Briefing Space Weather

2022/10/25

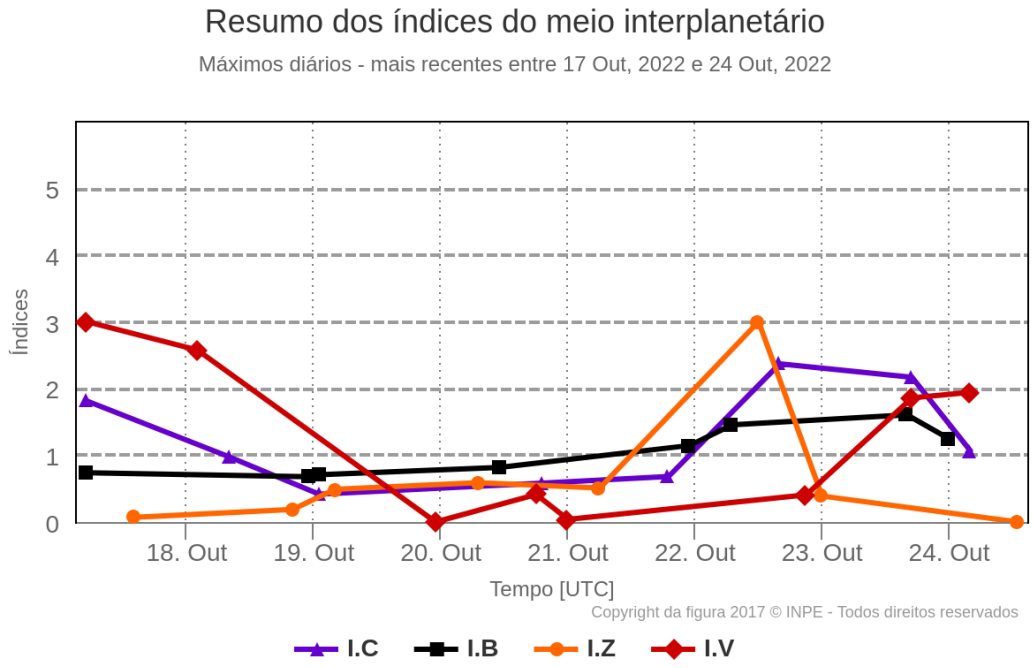
1 Sun

1.1 Responsible: José Cecatto

10/17 – No flare (M/X); Fast wind stream (=< 600 km/s); 5 CME c.h.c. toward the Earth;
10/18 – No flare (M/X); Fast wind stream (=< 550 km/s); 4 CME c.h.c. toward the Earth;
10/19 – No flare (M/X); Fast wind stream (=< 500 km/s); 6 CME c.h.c. toward the Earth;
10/20 – No flare (M/X); Fast wind stream (=< 450 km/s); 6 CME c.h.c. toward the Earth;
10/21 – No flare (M/X); No fast wind stream; 4 CME c.h.c. toward the Earth;
10/22 – No flare (M/X); No fast wind stream; 1 CME c.h.c. toward the Earth;
10/23 – No flare (M/X); Fast wind stream (=< 550 km/s); 4 CME c.h.c. toward the Earth;
10/24 – No flare (M/X); Fast wind stream (=< 550 km/s); 1 CME c.h.c. toward the Earth;
Prev.: Fast wind stream expected up to October 25; for the next 2 days (05% M, 01% 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 nT on Oct 23 at 16:30 during the analyzed period.
- The BxBy components showed variations in the analyzed period, both remaining oscillating within the [+10, -10] nT interval, without the presence of sector boundary crossings. However, the components presented a rotation that started on Oct/21 at 11:30, characteristic of a MC.
- The component of the bz field presented a rotation that started on 21/Oct at 22:30 UT, and a minimum value of -10.3 nT at 11:30 on Oct/22.
- The solar wind density showed a minimum value on Oct 10 19:30 UT of 1.2 p/cm^3, and a maximum peak on Oct 22 at 16:30 UT 22 p/cm^3 . However, the density remained on average below 12 p/cm^3 in the rest of the period.
- The solar wind speed peaked on Oct 17 at 05:30 UT of 595 km/s. During the analyzed period the speed had a decrease reaching a minimum value of 333 km/s on the 22/Oct at 19:30. After this minimum value, the speed returned to oscillate above 400 km/s.
- The position of the magnetopause was oscillating with a minimum value recorded on 22/Oct at 15:30 UT of 7.9 Re.

