Briefing Space Weather

2022/11/09

1 Sun

1.1 Responsible: José Cecatto

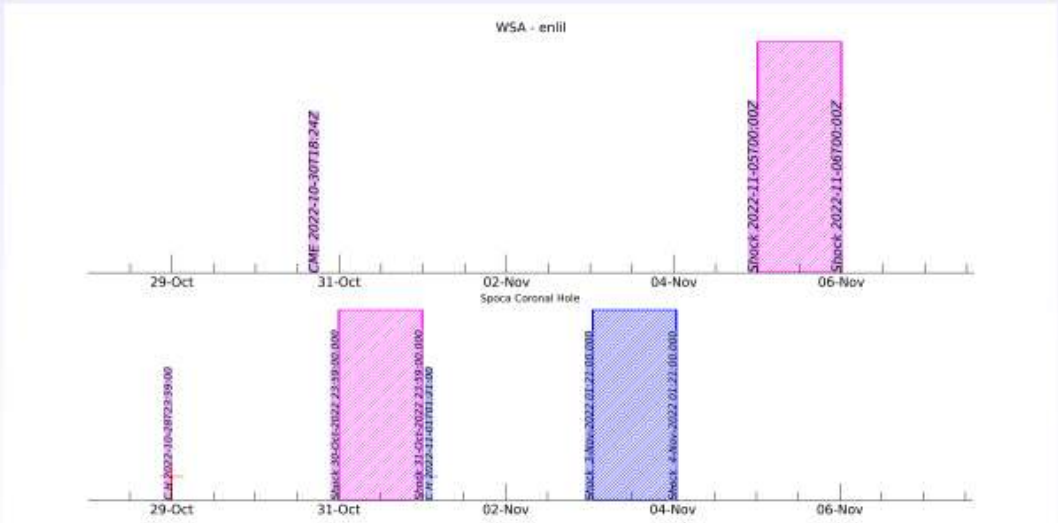
10/31 – No flare (M/X); Fast wind stream (=< 550 km/s); 4 CME c.h.c. toward the Earth;
11/01 – No flare (M/X); Fast wind stream (=< 500 km/s); 4 CME c.h.c. toward the Earth;
11/02 – No flare (M/X); Fast wind stream (=< 550 km/s); 2 CME c.h.c. toward the Earth;
11/03 – No flare (M/X); Fast wind stream (=< 600 km/s); 5 CME c.h.c. toward the Earth;
11/04 – No flare (M/X); Fast wind stream (=< 600 km/s); 3 CME c.h.c. toward the Earth;
11/05 – No flare (M/X); Fast wind stream (=< 550 km/s); 1 CME c.h.c. toward the Earth;
11/06 – No flare (M/X); Fast wind stream (=< 450 km/s); 1 CME c.h.c. toward the Earth;
11/07 – M5.3 flare; No fast wind stream; 1 CME c.h.c. toward the Earth;
Prev.: Fast wind stream expected on November 10; for the next 2 days (25% M, 5% 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 Sun

2.1 Responsible: Douglas Silva

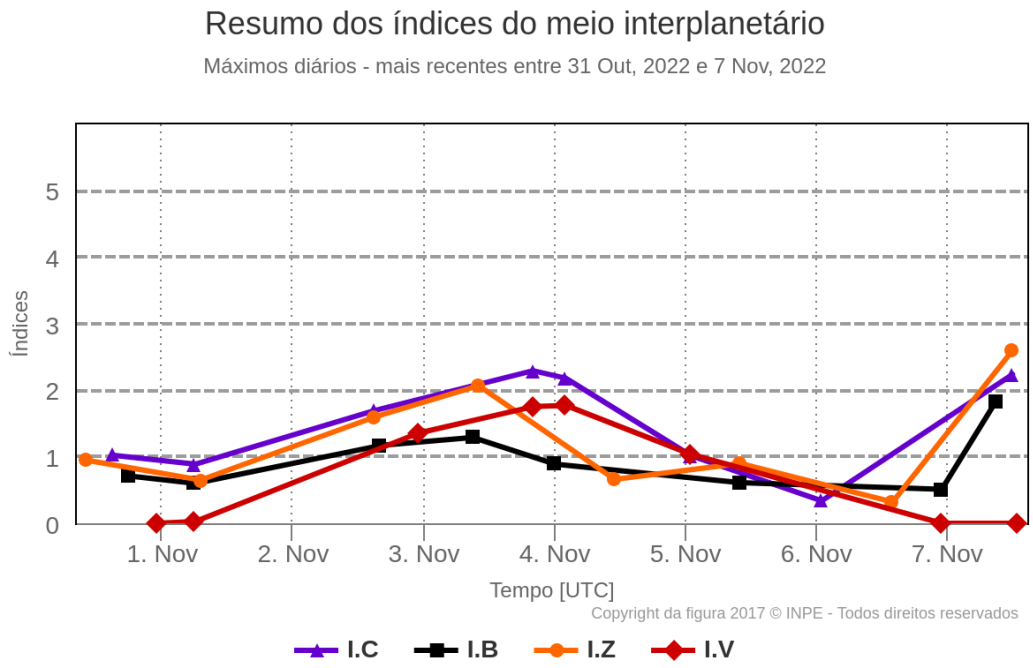
WSA-ENLIL (Prediction for CMEs :2022-10-30T18:24Z)

- The simulation result indicates that it will have no or little impact on Earth.



