

Briefing Space Weather

2022/11/22

1 Sun

1.1 Responsible: José Cecatto

11/07 – M5.3 flare; No fast wind stream; 1 CME c.h.c. toward the Earth;
11/08 – No flare (M/X); No fast wind stream; 1 CME c.h.c. toward the Earth;
11/09 – No flare (M/X); No fast wind stream; 4 CME c.h.c. toward the Earth;
11/10 – No flare (M/X); No fast wind stream; 2 CME c.h.c. toward the Earth;
11/11 – M1.2, M1.2 flares; Fast wind stream ($= < 450$ km/s); 4 CME c.h.c. toward the Earth;
11/12 – M1.1 flare; Fast wind stream ($= < 500$ km/s); 1 CME c.h.c. toward the Earth;
11/13 – No flare (M/X); Fast wind stream ($= < 500$ km/s); 4 CME c.h.c. toward the Earth;
11/14 – No flare (M/X); Fast wind stream ($= < 450$ km/s); 3 CME c.h.c. toward the Earth;
Prev.: No fast wind stream expected for the next 3 days; for the next 2 days (35% 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

11/15 – M1.1 flare; Fast wind stream ($= < 450$ km/s); 4 CME c.h.c. toward the Earth;
11/16 – No flare (M/X); No fast wind stream; 8 CME c.h.c. toward the Earth;
11/17 – No flare (M/X); No fast wind stream; 2 CME c.h.c. toward the Earth;
11/18 – No flare (M/X); No fast wind stream; 1 CME c.h.c. toward the Earth;
11/19 – M1.6 flare; No fast wind stream; 9 CME c.h.c. toward the Earth *;
11/20 – No flare (M/X); Fast wind stream ($= < 450$ km/s); 5 CME c.h.c. toward the Earth;
11/21 – No flare (M/X); Fast wind stream ($= < 450$ km/s); 3 CME c.h.c. toward the Earth;
Prev.: No fast wind stream expected for the next 3 days; for the next 2 days (35% 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 Sun

2.1 Responsible: Douglas Silva

- WSA-ENLIL (Prediction for CME :2022-11-13T11:36)
 - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-11-17T00:00 UT e 2022-11-17T14:00 UT.
- WSA-ENLIL (Prediction for CME : 2022-11-14T03:24)
 - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-11-17T05:11 UT and 2022-11-17T18:11Z UT.
- WSA-ENLIL (Prediction for CMEs :2022-11-19T07:36UT e 2022-11-19T13:53UT)
 - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-11-22T13:00UT and 2022-11-23T03:00UT.
- WSA-ENLIL (Prediction for CME : 2022-11-19T09:48UT)

- The simulation results indicate that the CME will reach the DSCOVR mission between 2022-11-21T21:51UT and 2022-11-22T11:51UT.

Coronal holes (SPOCA):

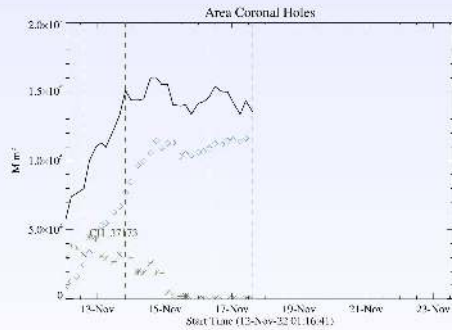


Figura: The solid line in black shows the products of the sum of areas for each detection interval performed by SPOCA between November 12 and 17, 2022.

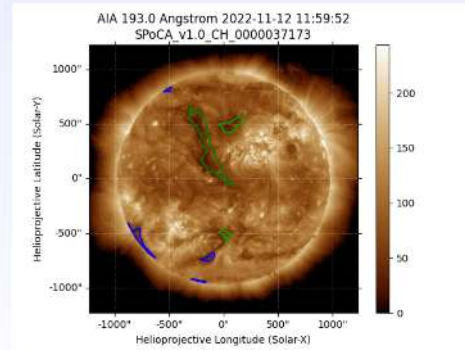


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 11:59 UT on November 12, 2022 (green dot line).

Navigation icons: back, forward, search, etc.

Coronal holes (SPOCA):

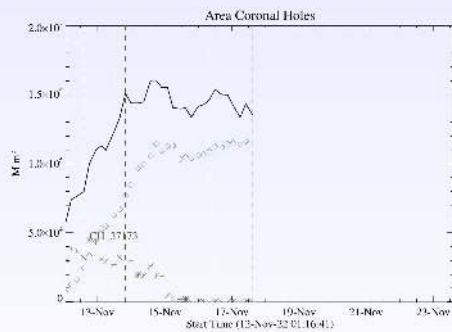


Figura: The solid line in black shows the products of the sum of areas for each detection interval performed by SPOCA between November 12 and 17, 2022.

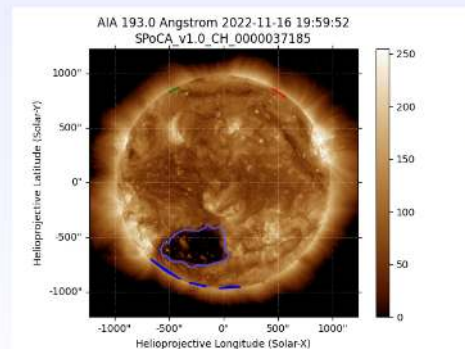
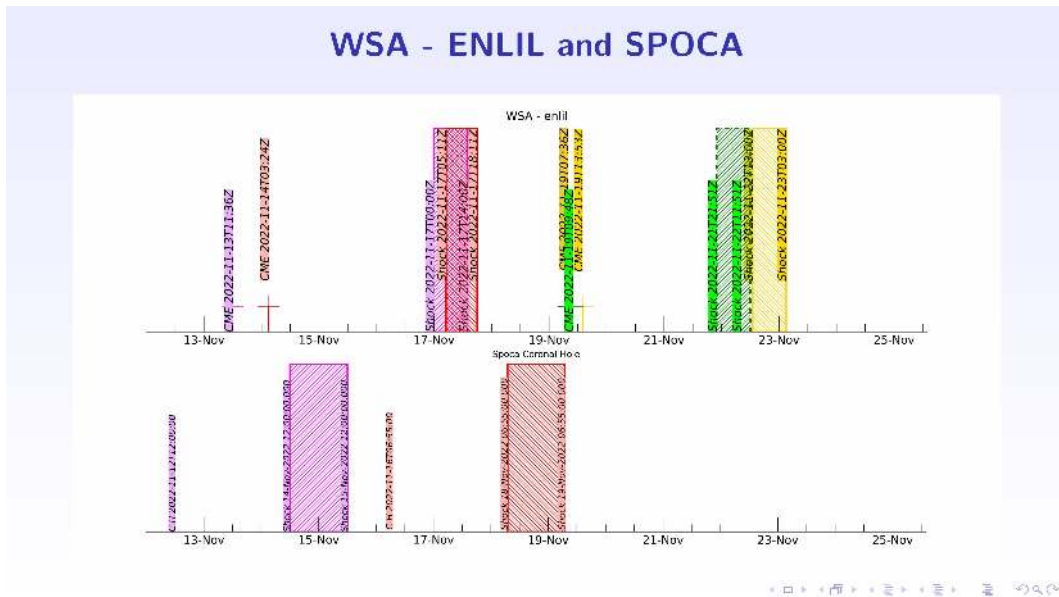


