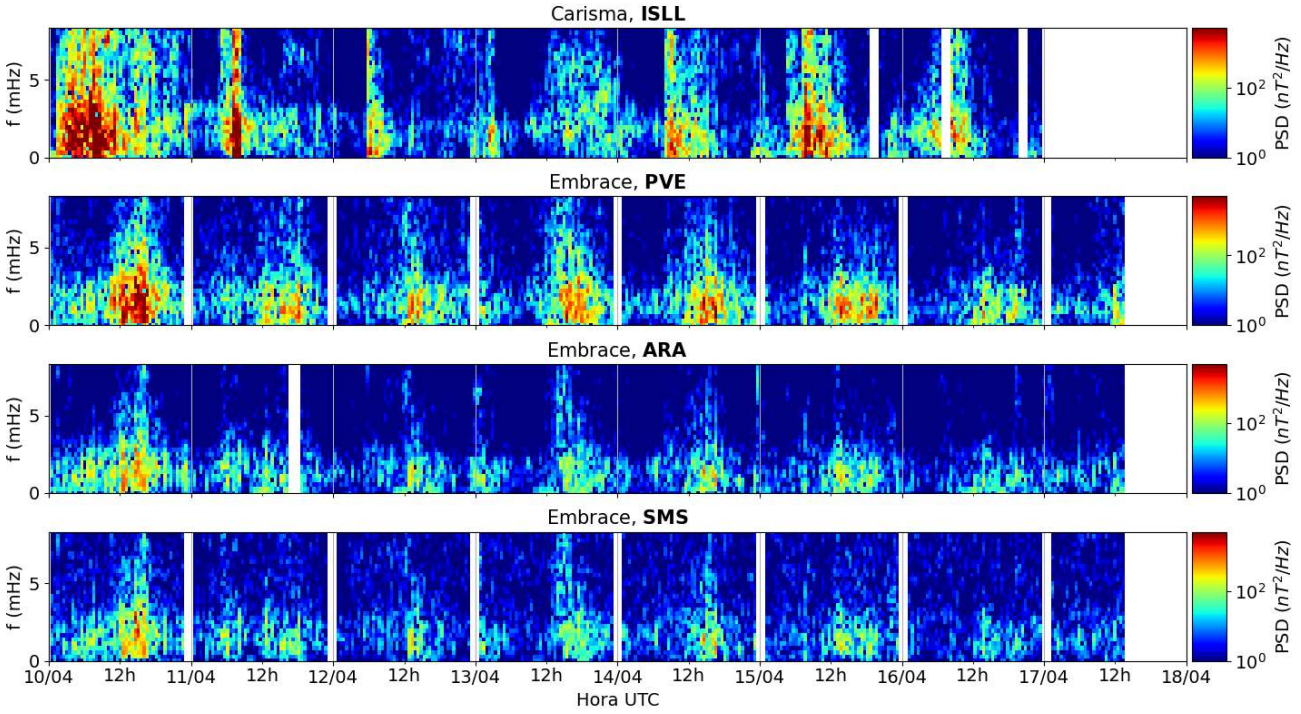


Figura 3: a-d) Time evolution of the power spectral density obtained from the filtered timeseries of the geomagnetic field total component (δ Btotal) for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, ARA, SMS).