3 Interplanetary Medium

3.1 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 peaked at 13 nT on 07/Nov at 10:30 UT 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 crossing.
- The component of the bz field presented a negative minimum value on 07/Nov 15:30 UT of -10.9 nT, due to the interaction of a structure of the CME type. The density of the solar wind peaked on 07/Nov 08:30 of 22 p/cm^3, however the density remained on average below 15 p/cm^3 in the rest of the period.
- The solar wind speed remained on average above 400 km/s with a maximum peak on November 04 at 02:30 UT of 593 km/s, and a minimum recorded value of 383 km/s on November 07 at 12:30 UT.
- The position of the magnetopause was oscillating with a minimum value recorded on 07/Nov at 15:30 UT of 7.7 Re. On average, the magnetopause position was below the equilibrium position.

4 Radiation Belts

4.1 Responsible: Ligia Alves da Silva

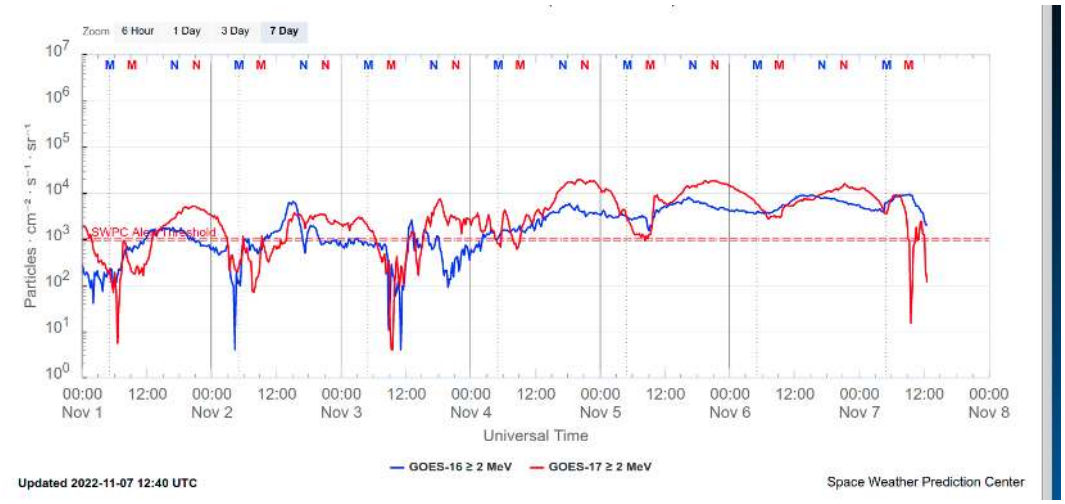


Figura 1: High-energy electron flux (> 2 MeV) obtained from GOES-16 and GOES-17 satellite. Source: `https://www.swpc.noaa.gov/products/goes-electron-flux`