3 Radiation Belts

3.1 Responsible: Ligia Alves da Silva

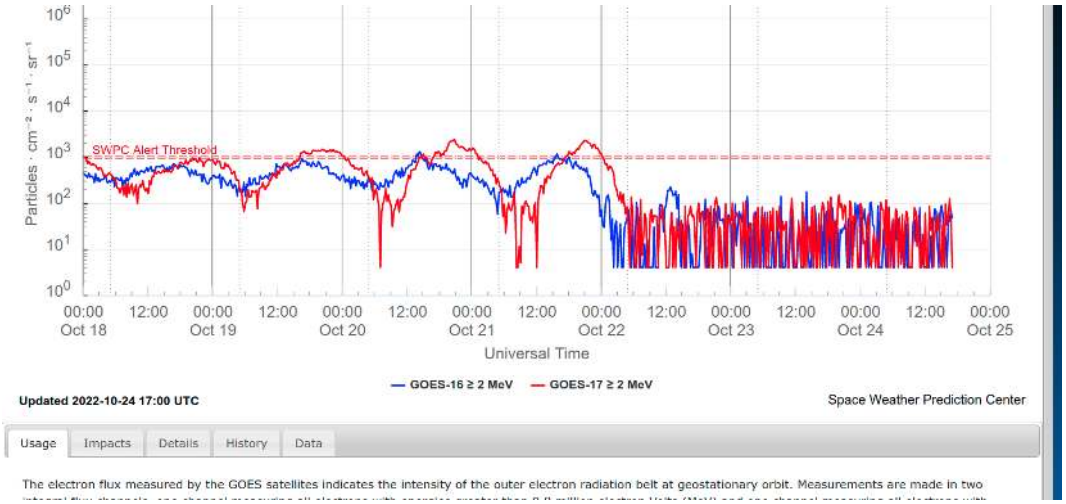


Figura 1: High-energy electron flux (> 2 MeV) obtained from GOES-16 and GOES-17 satellite. Source: `https://www.swpc.noaa.gov/products/goes-electron-flux`.

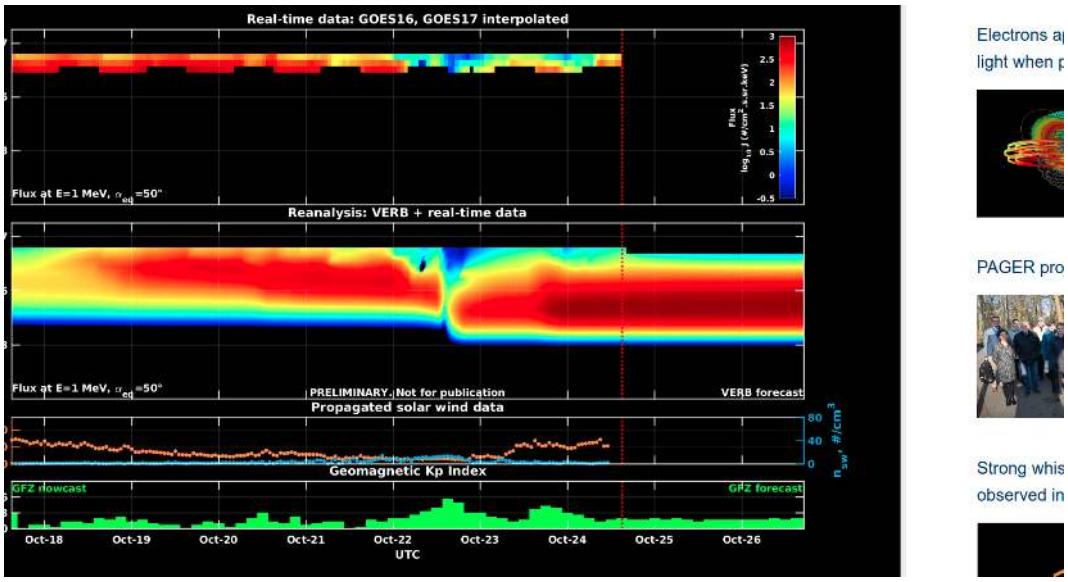


Figura 2: High-energy electron flux data (real-time and interpolated) obtained from GOES-16 and GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: `https://rbm.epss.ucla.edu/realtime-forecast/`.

High-energy electron flux (> 2 MeV) in the outer boundary of the outer radiation belt obtained from geostationary satellite data GOES-16 and GOES-17 (Figure 1) is between 10^2 and 10^3 particles/$(cm^2 ssr)$ until the beginning of October 20th, followed by two rapid dropouts on October 20th and 21st. A significant electron flux decrease was observed at the beginning of October 22nd, in which the electron flux was confined below 10^2 particles/$(cm^2 ssr)$ until the end of the analyzed period.

The GOES-16 and GOES-17 satellite data are interpolated and assimilated into the VERB code (Figure 2), which reconstructs this electron flux considering the Ultra Low Frequency (ULF) waves' radial diffusion. The simulation (VERB code) shows that the first two dropouts reach $L - shell > 6.0$, and the last one reaches all L-shells in the outer belt, followed by a significant repopulation from $L - shell > 3.3$. The electron flux variabilities coincide with the arrival of solar wind structures and ULF wave activity. A sector boundary crossing and the arrival of the CIR are observed during the electron flux repopulation.

