Briefing Space Weather

2022/11/1

1 Sun

1.1 Responsible: José Cecatto

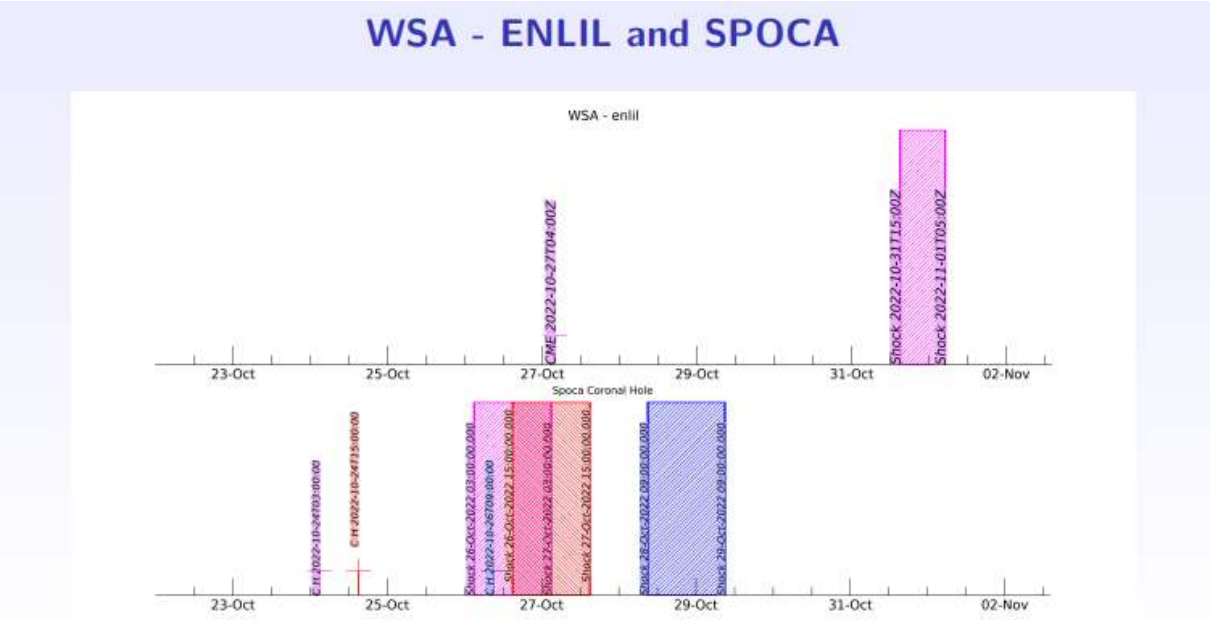
10/24 – No flare (M/X); Fast wind stream (=< 550 km/s); 5 CME c.h.c. toward the Earth;
10/25 – No flare (M/X); Fast wind stream (=< 450 km/s); 6 CME c.h.c. toward the Earth;
10/26 – No flare (M/X); No fast wind stream; 6 CME c.h.c. toward the Earth **;
10/27 – No flare (M/X); Fast wind stream (=< 450 km/s); 5 CME c.h.c. toward the Earth;
10/28 – No flare (M/X); Fast wind stream (=< 550 km/s); 1 CME c.h.c. toward the Earth;
10/29 – No flare (M/X); Fast wind stream (=< 600 km/s); No CME toward the Earth;
10/30 – No flare (M/X); Fast wind stream (=< 550 km/s); 1 CME c.h.c. toward the Earth;
10/31 – No flare (M/X); Fast wind stream (=< 500 km/s); No CME toward the Earth;
Prev.: Fast wind stream expected up to November 02; 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 Sun

2.1 Responsible: Douglas Silva

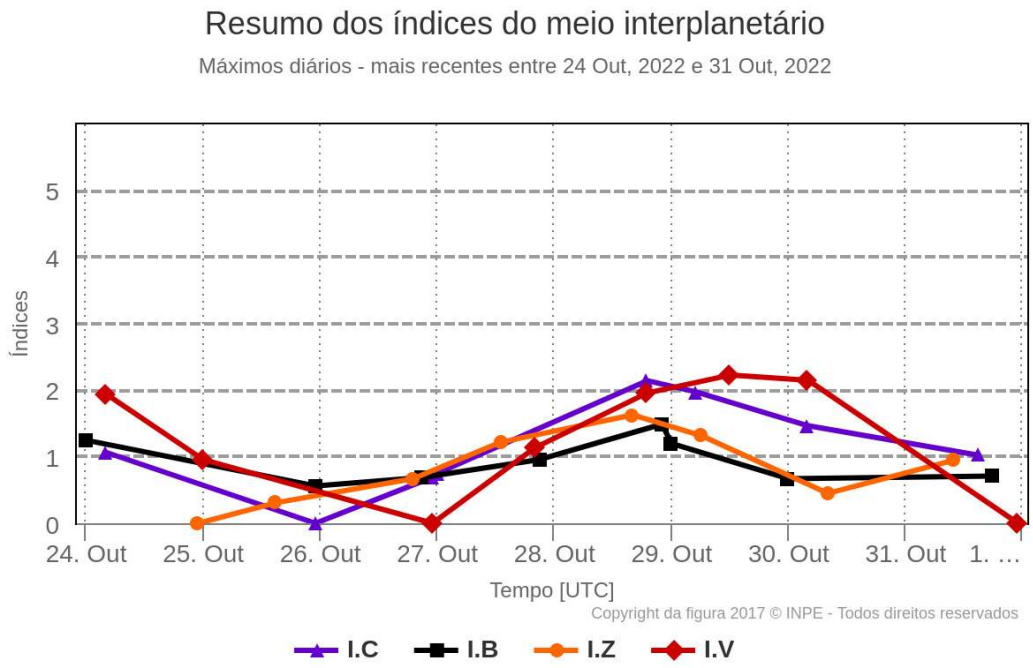
WSA-ENLIL (Prediction for CME 2022-09-04T08:48Z)

- The simulation indicates that Coronal Mass Ejection will reach the DSCOVR mission between 2022-10-31T15:00Z e 2022-11-01T05:00Z.