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 19:59 UT on November 16, 2022 (blue dot line).

Navigation icons: back, forward, search, etc.

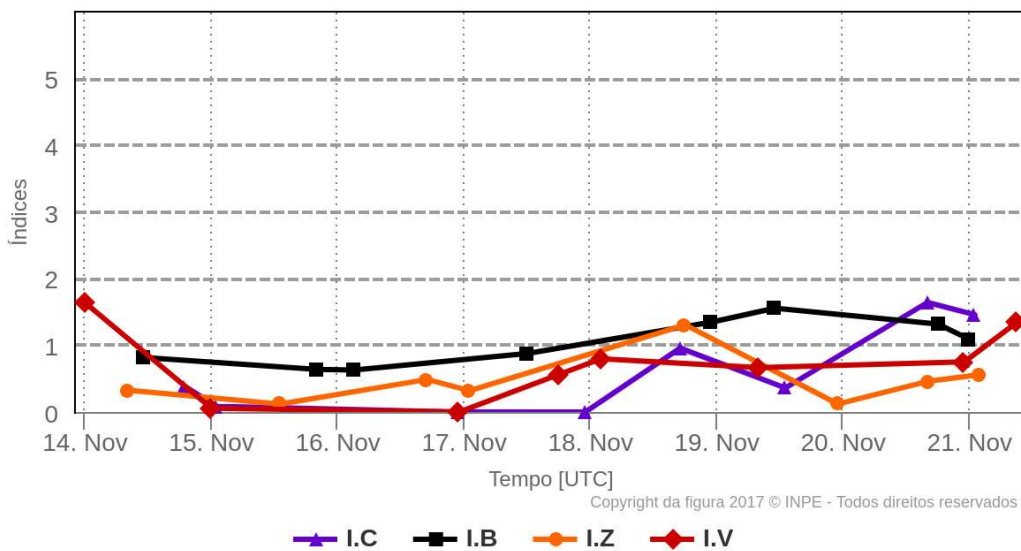


3 Interplanetary Medium

3.1 Responsible: Paulo Jauer

Resumo dos índices do meio interplanetário

Máximos diários - mais recentes entre 14 Nov, 2022 e 21 Nov, 2022



- 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 DISCOVER satellite in the interplanetary medium.
- The modulus of the interplanetary magnetic field component peaked at 11.9 nT on 19/Nov at 11:30 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 switching.

- The solar wind density showed the highest peak during the analyzed period on 20/Nov 16:30 of 18 p/cm^3 , however the density remained on average below 15 p/cm^3 in the rest of the period, showing disturbances.
- The solar wind speed remained on average below 400 km/s with a maximum peak on November 21 at 09:30 UT of 455 km/s , and a minimum recorded value of 302 km/s on November 17 at 05:30 UT.
- The position of the magnetopause was oscillating with a minimum value recorded on 27/Nov at 00:30 UT of 8.7 Re . On average, the magnetopause position was above the equilibrium position.