4 ULF waves

4.1 Responsible: Graziela B. D. Silva

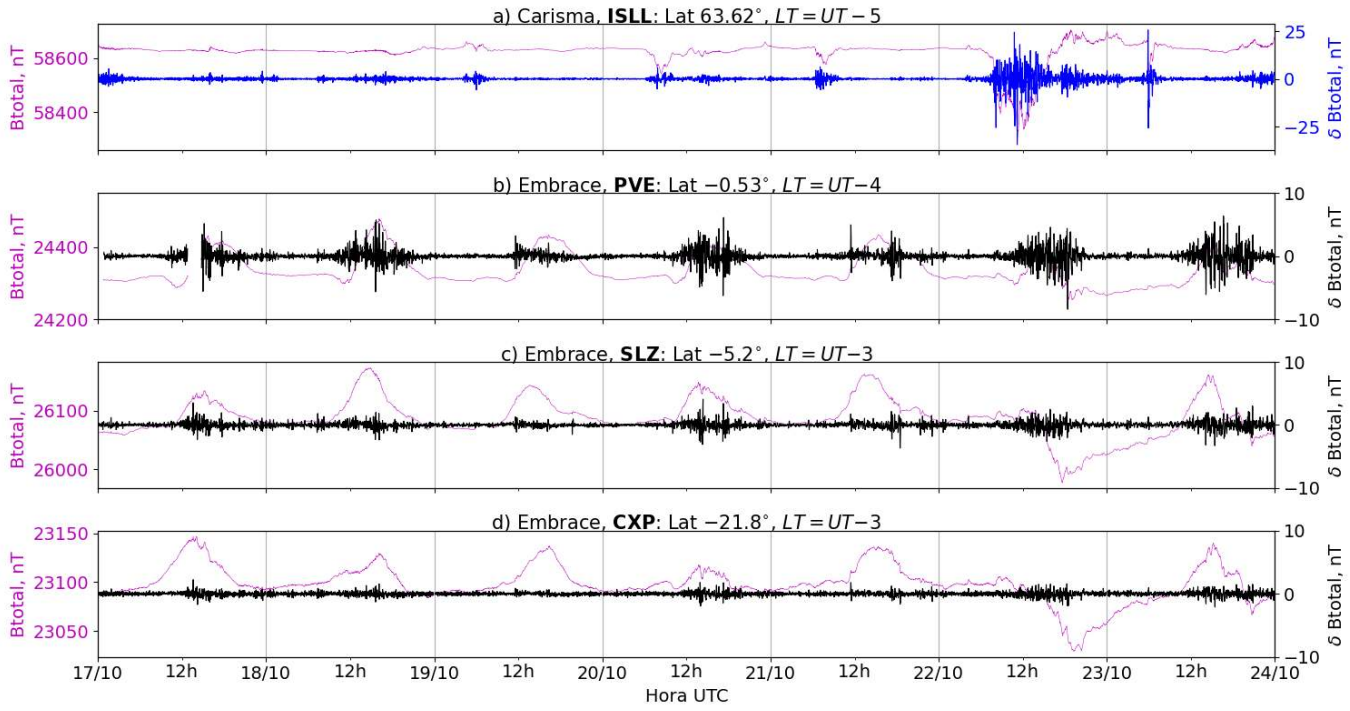


Figura 3: a) Timeseries of the geomagnetic field total component measured at ISLL station (Island Lake) of the CARISMA magnetometer network in magenta, along with the associated perturbation in the Pc5 band shown in blue. b-d) timeseries of the geomagnetic field total component measured at stations PVE (Porto Velho), SLZ (São Luís), and CXP (Cachoeira Paulista) of the EMBRACE network in magenta, along with the Pc5 perturbation in blue.

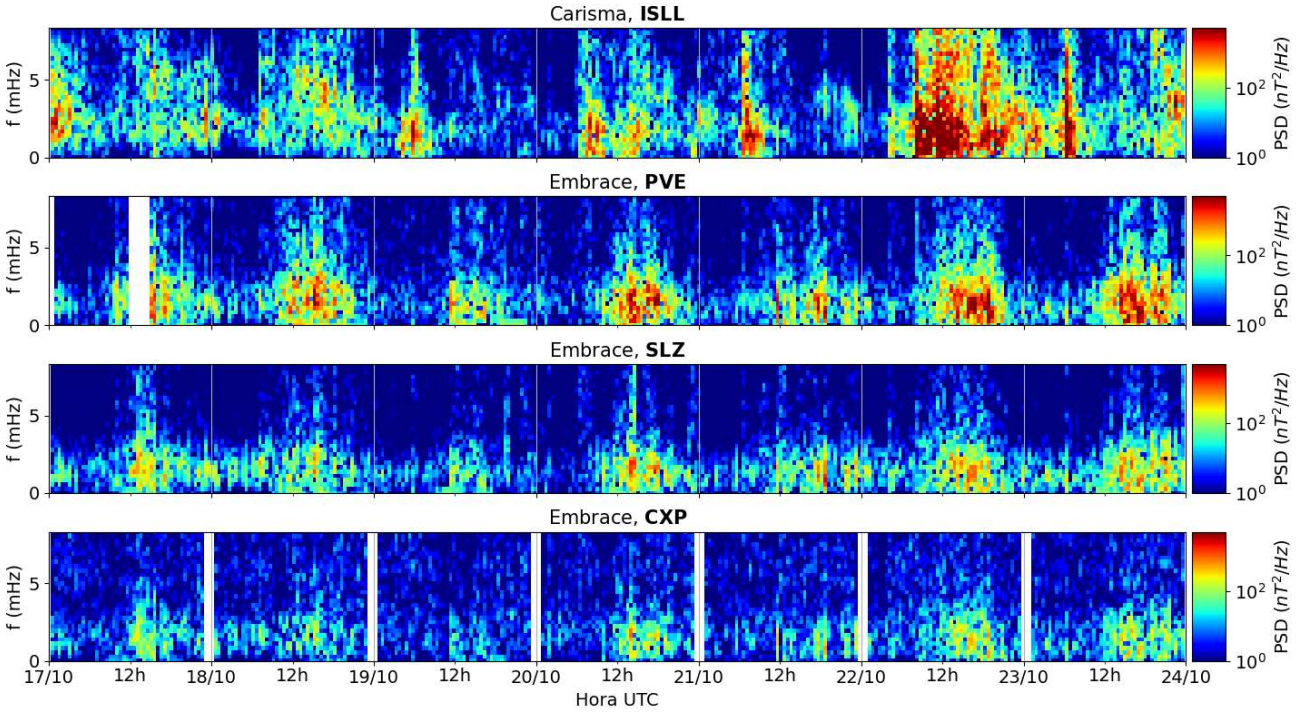


Figura 4: a-d) Time evolution of the power spectral density obtained from the filtered timeseries of the geomagnetic field total component (δ Btotal) for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, SLZ, CXP).