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 11.46 nT on 28/Oct at 22:30 during the analyzed period.
- The BxBy components showed variations in the analyzed period, both remaining oscillating within the [+8, -8] nT interval, with the presence of sector boundary crossing on October 27 and 28 at 03:30 and 15:30 UT respectively .
- The component of the bz field presented a minimum value on Oct/28 at 2:30 UT of -7.85 nT and a maximum value of 6.67 nT on Oct/28 at 9:30 PM UT. In the rest of the period the bz component oscillated in the interval [+5, -5] nT.
- The solar wind density peaked on Oct 26 at 20:30 UT of 15.4 p/cm^3, however the density was oscillating in the range [3-15.4] p/cm^3.
- The solar wind speed remained on average oscillating above 400 km/s with a maximum peak on Oct 29 at 12:30 UT of 567 km/s, and a minimum peak on Oct 26 at 22:30 UT of 350 km/s.
- The position of the magnetopause was oscillating with a minimum value recorded on Oct 28 at 19:30 UT at 8.09 Re. On average the position of the magnetopause was oscillating in the range [8-11.6] Re.

4 Radiation Belts

4.1 Responsible: Ligia Alves da Silva

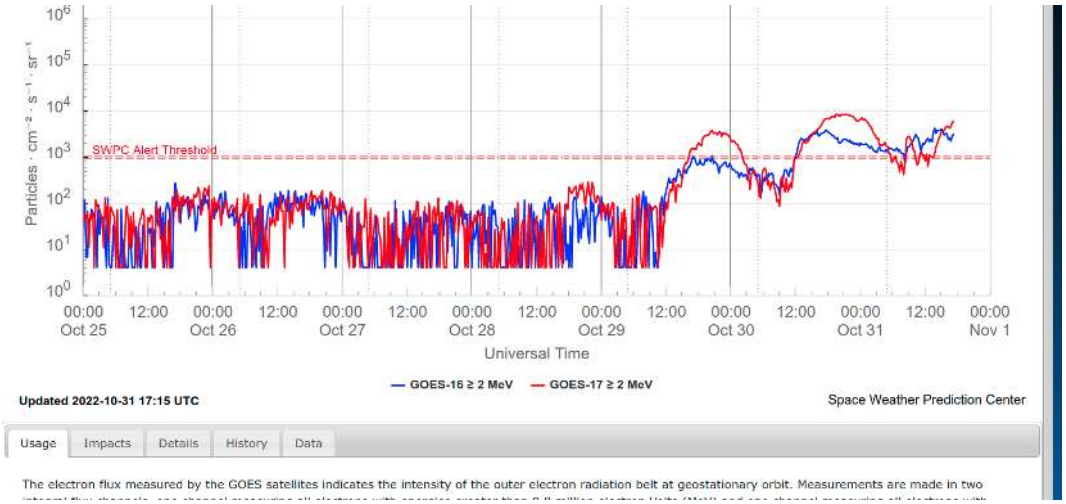


Figura 1: High-energy electron flux (> 2 MeV) obtained from GOES-16 and GOES-17 satellite. Source: `https://www.swpc.noaa.gov/products/goes-electron-flux`