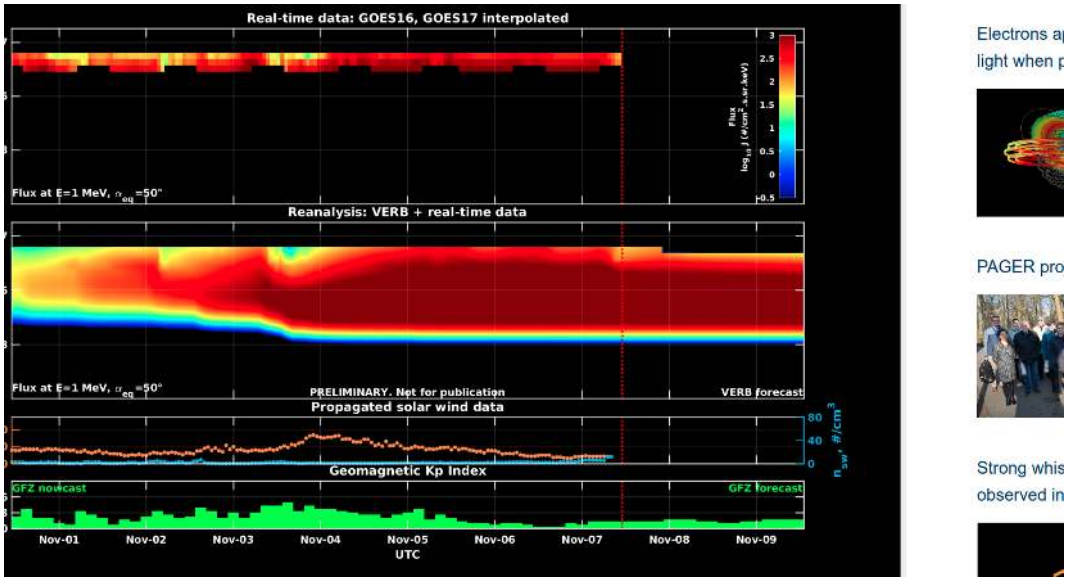


Figura 2: High-energy electron flux data (real-time and interpolated) obtained from GOES-16 and GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: `https://rbm.epss.ucla.edu/realtime-forecast/`

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 around 10^3 particles/$(cm^2 ssr)$ from 1st-3rd of November, presenting three rapid dropouts, on the 1st, 2nd and 3rd of November. The electron flux is concentrated above 10^3 particles/$(cm^2 ssr)$ from November 4th and presents a new dropout from 09:15 UT on November 7th.

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 second and third dropouts were more significant, which reached $L - shell > 5.8$, while the first and last dropouts reached $L - shell > 6.2$. The electron flux variabilities coincide with the arrival of solar wind structures and ULF wave activity.

5 ULF waves

5.1 Responsible: Graziela B. D. Silva

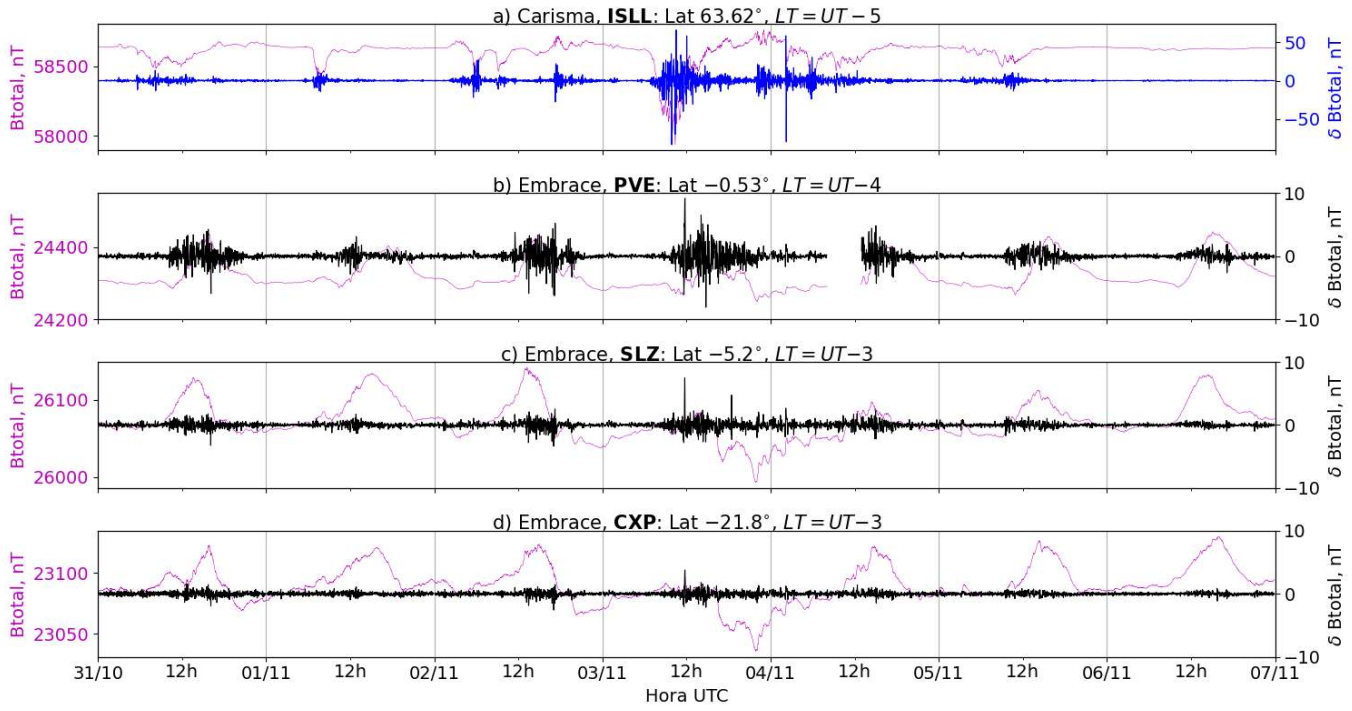


Figura 3: a) Timeseries of the geomagnetic field total component measured at ISLL station (Island Lake) of the CARISMA magnetometer network in magenta, along with the associated perturbation in the Pc5 band shown in blue. b-d) timeseries of the geomagnetic field total component measured at stations PVE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