4 ULF waves

4.1 Responsible: Graziela B. D. Silva

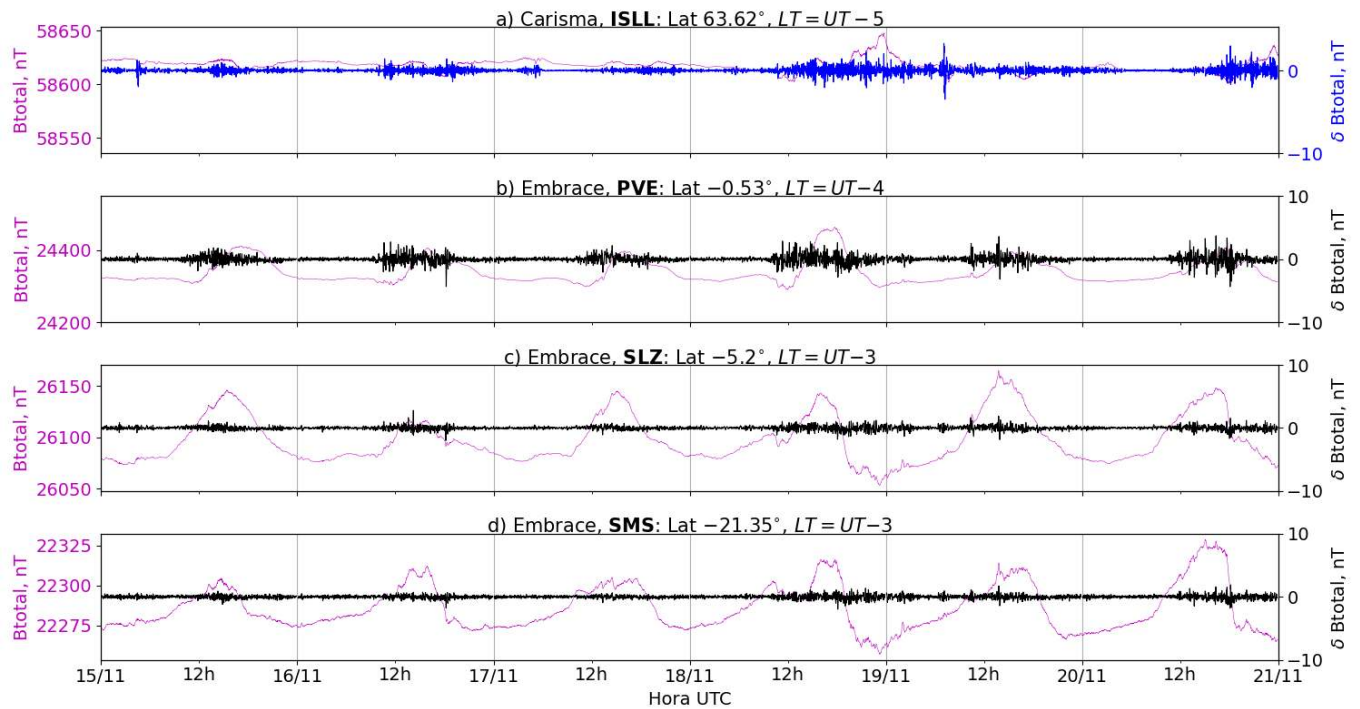


Figura 1: a) Timeseries of the geomagnetic field total component measured at ISLL station (Island Lake) of the CARISMA magnetometer network in magenta, along with the associated perturbation in the Pc5 band shown in blue. b-d) timeseries of the geomagnetic field total component measured at stations PVE (Porto Velho), SLZ (São Luís), and SMS (São Martinho da Serra) of the EMBRACE network in magenta, along with the Pc5 perturbation in blue.

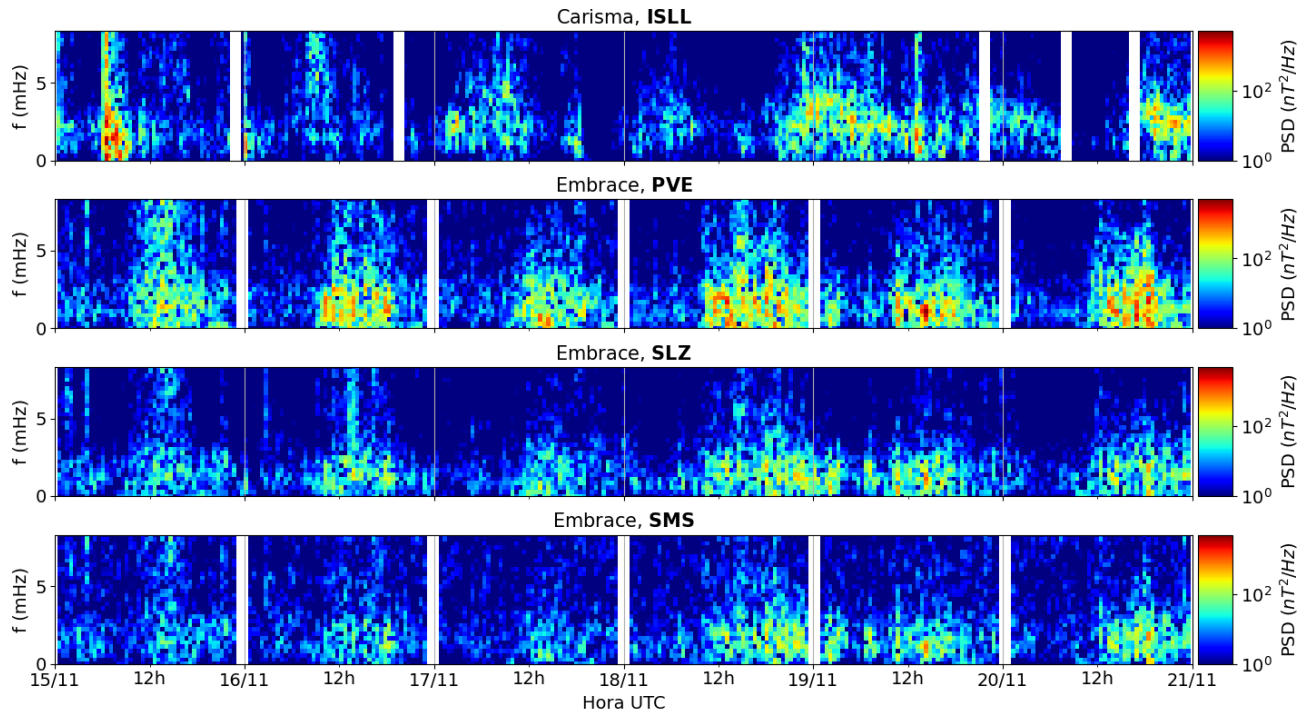


Figura 2: a-d) Time evolution of the power spectral density obtained from the filtered timeseries of the geomagnetic field total component (δB_{total}) for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, SLZ, SMS).