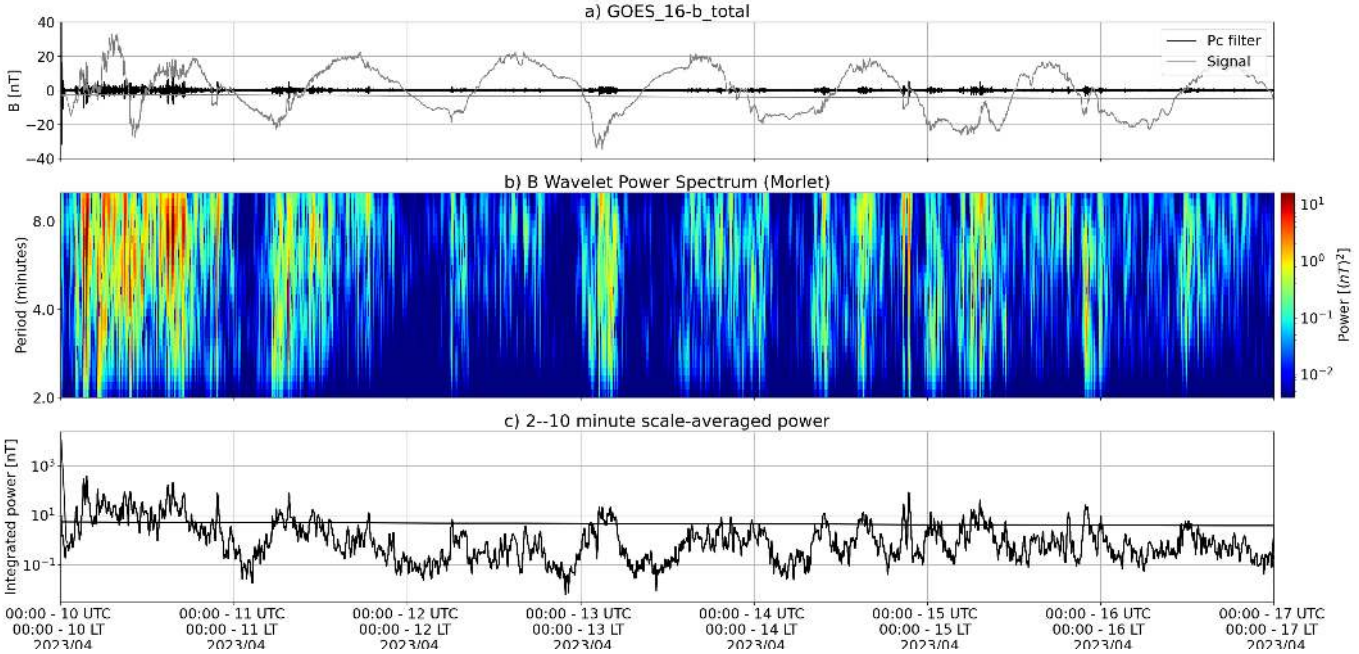


Figura 4: a) Timeseries of the geomagnetic field total component measured by GOES 16, together with the Pc5 fluctuation in black. b) Wavelet power spectrum of the filtered timeseries. c) Average ULF power in the period range from 2 to 10 minutes.