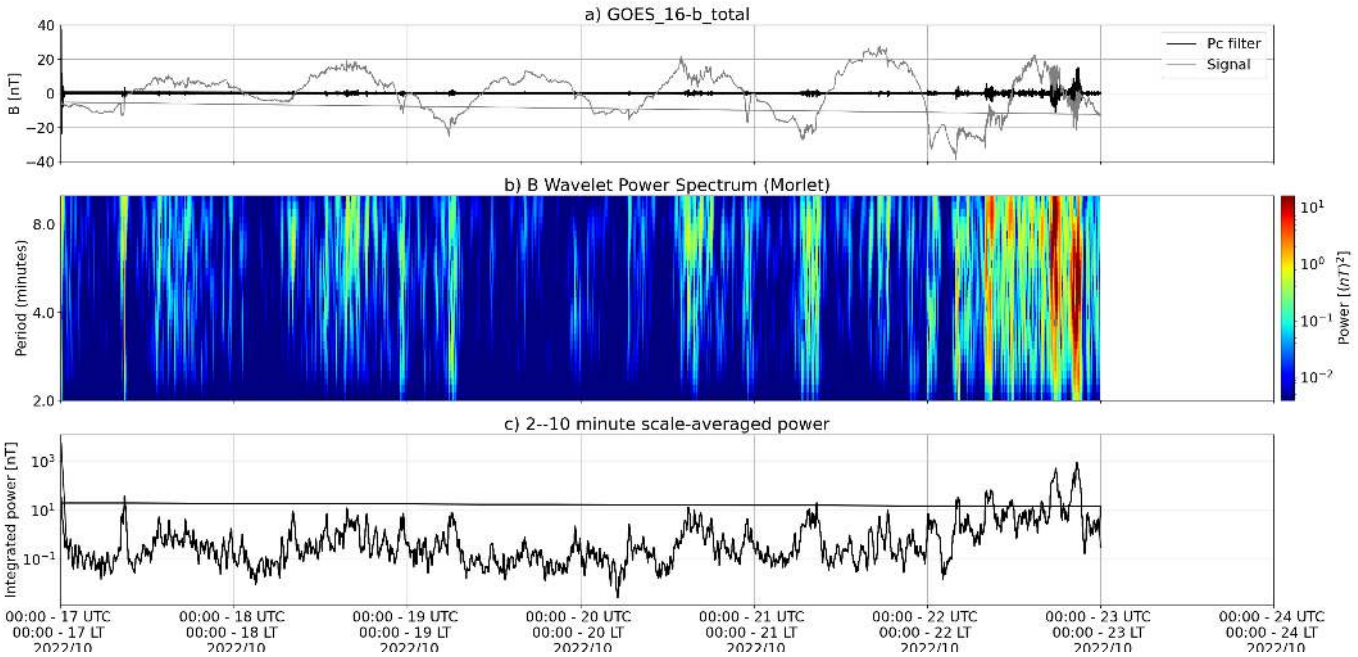


Figura 5: a) Timeseries of the geomagnetic field total component measured by GOES 16, together with the Pc5 fluctuation in black. b) Wavelet power spectrum of the filtered timeseries. c) Average ULF power in the period range from 2 to 10 minutes.