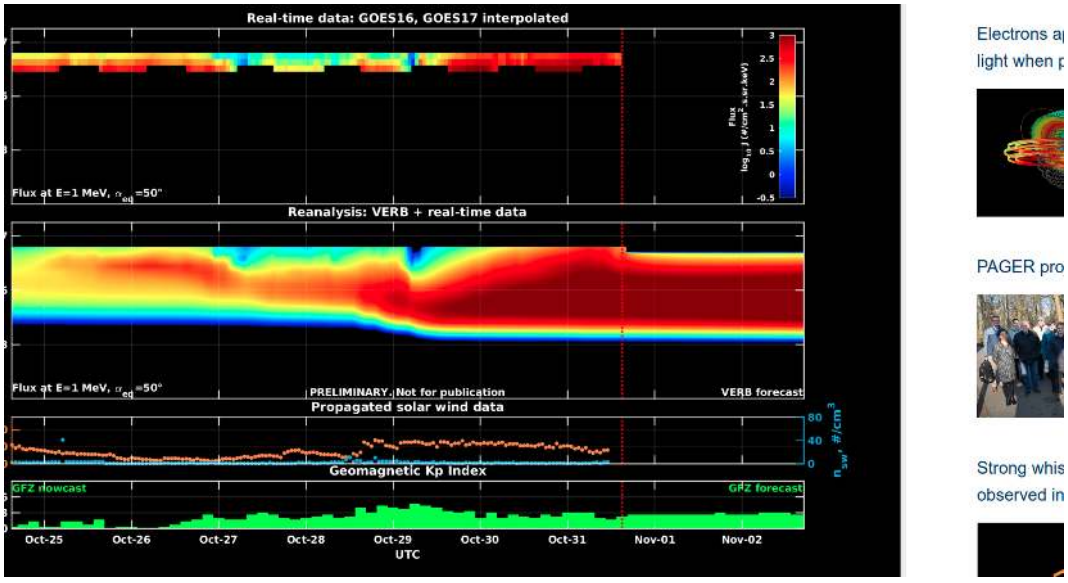


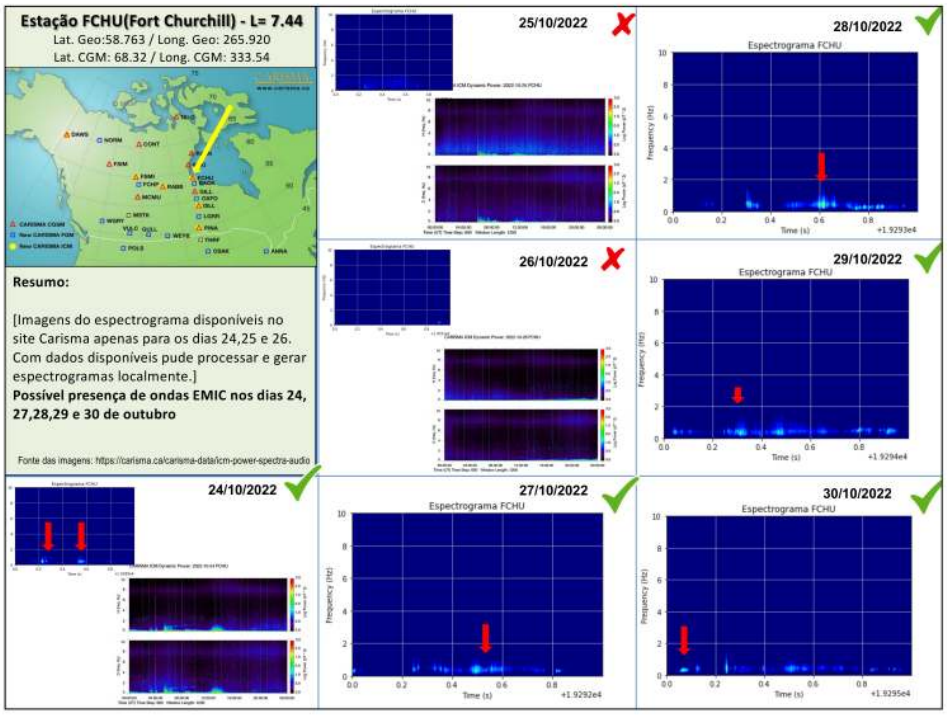
Figura 2: High-energy electron flux data (real-time and interpolated) obtained from GOES-16 and GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: `https://rbm.epss.ucla.edu/realtime-forecast/`

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 below 10^3 particles/$(cm^2 ssr)$ up 16:00 UT on October 29th, concentrating around 10^2 particles/$(cm^2 ssr)$ on October 25th, 26th and 28th. The electron flux approaches 10^4 particles/$(cm^2 ssr)$ from 19:00 UT on October 30th.

The GOES-16 and GOES-17 satellite data are interpolated and assimilated into the VERB code, which reconstructs this electron flux considering the Ultra Low Frequency (ULF) waves' radial diffusion. The simulation (VERB code) shows two significant dropouts, the first on October 27th reaching $L - shell > 5.8$, and the second reaching $L - shell > 5.3$, followed by repopulation throughout all L-shells in the outer belt. The electron flux variabilities coincide with the arrival of solar wind structures and ULF wave activity.

5 EMIC waves

5.1 Responsible: Claudia Medeiros



6 ULF waves

6.1 Responsible: Graziela B. D. Silva

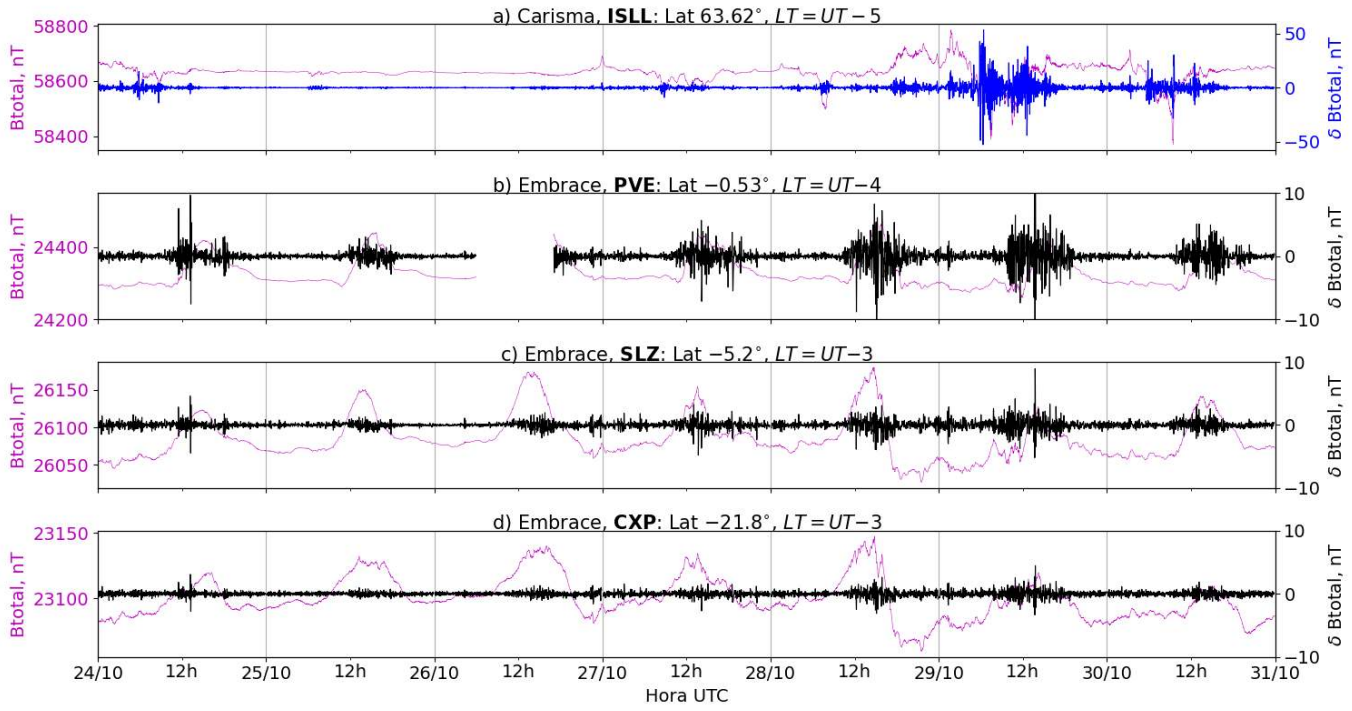


Figura 3: a) Timeseries of the geomagnetic field total component measured at ISLL station (Island Lake) of the CARISMA magnetometer network in magenta, along with the associated perturbation in the Pc5 band shown in blue. b-d) timeseries of the geomagnetic field total component measured at stations PVE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