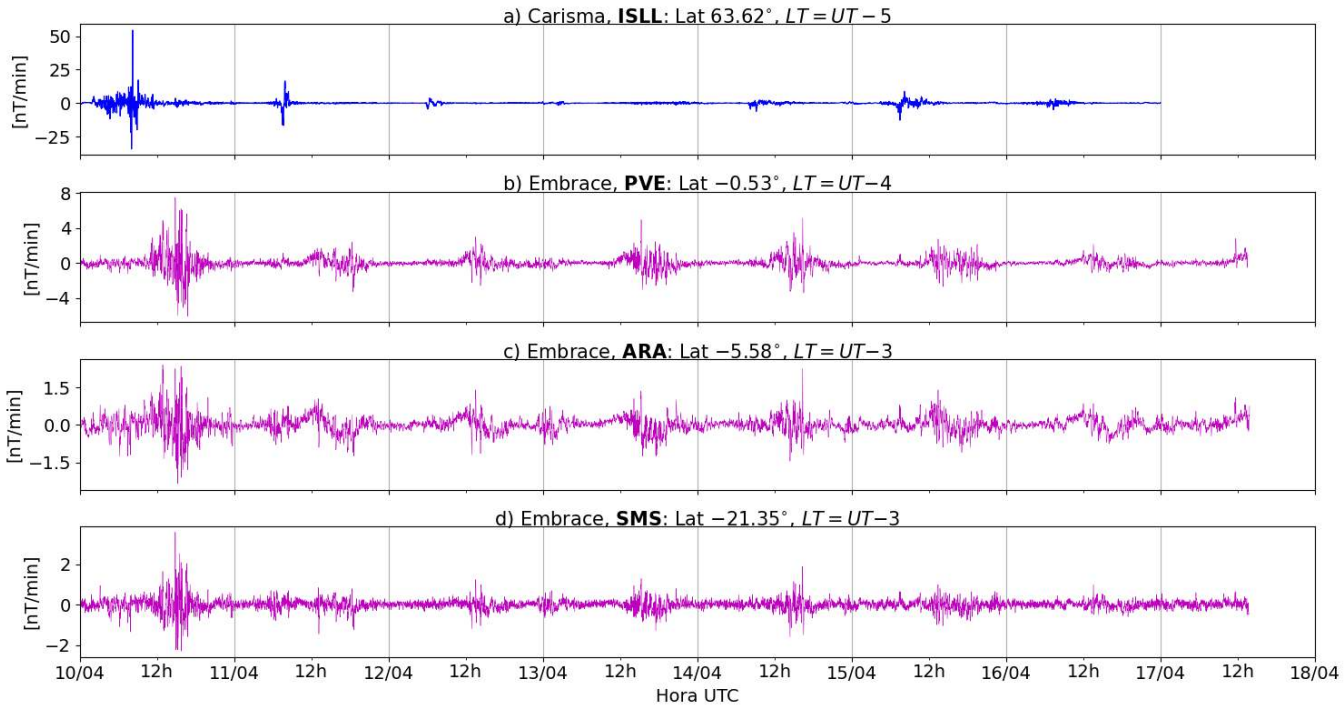


Figura 5: a-d) The rate of change of the geomagnetic field total component (dB/dt) obtained for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, ARA, SMS).

- The GOES 16 satellite in geosynchronous orbit (L $\sim$ 6.6) registered an intense activity of Pc5 ULF waves on April 10.
- As observed on the ground, the ISLL station at high latitude registered significant levels of ULF wave activity over the week, especially on this day.
- The PVE station from Embrace MagNet, located under the dip equator, registered significant levels of ULF wave activity over these days, however, with a strong diurnal influence by the equatorial electrojet. But April 10 was the most active day for the ULF waves.
- The ARA and SMS stations at low latitudes of Brazil did register significant activity of the waves on April 10, but with lower intensity compared to the power spectral results of PVE.
- The dB/dt rates were enhanced on April 10 in all stations, but they reached significant levels in PVE (equatorial region: 8 nT/min) and in ISLL (high latitude: 50 nT/min).

5 Geomagnetic activity

5.1 Responsible: Lívia Alves/Leonardo Klaus

The figure below show that the week of April 10 the maximum Kp index was 3+ at 3 and 6 UT (Graph 1), and that this was the maximum value of the week (Graph 2). The auroak index AE was below 500 nT on April 10 (Graph 3) and throughout the week. On April 10 the most geomagnetically active conditions were observed, but since the Dst index was never below -50 nT, there were no geomagnetic storm over the week.