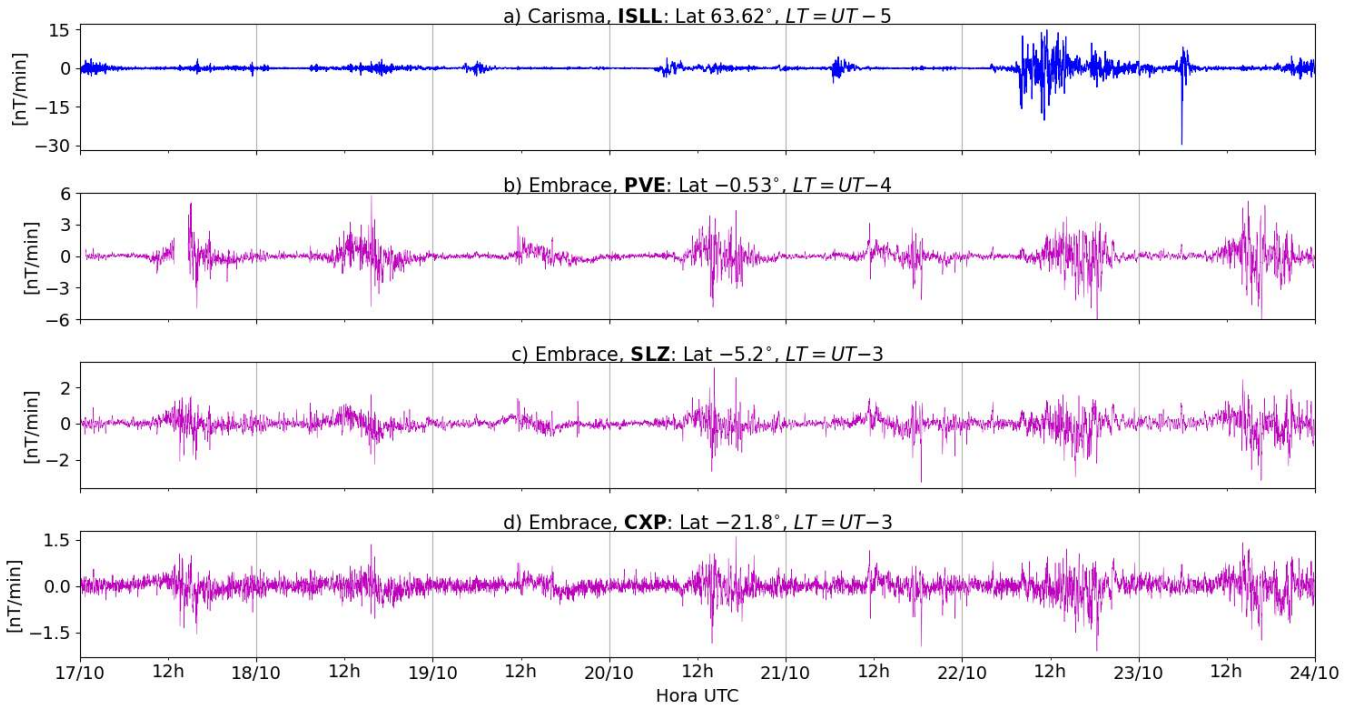


Figura 6: a-d) The rate of change of the geomagnetic field total component (dB/dt) obtained for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, SLZ, CXP).

- The GOES 16 satellite in geosynchronous orbit (L $\sim$ 6.6) registered significant activity of Pc5 ULF waves on October 22nd in response to a moderate geomagnetic storm.
- As observed on the ground, the ISLL station at high latitude registered weak to moderate levels of ULF wave activity until Oct. 21st, and an intense wave activity on Oct. 22 and such as reported using GOES-16 data.
- The PVE and SLZ stations at very low latitudes of Brazil measured moderate to intense levels of ULF wave activity throughout the reported week. Also, it can be noted as of $\sim$ 12 UT on a daily basis, and for both stations, the strong modulation by the equatorial electrojet on the wave activity.
- The rate of change in the geomagnetic field (dB/dt) estimated for the ISLL station (Carisma network) reached a maximum magnitude of $\sim$ 30 nT/min over the week, while the three Embrace stations had dB/dt magnitude rates ranging up $\sim$ 6 nT/min.

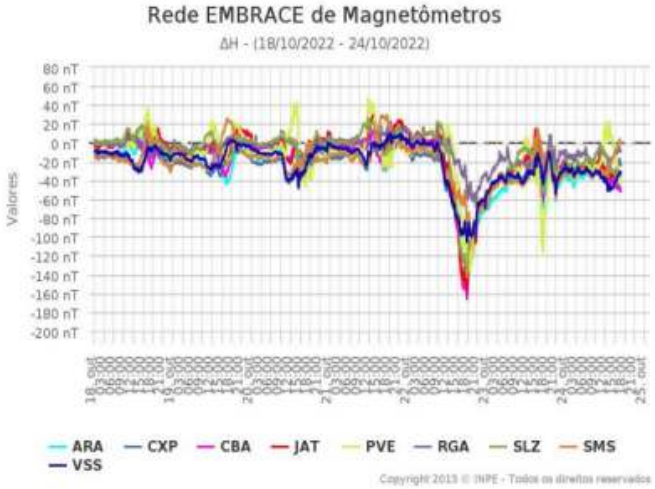
5 Geomagnetic activity

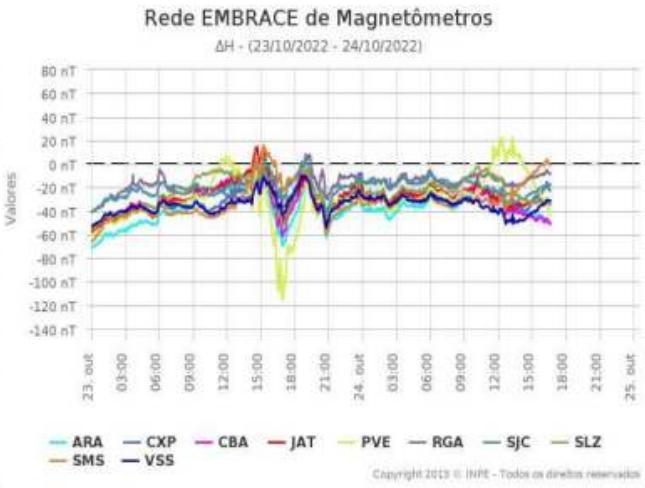
5.1 Responsible: Lívia Alves

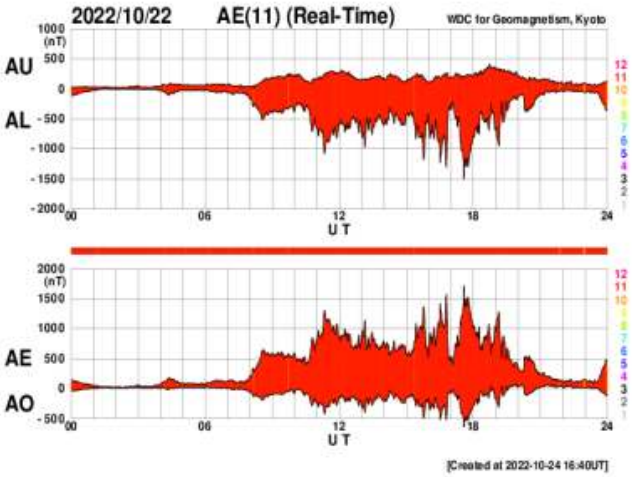
In the week of October 17-24, the following events related to geomagnetic activity stand out:

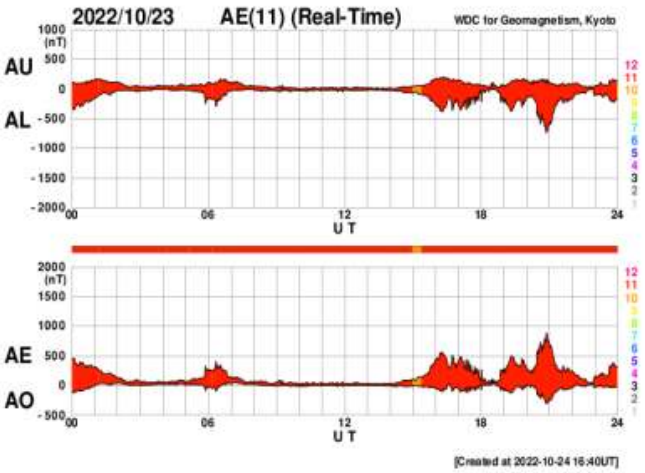
- The data from the Embrace magnetometer network registered instabilities in Oct 22-23, associated with the geomagnetic storm of Oct. 22.
- The magnetometers of the Embrace network recorded a significant drop in the H component to -140 nT on these days.
- On Oct. 22nd, the geomagnetic conditions were active. The AE index was at $\sim$ 1000 nT for several hours on Oct. 22. The Dst index reached -75 nT. The highest Kp of the week was 6-.
- The geomagnetic field measured at the GOES orbit shows instabilities after Oct. 22nd.