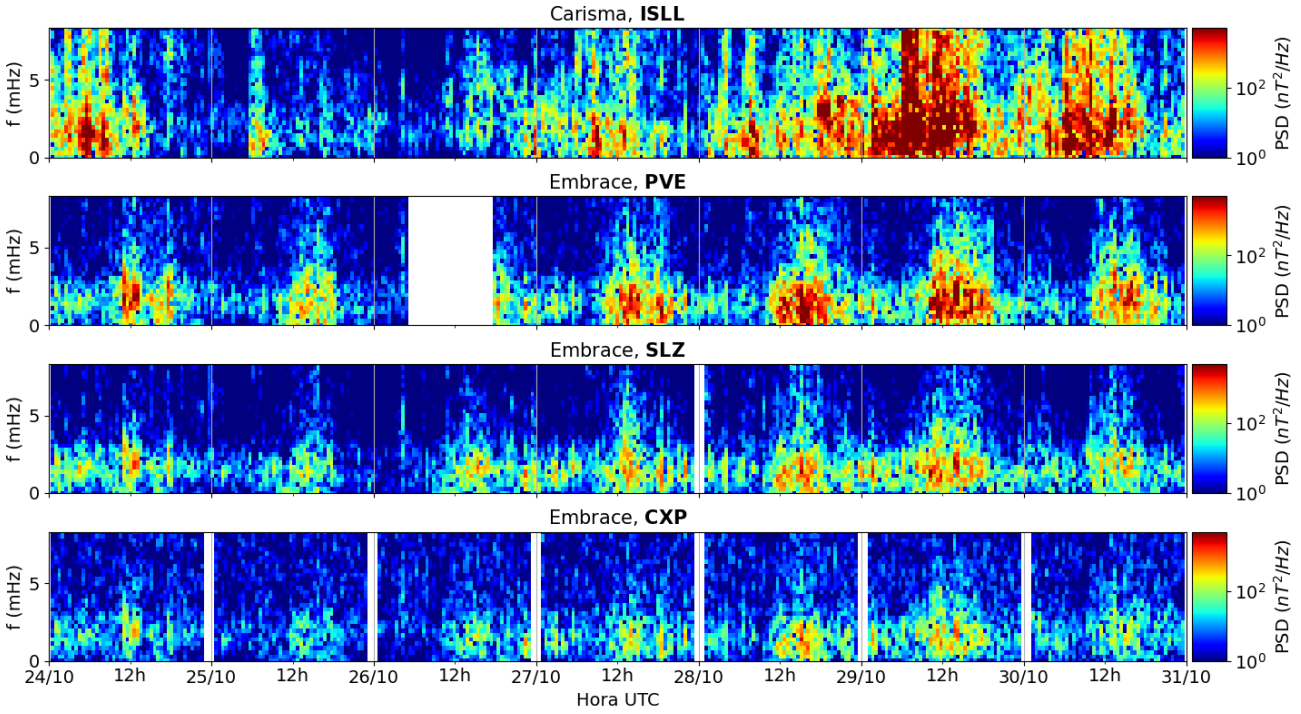


Figura 4: a-d) Time evolution of the power spectral density obtained from the filtered timeseries of the geomagnetic field total component (δ Btotal) for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, SLZ, CXP).

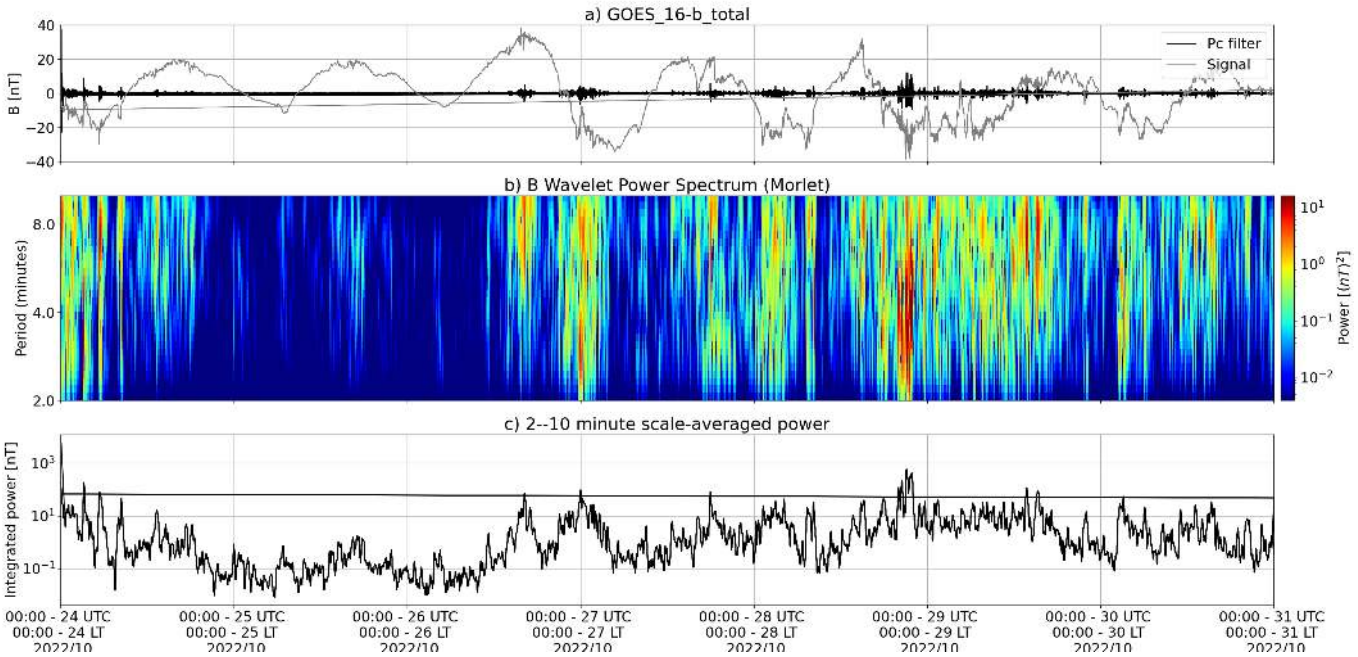


Figura 5: a) Timeseries of the geomagnetic field total component measured by GOES 16, together with the Pc5 fluctuation in black. b) Wavelet power spectrum of the filtered timeseries. c) Average ULF power in the period range from 2 to 10 minutes.