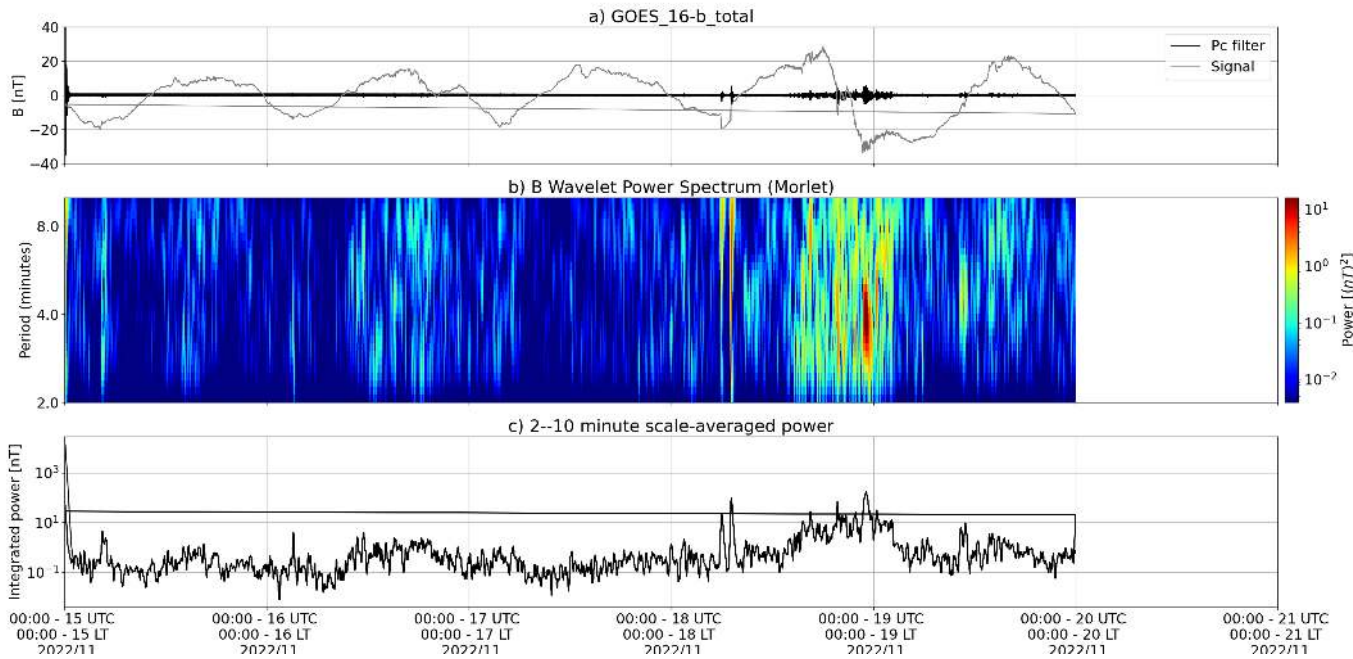


Figura 3: a) Timeseries of the geomagnetic field total component measured by GOES 16, together with the Pc5 fluctuation in black. b) Wavelet power spectrum of the filtered timeseries. c) Average ULF power in the period range from 2 to 10 minutes.

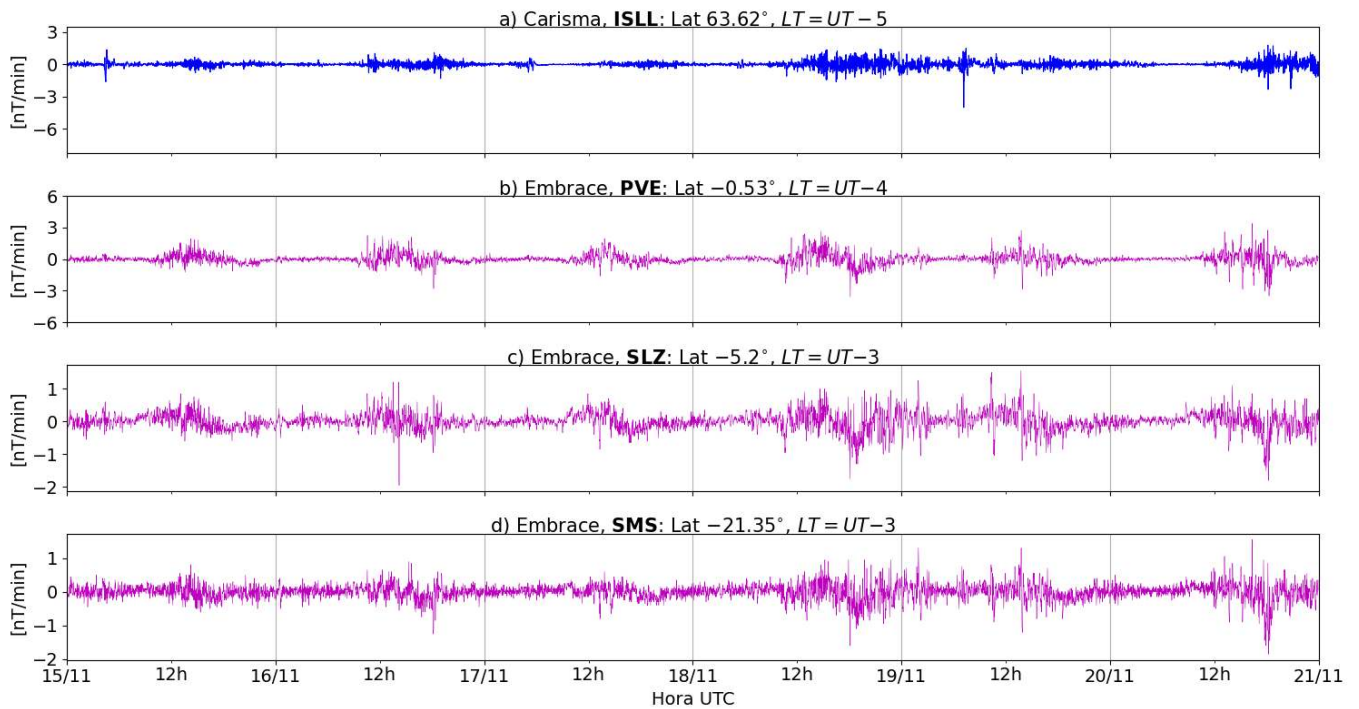


Figura 4: a-d) The rate of change of the geomagnetic field total component (dB/dt) obtained for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, SLZ, SMS).

- The GOES 16 satellite in geosynchronous orbit ($L \sim 6.6$) registered significant activity of Pc5 ULF waves only on November 18th, which started after 12 UT.
- As observed on the ground, the ISLL station at high latitude registered low intensity levels of ULF wave activity over the week, except on Nov. 15th.
- The PVE station from Embrace MagNet, located under the dip equator, registered moderate levels of ULF wave activity over the week, as a result of the strong diurnal influence by the equatorial electrojet.
- The SLZ and SMS stations at low latitudes of Brazil did not register any significant activity of the waves throughout the reported week.
- The rate of change in the geomagnetic field (dB/dt) was in the interval around $[-3, +3]$ nT/min, as measured both by the ISLL station (Carisma network) and the three Embrace Magnet stations (PVE, SLZ, and SMS).

5 Geomagnetic activity

5.1 Responsible: Lívia Alves

In the week of November 8-20, the following events related to geomagnetic activity stand out:

- In Nov20-21 is observed a drop in the H component.
- In Nov 18, the AE index reached 500 nT for several hours. The Dst index reached -16 nT(Nov 11) . The highest Kp of the week was 4-.
- The geomagnetic field measured at the GOES orbit shows instabilities throughout the week.