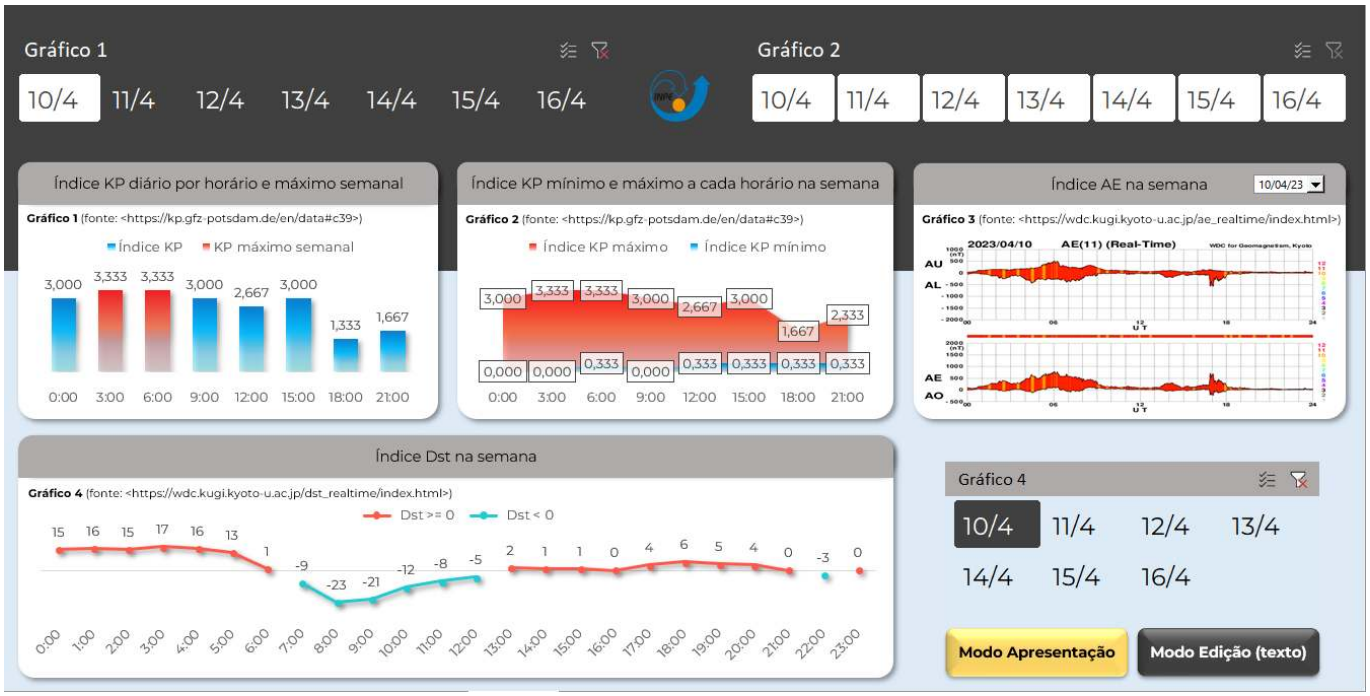


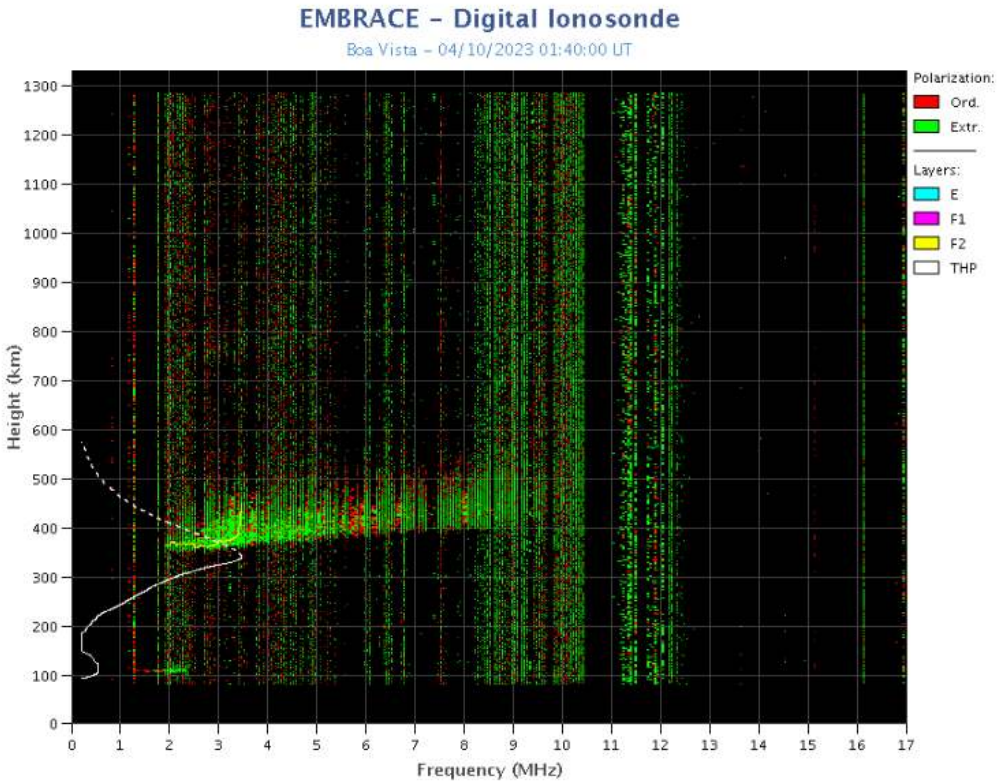
Figura 6: Time evolution of the geomagnetic indices on April 10 and over the reported week.