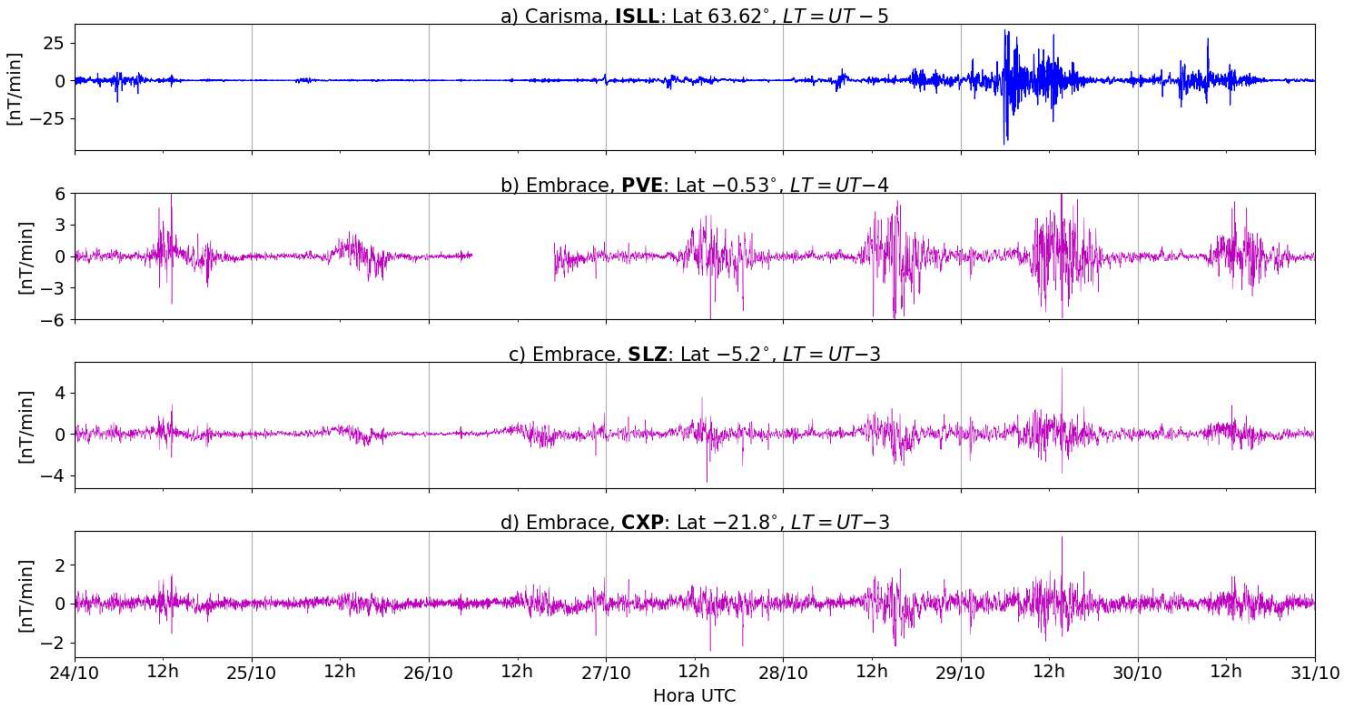


Figura 6: a-d) The rate of change of the geomagnetic field total component (dB/dt) obtained for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, SLZ, CXP).

- The GOES 16 satellite in geosynchronous orbit (L $\sim$ 6.6) registered an intense activity of Pc5 ULF waves trhoughout the week, except from October 25 through the first 12 hours of Oct. 26.
- As observed on the ground, the ISLL station at high latitude registered intense levels of ULF wave activity over the week, except through Oct. 25-26 as reported with GOES 16.
- 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 for these stations the strong modulation by the equatorial electrojet on the wave activity.
- The CXP station from Embrace MagNet captured less intense levels of wave activity over the entire week.
- The rate of change in the geomagnetic field (dB/dt) estimated for the ISLL station (Carisma network) reached a maximum magnitude within $\sim$ 25-30 nT/min over the week, while the three Embrace stations had dB/dt magnitudes ranging up to $\sim$ 6 nT/min.

7 Geomagnetic activity

7.1 Responsible: Lívia Alves

In the week of October 24-31, the following events related to geomagnetic activity stand out:

- The data from the Embrace magnetometer network registered instabilities in Oct 28-29, associated with the geomagnetic storm of Oct. 29.
- The magnetometers of the Embrace network recorded a significant drop in the H component to -100 nT on these days.
- The AE index reached above 1000 nT on Oct. 29 and above 500 nT on Oct. 30. The minimum Dst index reached -53 nT. The highest Kp of the week was 5-.

- The geomagnetic field measured at the GOES orbit shows instabilities after Oct. 27.