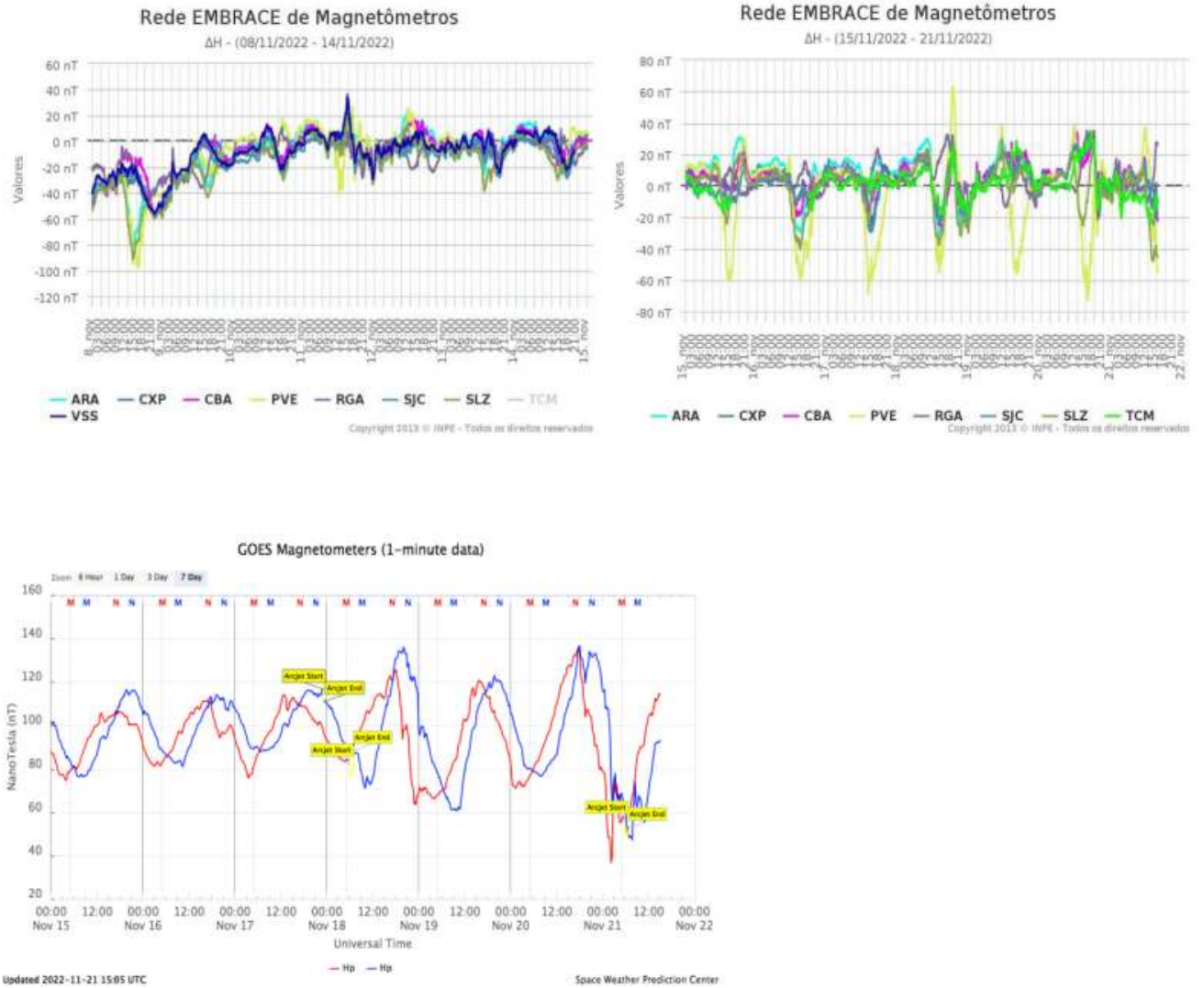


Figura 5: The figures from top to bottom show the weekly evolution of the H magnetic field component measured by the Embrace network, and of the geomagnetic field measured by the GOES satellites at $L \sim 6.6$.