6 Ionosphere

6.1 Responsible: Laysa Resende

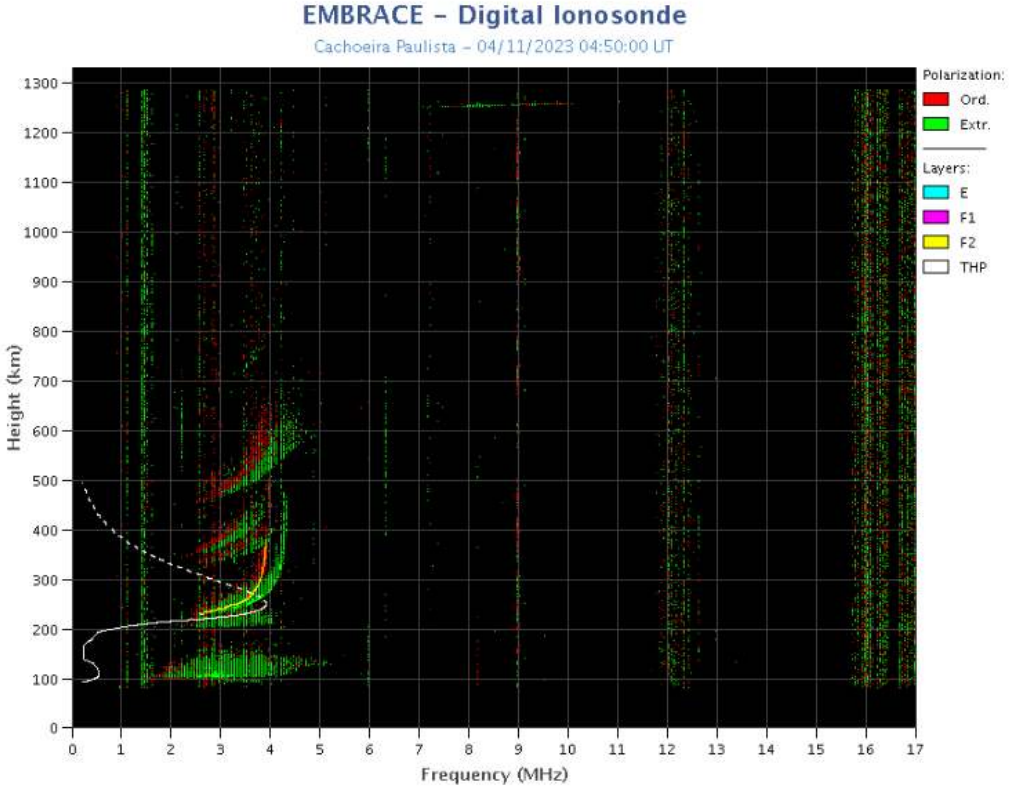
Boa Vista:

- There were spread F during all days in this week.
- The Es layers reached scale 2 in this week.