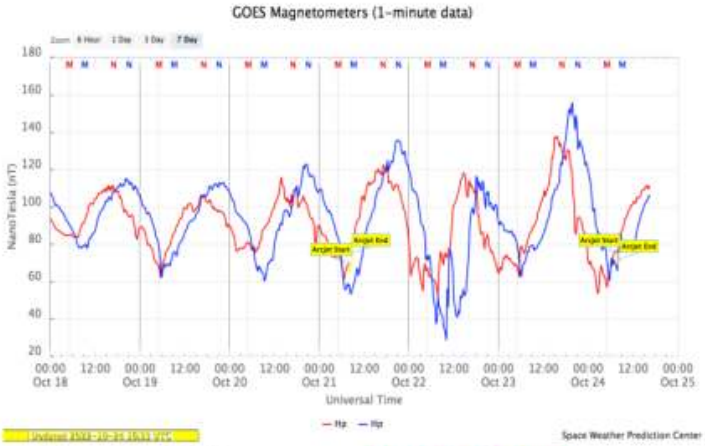
Briefing semana de 17 à 24/10 de 2022

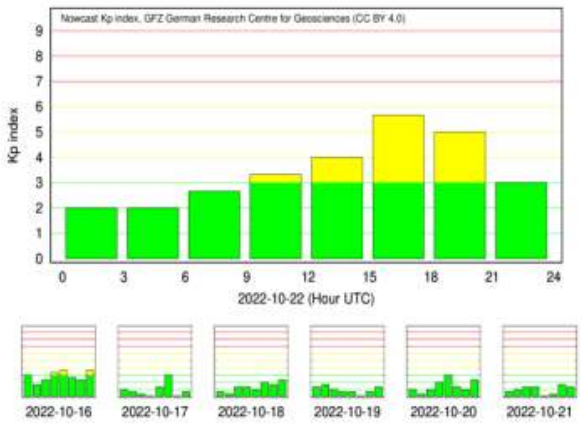


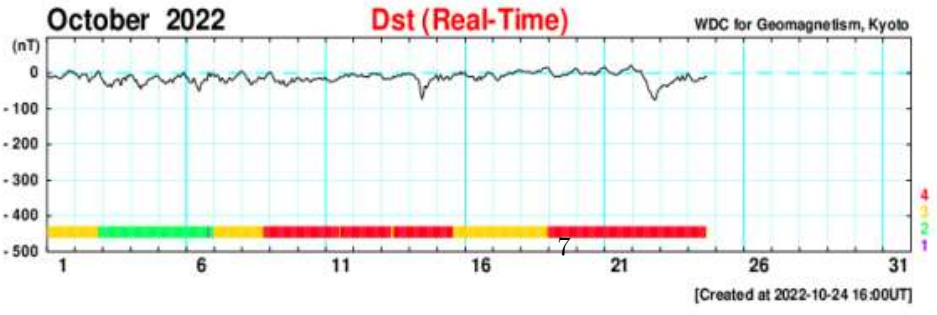










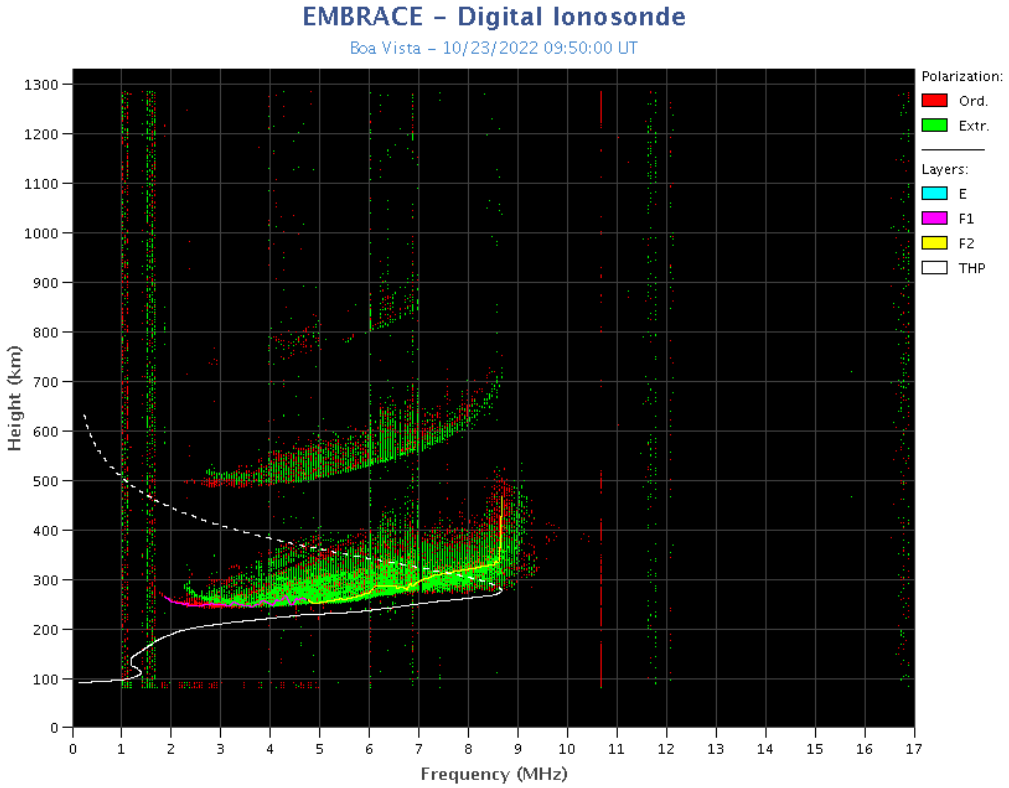


6 Ionosphere

6.1 Responsible: Laysa Resende

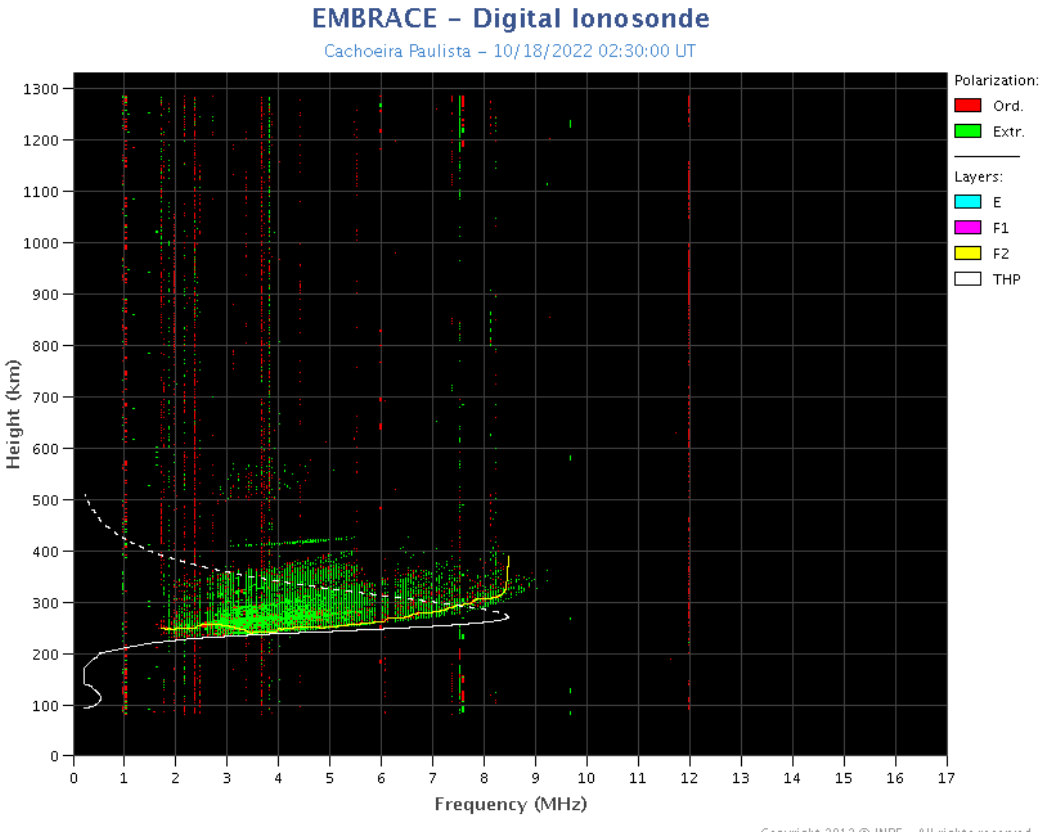
Boa Vista:

- There were not spread F on October 17.
- The Es layers reached scale 2 during the week.