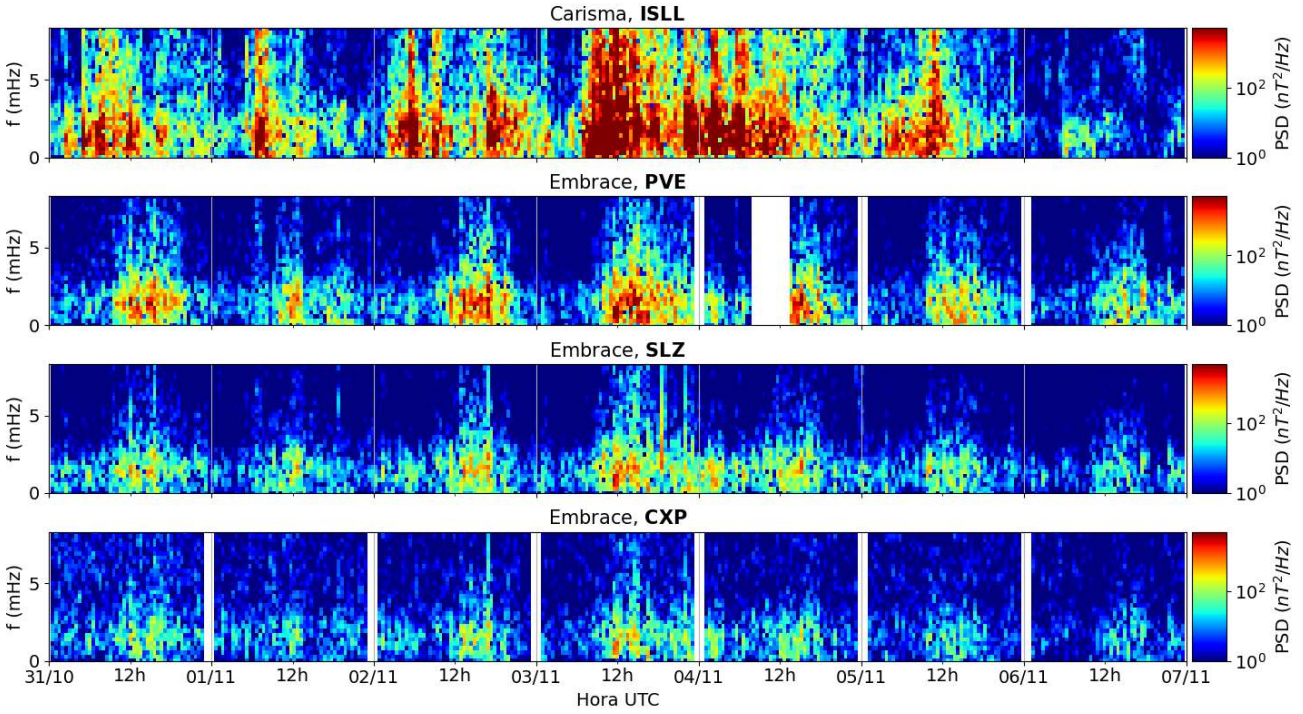


Figura 4: a-d) Time evolution of the power spectral density obtained from the filtered timeseries of the geomagnetic field total component (δ Btotal) for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, SLZ, CXP).