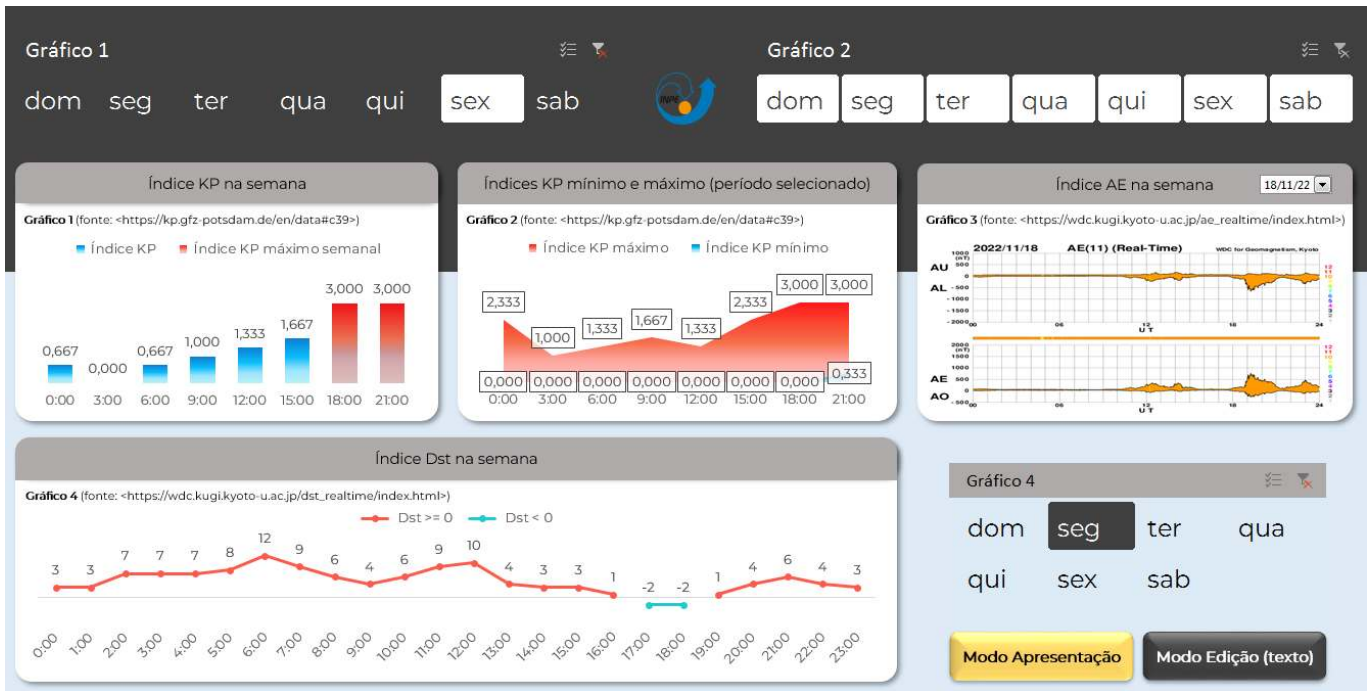


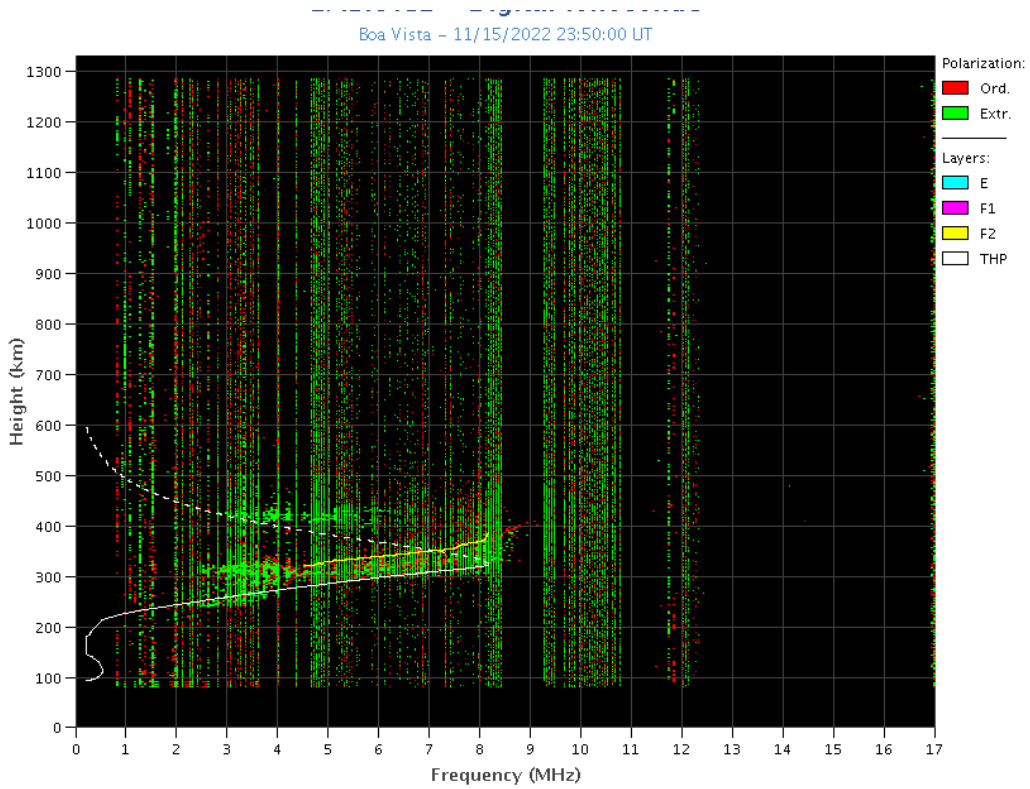
Figura 6: Graph 1 shows results of the Kp index for the weekday in which this index reached a maximum value (Nov. 18) ; graph 2 shows the hourly maximum values of the Kp index over the week; graph 3 shows the auroral AE index during the most disturbed day of the week (Nov. 18); and graph 4 shows the hourly value of the Dst index on Nov. 14 .

6 Ionosphere

6.1 Responsible: Laysa Resende

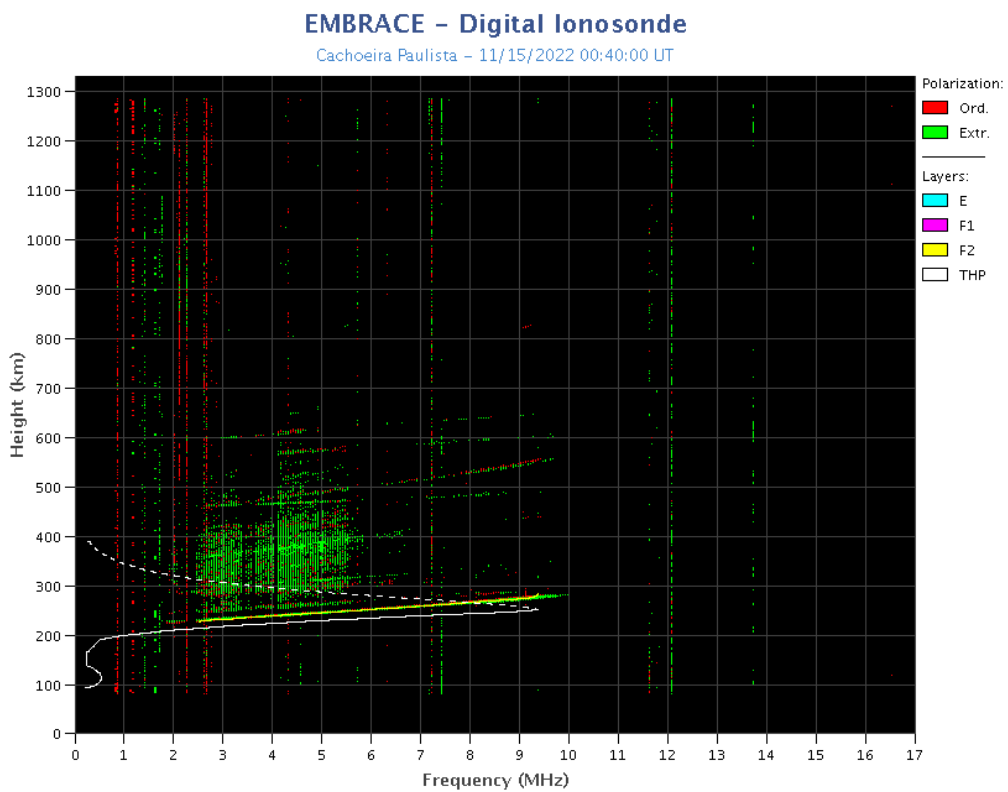
Boa Vista:

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



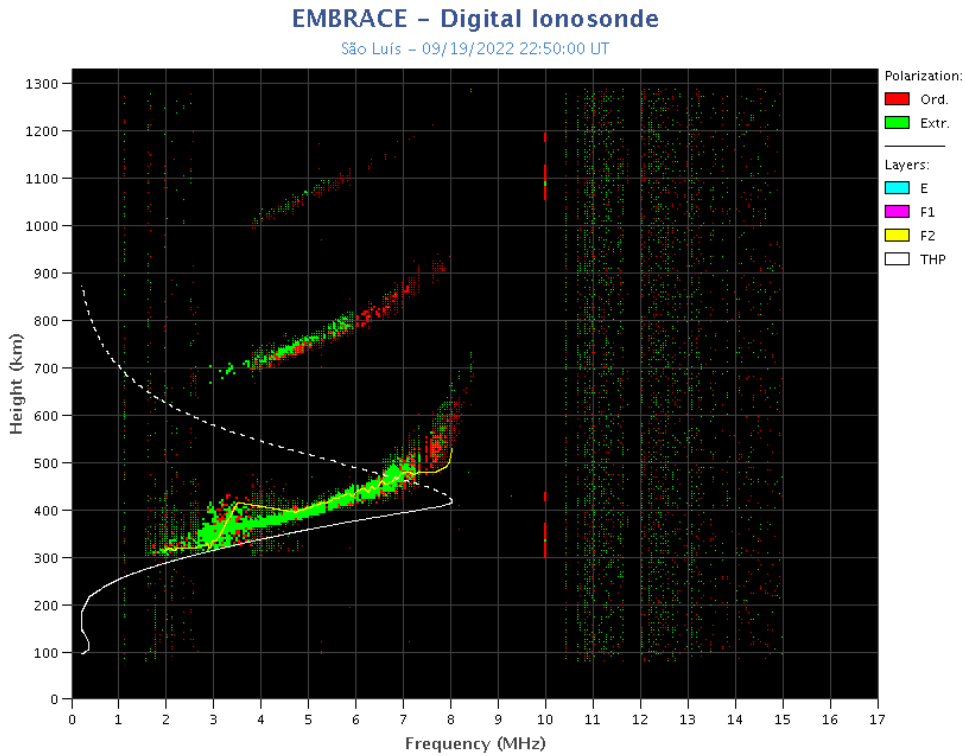
Cachoeira Paulista:

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



São Luís:

- There were spread F during this week.
- The Es layers reached scale 5 on November 21.



7 Scintillation

7.1 Responsible: Siomel Savio Odriozola

Summary: Ionosphere Retrospective (Scintillation S4)

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 all the stations (Figure 1). The period after sunset on 11/16th to the early hours of the 11/17th was particularly intense at the SLMA and STCB station. Something similar was recorded on 11/19th for the UFBA and SJCE stations. Figure 2 shows the maps with the spatial arrangement of signal interception from some satellites in the GPS constellation, which presented S4 values ≥ 0.2 and elevation $\geq 25^\circ$, with a layer at 400 km height over the field of view of the stations used in this report. These maps correspond to the aforementioned dates. The maximum values of S4 appear in the region where the southern crest of the equatorial ionization anomaly intercepts the plasma bubble that possibly is causing this degradation in the signal emitted by the satellites of the GPS constellation

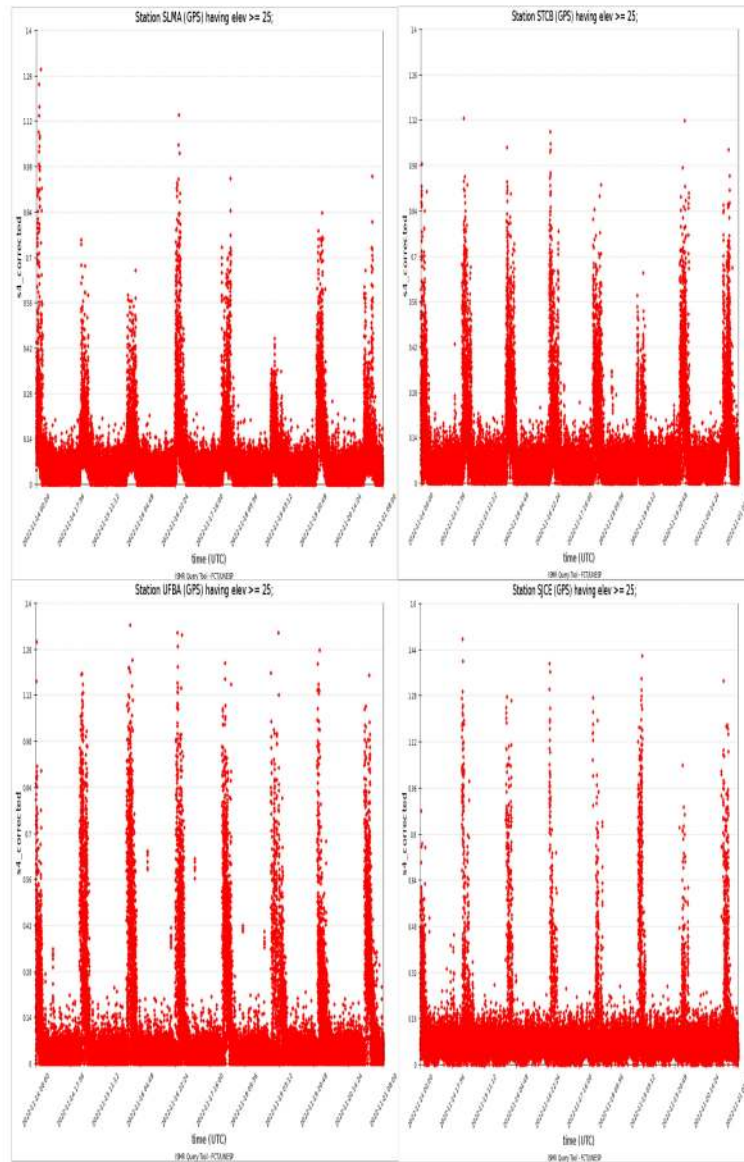


Figure 1: S4 index values for the GPS constellation measured at SLMA (upper left panel), STCB (upper right panel), UFBA (lower left panel) and SJCE (lower right panel) during the week 11/14–20.