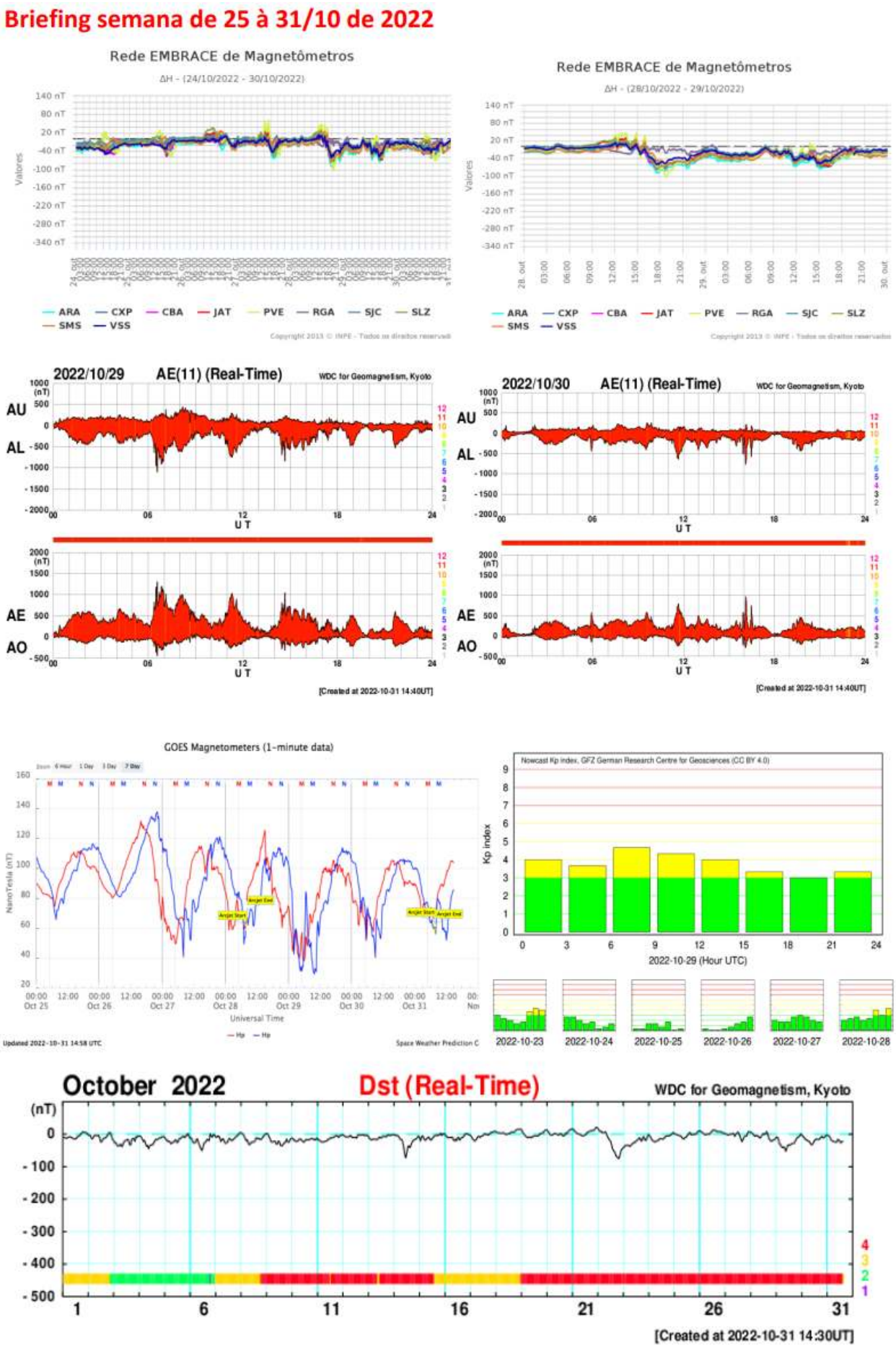


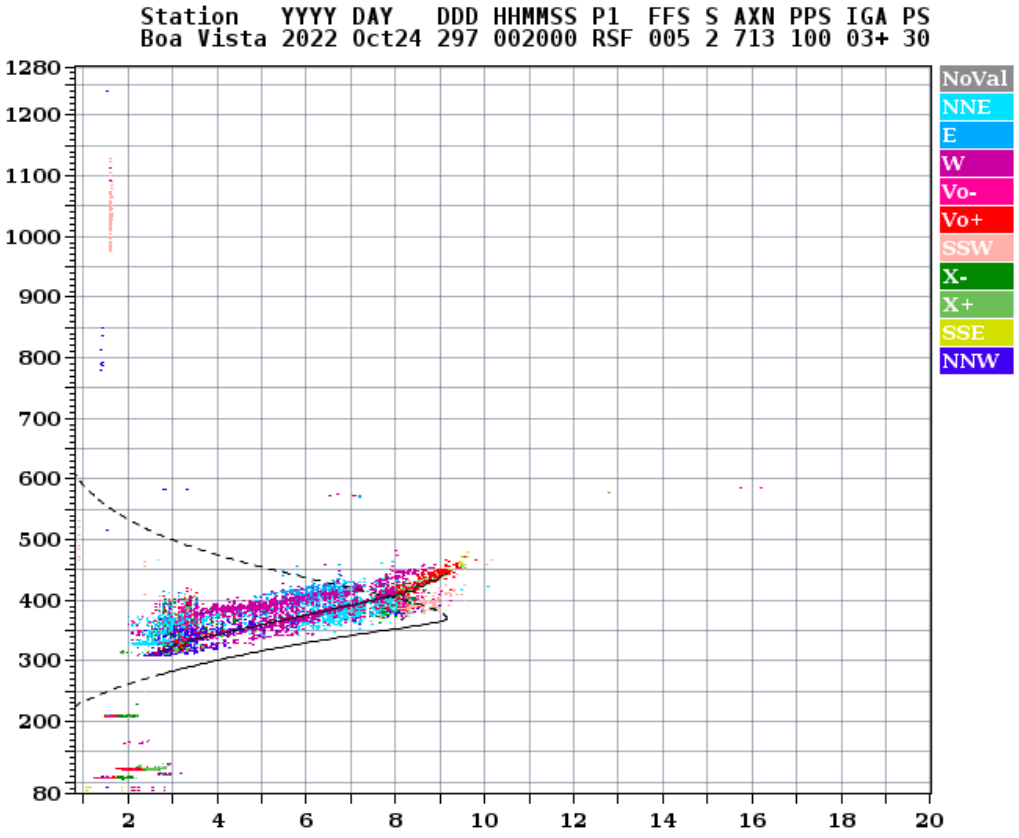
Figura 7: The figures from top to bottom show the weekly evolution of the H magnetic field component measured by the Embrace network, of the auroral AE index, of the geomagnetic field measured by the GOES satellites at $L \sim 6.6$ on the left, along with the Kp index on the right hand side. The bottom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