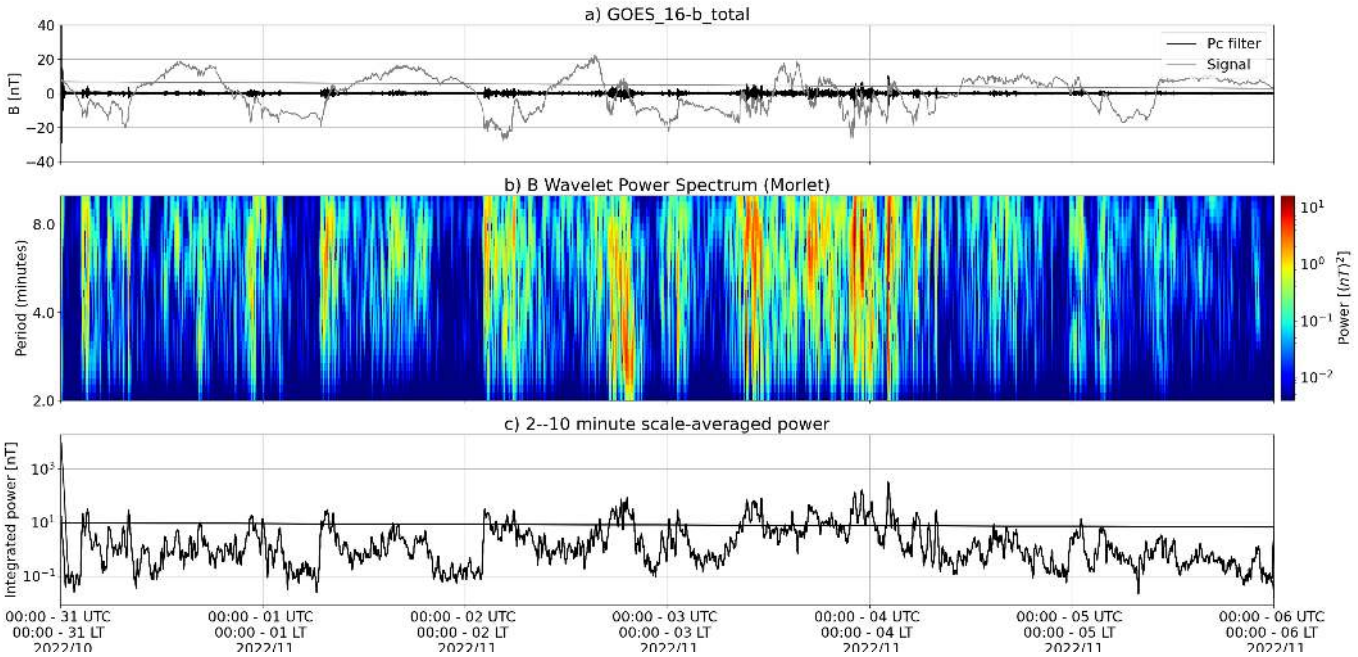


Figura 5: a) Timeseries of the geomagnetic field total component measured by GOES 16, together with the Pc5 fluctuation in black. b) Wavelet power spectrum of the filtered timeseries. c) Average ULF power in the period range from 2 to 10 minutes.

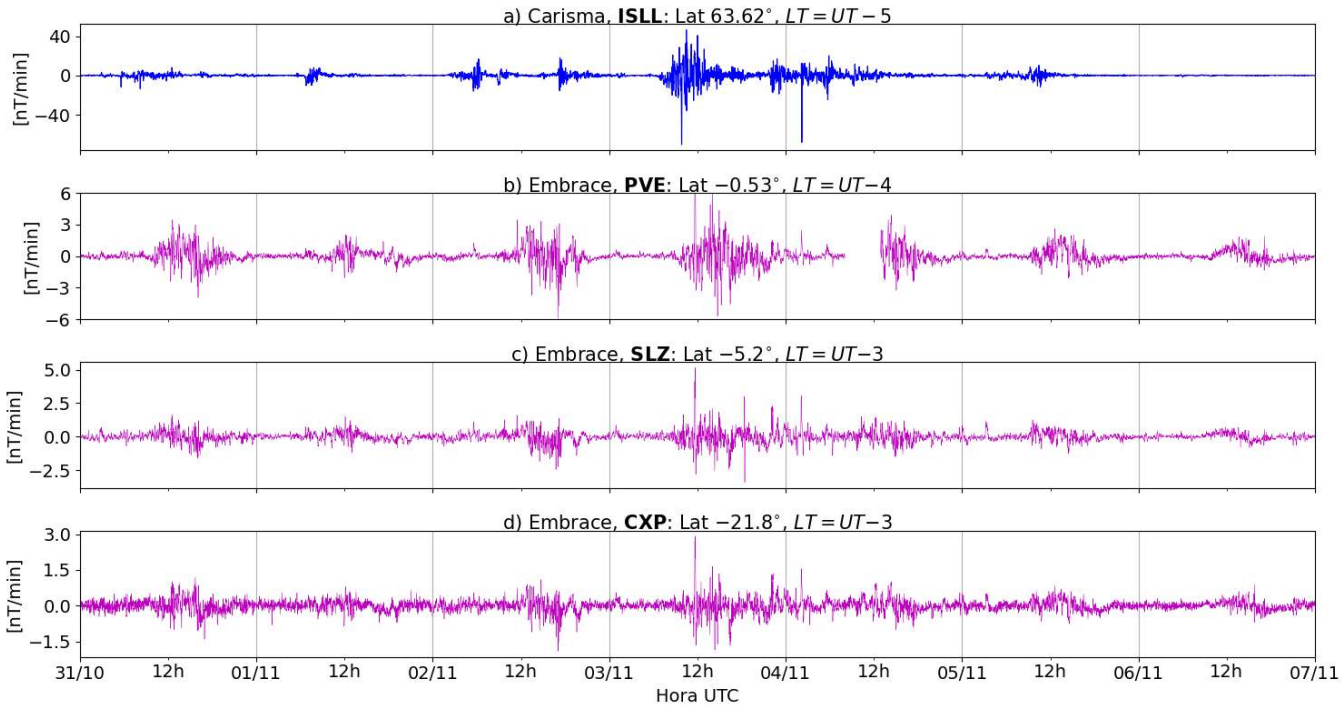
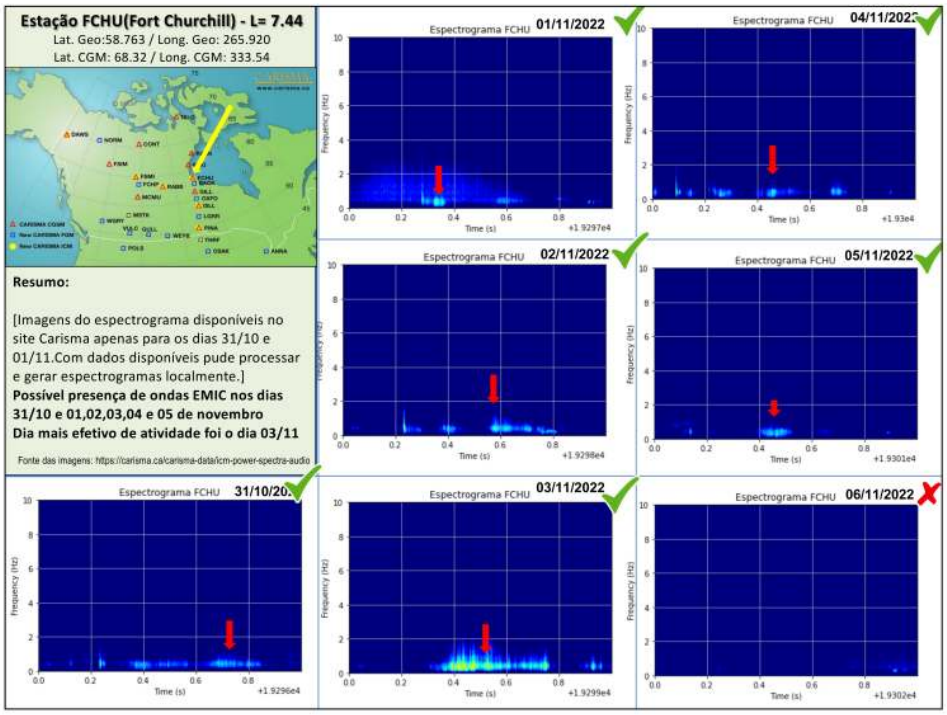