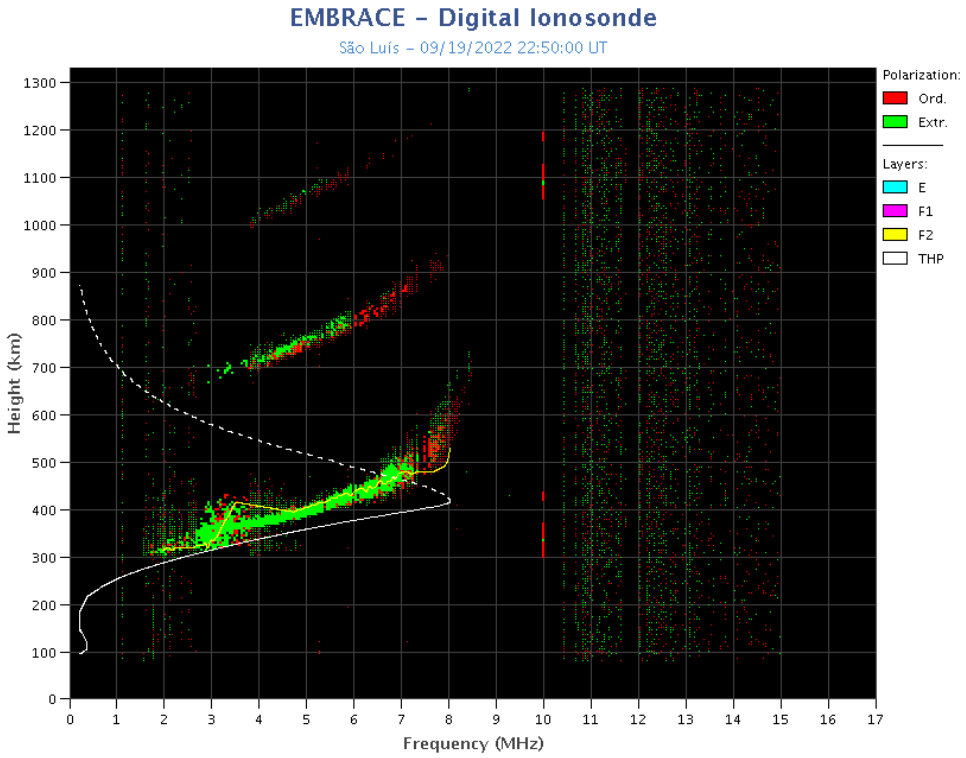
Cachoeira Paulista:

- There were not spread F during all days in this week.
- The Es layers reached scale 2 and 3 during the week.



São Luís:

- There were spread F during all days in this week.
- The Es layers reached scale 2 during all days in this week.



7 ROTI

7.1 Responsible: Carolina de Sousa do Carmo

In the week 2257 (April 09 to 15, 2023) there were ionospheric irregularities (plasma bubble), on all analyzed days, in the equatorial region, being less intense on the night of the 13th to the 14th. Figure 7 shows the ROTI time series for four stations in the Brazilian sector (Natal (RNNA), Bacabal (MABB), Cuiabá (CUIB) and São José dos Campos (SJSP)).

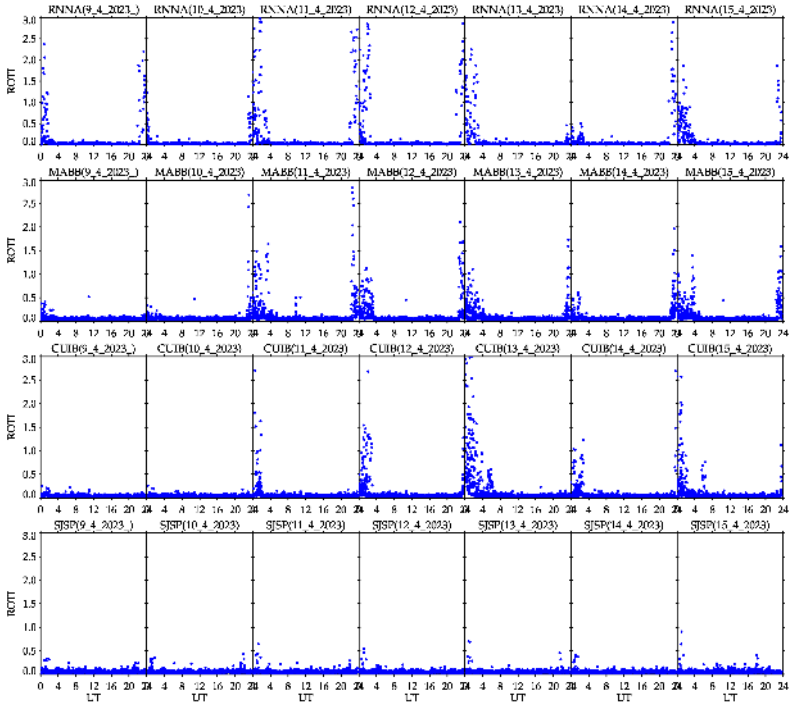


Figura 7: ROTI time series for four stations in the Brazilian sector (Natal (RNNA), Bacabal (MABB), Cuiabá (CUIB) and São José dos Campos (SJSP)), from April 09 to 15, 2023.