8 Ionosphere

8.1 Responsible: Laysa Resende

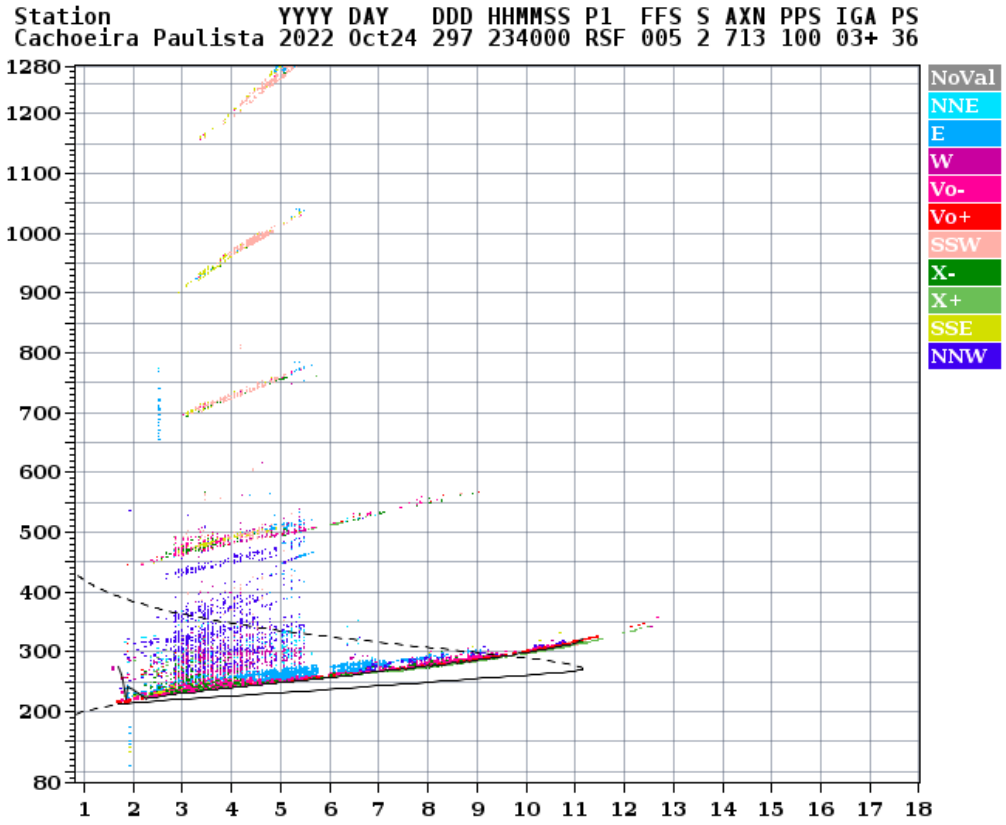
Boa Vista:

- There were spread F during this week.
- The Es layers reached scale 2 during the week.



Cachoeira Paulista:

- There were not spread F on October 26, 27, and 28.
- The Es layers reached scale 2 during the week.



9 Scintilation

9.1 Responsible: Siomel Savio Odriozola

In this report on the S4 scintillation index, data from SLMA in São Luiz/MA, UFBA in Salvador/BA, STCB in Cuiabá/MT and SJCE in São José dos Campos/SP are presented. The S4 index tracks the presence of irregularities in the ionosphere having a spatial scale ~ 360 m. The S4 index registered values of scintillation ranging from strong to severe during a whole week in the SLMA and UFBA stations . At the STCB station, no scintillation was observed only on 10/28. In the SJCE station, the absence of scintillation occurred between the 26th to the 28/10. The most intense and lasting event of scintillation of the week reported in this summary (for all the station) was recorded after sunset on October 30.