Figura 6: a-d) The rate of change of the geomagnetic field total component (dB/dt) obtained for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, SLZ, CXP).

- The GOES 16 satellite in geosynchronous orbit (L $\sim$ 6.6) registered significant activity of Pc5 ULF waves nearly throughout the week, especially between November 2-3.
- As observed on the ground, the ISLL station at high latitude registered intense levels of ULF wave activity over October 31 to November 5, with emphasis also on Nov. 3.
- The PVE and SLZ stations at very low latitudes of Brazil measured significant levels of ULF wave activity throughout the reported week. Also, it can be noted for these stations the strong diurnal modulation by the equatorial electrojet on the wave activity.
- The CXP station from Embrace MagNet captured weaker levels of wave activity over the entire week, except on Nov. 3.
- The rate of change in the geomagnetic field (dB/dt) estimated for the ISLL station (Carisma network) reached a maximum magnitude of $\sim$ 80 nT/min over the week, while the three Embrace stations had dB/dt magnitudes ranging up to $\sim$ 6 nT/min.

6 EMIC waves

6.1 Responsible: Claudia Medeiros



7 Geomagnetic activity

7.1 Responsible: Lívia Alves

In the week of November 1-7, the following events related to geomagnetic activity stand out:

- The data from the Embrace magnetometer network registered two geomagnetic storms in the observed period. We highlight the disturbed days from Nov. 3 to 4, and Nov. 7.
- The magnetometers of the Embrace network recorded a significant drop in the H component to -120 nT on these days.
- On days 2 and 3 the magnetometers registered the arrival of interplanetary shocks associated to solar wind strctures.
- In Nov 4, 5 and 7, the AE index reached 500 nT for several hours. The Dst index reached -55 nT(Nov 3) and -89 nT (Nov 7) . The highest Kp of the week was 5o.
- The geomagnetic field measured at the GOES orbit shows instabilities on Nov. 2, 3 e 7.