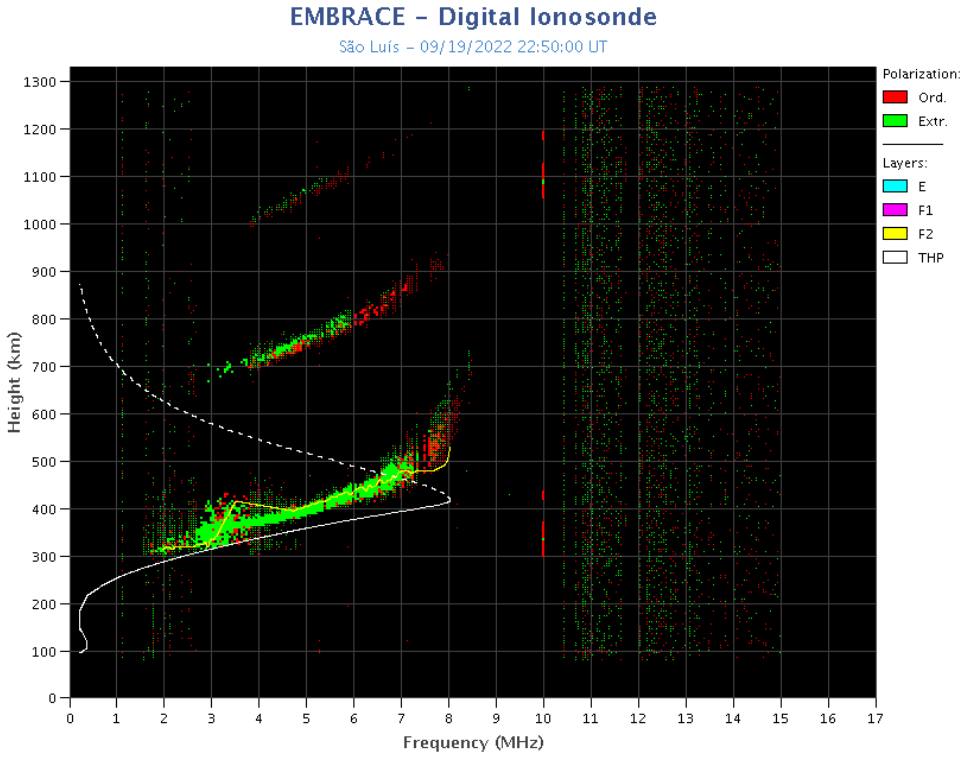
Cachoeira Paulista:

- There were not spread F on October 17.
- The Es layers reached scale 2 during the week.



São Luís:

- There were spread F during this week.
- The Es layers reached scale 3 on October 19.



7 ROTI

7.1 Responsible: Carolina de Sousa do Carmo

In the week 2232 (October 16 to 22, 2022) there were ionospheric irregularities (plasma bubble), on all analyzed days, as shown in Table 1. In addition, Figure 1 shows the ROTI time series for four stations in the Brazilian sector (Natal (RNNA), São Luis (SALU), Cuiabá (CUIB) and São José dos Campos (SJSP)).

Sunday	2022/10/16	00:00-04:30; 22:00-24:00
Monday	2022/10/17	00:00-04:00; 22:00-24:00
Tuesday	2022/10/18	00:00-04:00; 22:00-24:00
Wednesday	2022/10/19	00:00-04:00; 21:30-24:00
Thursday	2022/10/20	00:00-04:00; 22:00-24:00
Friday	2022/10/21	00:00-04:00; 21:00-24:00
Saturday	2022/10/22	00:00-05:00

Tabela 1: Weekly Summary (Oct 16-22, 2022).

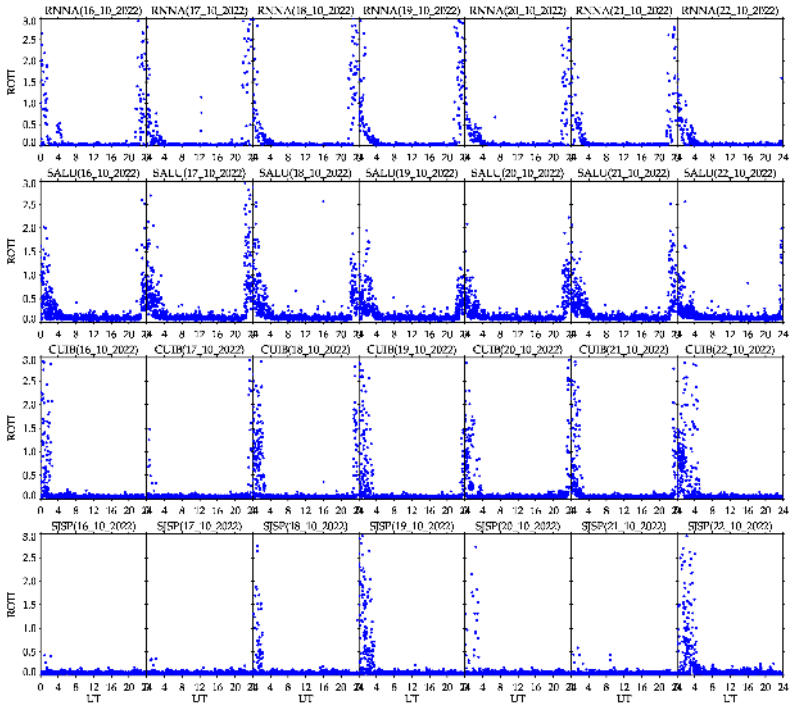


Figura 8: ROTI time series for four stations in the Brazilian sector (Natal (RNNA), São Luis (SALU), Cuiabá (CUIB) and São José dos Campos (SJSP)), from October 16 to October 22, 2015.