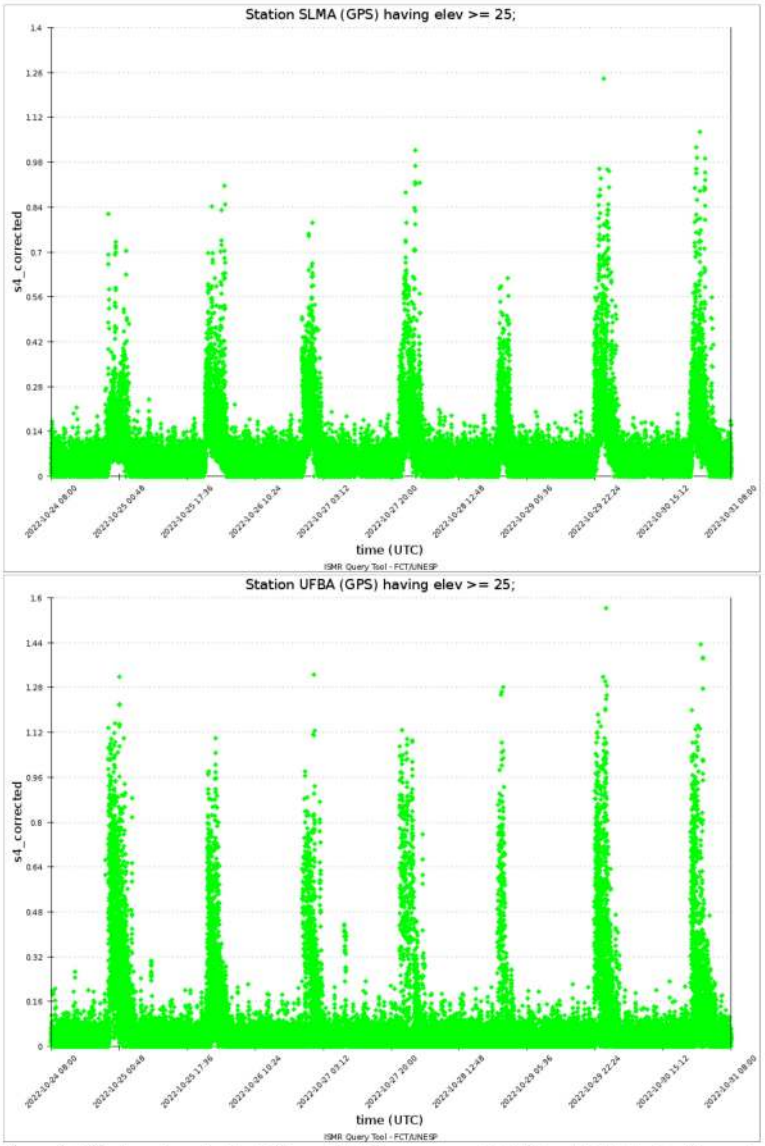
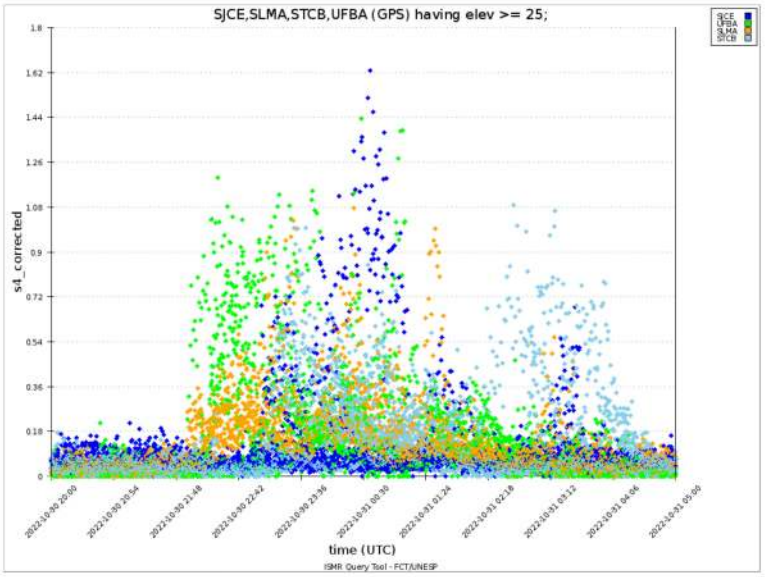


Figure 1: S4 index values for the GPS constellation measured at SLMA and UFBA during the week 10/24--30.



S4 index values for the GPS constellation measured at the SLMA, UFBA, STCB e SJCE station between 20UT of the October 30 to 05UT of the following day.

10 ROTI

10.1 Responsible: Carolina de Sousa do Carmo

In the week 2233 (October 23 to 29, 2022) there were ionospheric irregularities (plasma bubble), on all analyzed days, as shown in Table 1. In addition, the Figure below 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	2022/10/23	00:00-04:00; 21:00-24:00
Monday	2022/10/24	00:00-04:30; 21:00-24:00
Tuesday	2022/10/25	00:00-03:00; 21:00-24:00
Wednesday	2022/10/26	00:00-04:00; 21:30-24:00
Thursday	2022/10/27	00:00-03:00; 22:00-24:00
Friday	2022/10/28	00:00-05:00; 23:00-24:00
Saturday	2022/10/29	00:00-02:00; 22:00-24:00

Tabela 1: Weekly Summary (Oct 23-29, 2022).

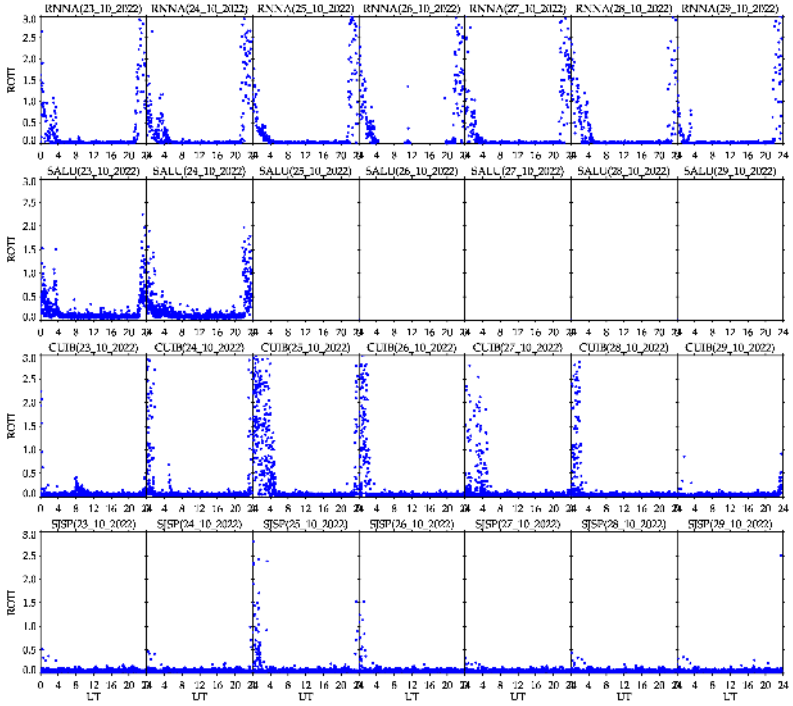


Figura 8: ROTI time series for four stations in the Brazilian sector (Natal (RNNA), São Luis (SALU), Cuiabá (CUIB) and São José dos Campos (SJSP)), from October 23 to October 29, 2015.