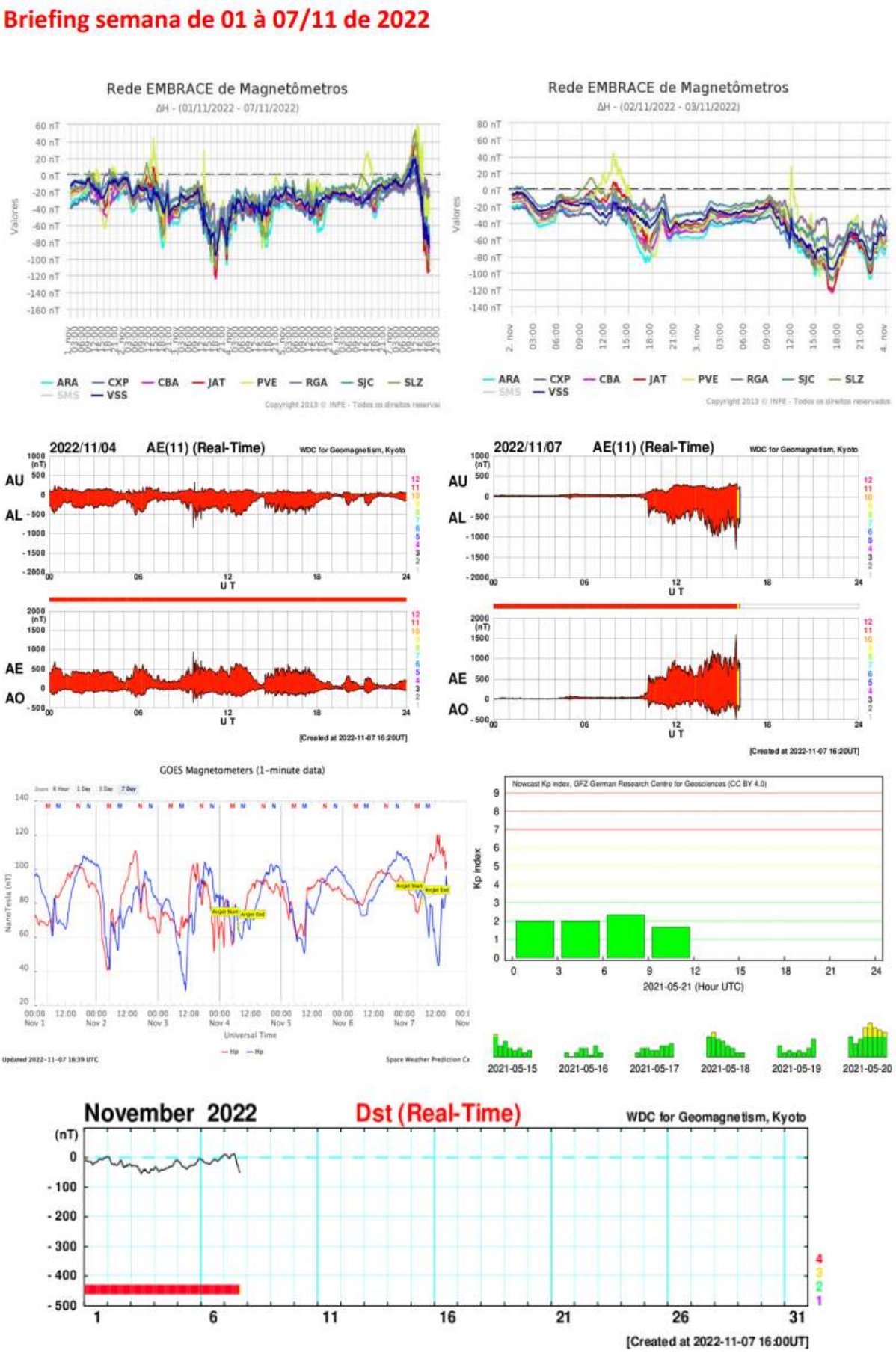


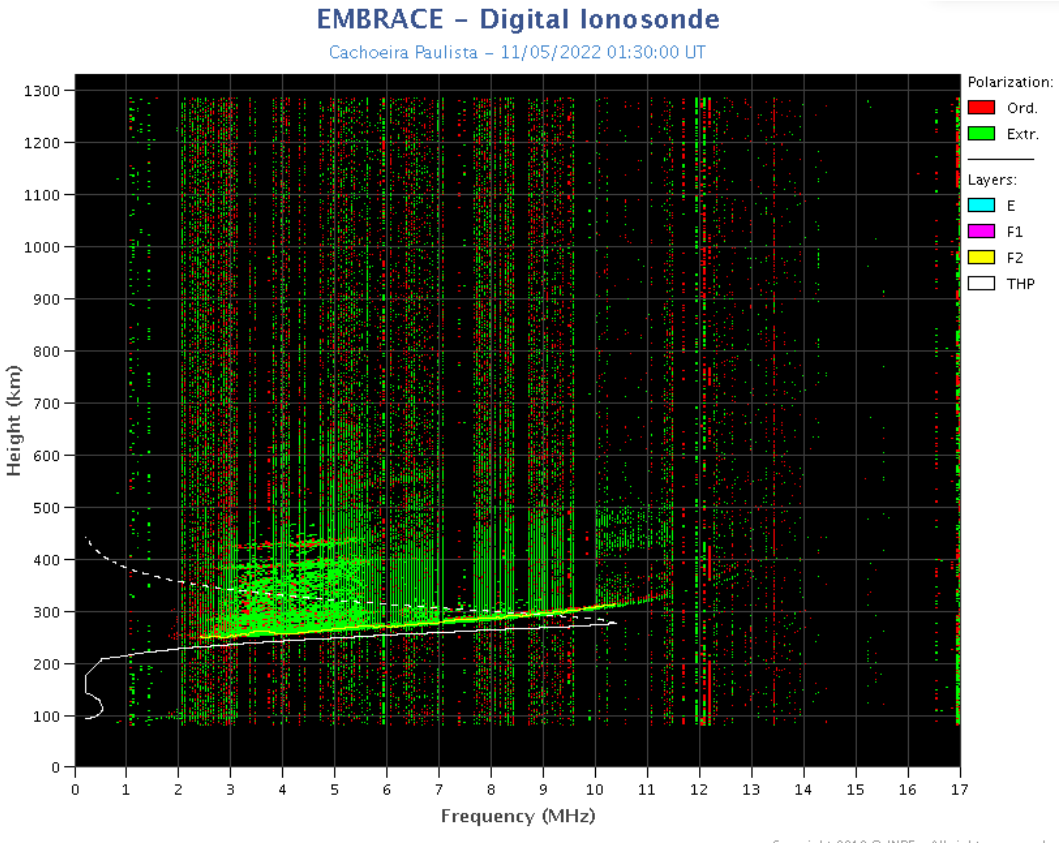
Figura 7: The figures from top to bottom show the weekly evolution of the H magnetic field component measured by the Embrace network, of the auroral AE index, of the geomagnetic field measured by the GOES satellites at $L \sim 6.6$ on the left, along with the Kp index on the right hand side. The bottom most figure contains the Dst index time series.

8 Ionosphere

8.1 Responsible: Laysa Resende

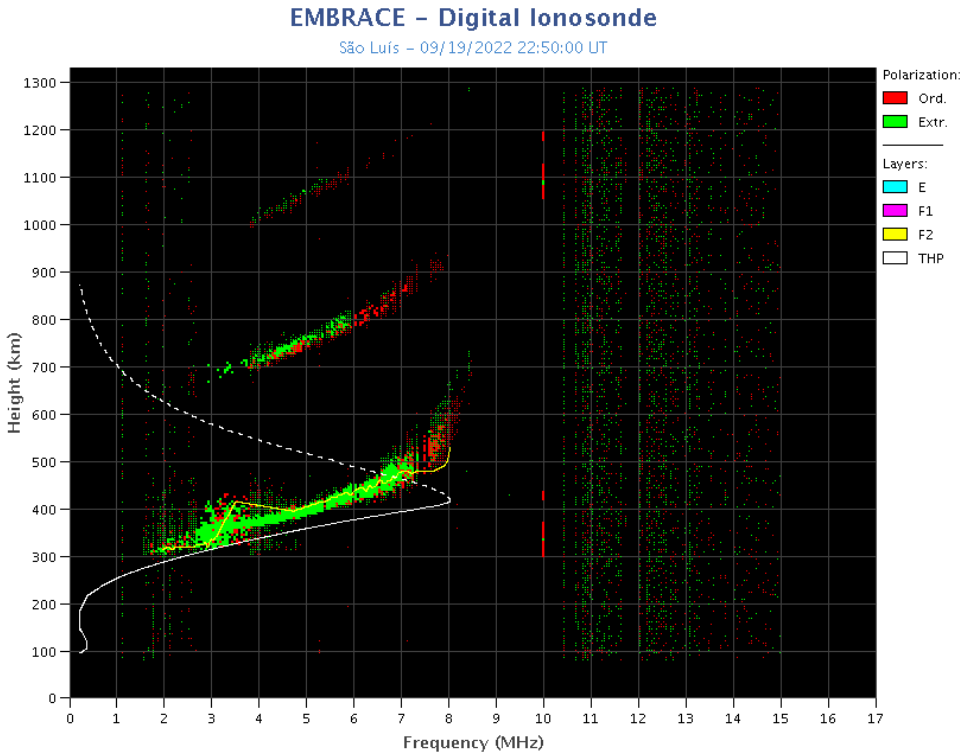
Cachoeira Paulista:

- There were not spread F on November 04, and 05.
- 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 November 04.


EMBRACE – Digital Ionosonde
São Luís – 09/19/2022 22:50:00 UT
Height (km)
Frequency (MHz)
Polarization:
Ord.
Extr.
Layers:
E
F1
F2
THP