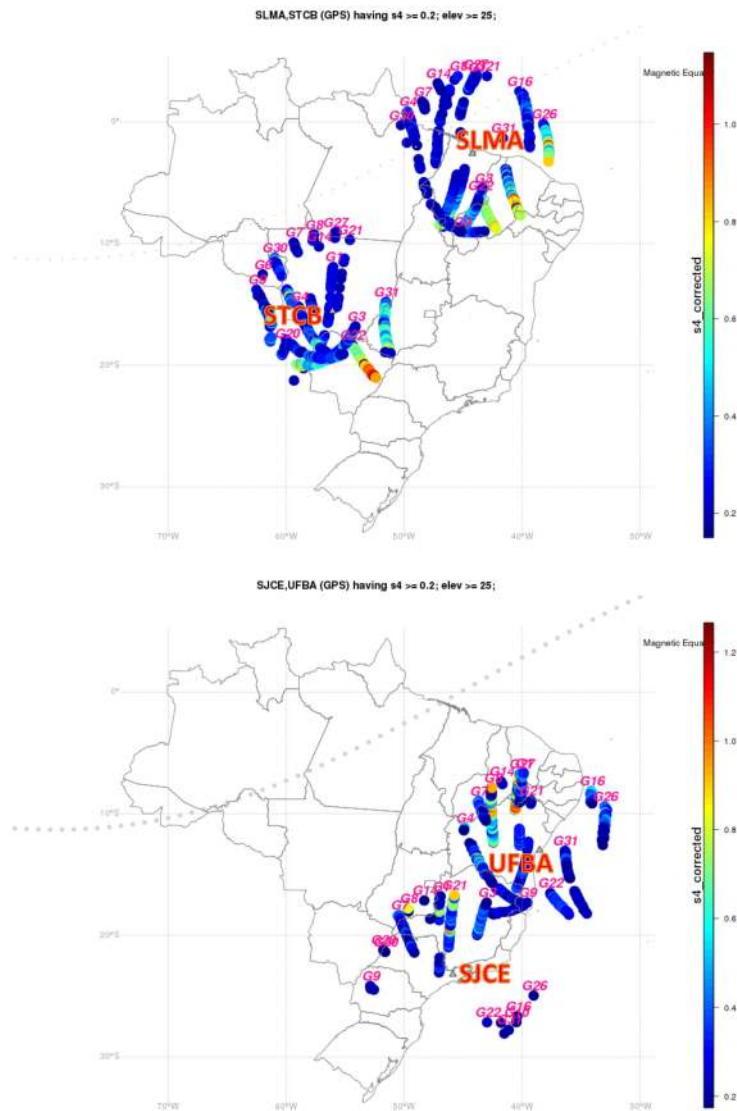


Figure 2: Map of S4 index values for the GPS constellation measured from the point of view of GNSS receiver at SLMA and STCB from 11/16 at 2030 UT to 11/17 at 0700 (upper panel) and UFBA, SJCE (lower panel) from 11/19 at 2030 UT to 11/20 at 0700 (lower panel).

8 ROTI

8.1 Responsible: Carolina de Sousa do Carmo

In the week 2236 (November 13 to 19, 2022) there were ionospheric irregularities (plasma bubble), on all analyzed days, as shown in Table 1. In addition, Figure 7 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	2022/11/13	00:00-04:00; 21:00-24:00
Monday	2022/11/14	00:00-04:00; 21:00-24:00
Tuesday	2022/11/15	00:00-04:00; 21:00-24:00
Wednesday	2022/11/16	00:00-04:00; 21:00-24:00
Thursday	2022/11/17	00:00-04:00; 21:00-24:00
Friday	2022/11/18	00:00-05:00; 23:00-24:00
Saturday	2022/11/19	00:00-04:00; 22:00-24:00

Tabela 1: Weekly Summary (Nov 13-19, 2022).

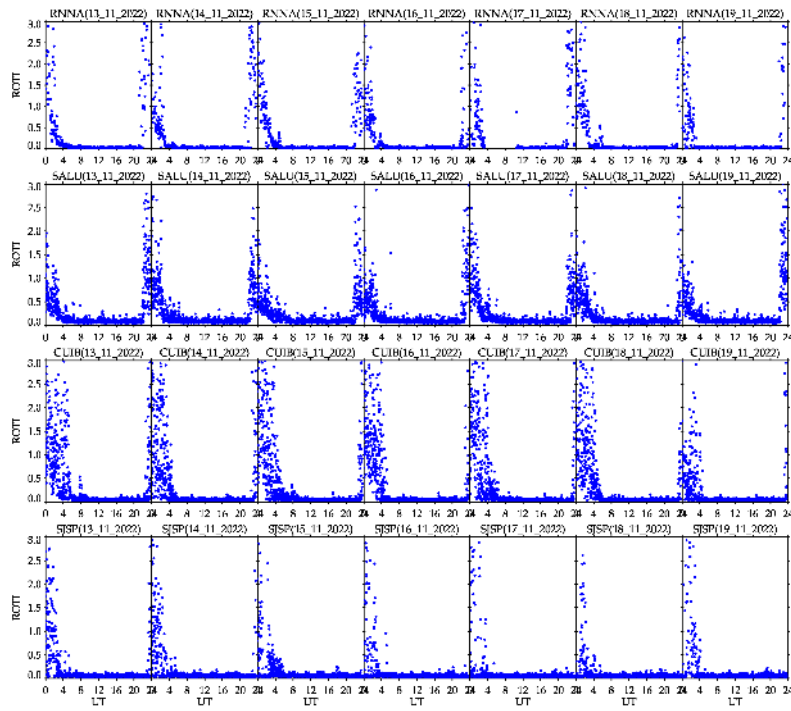


Figura 7: ROTI time series for four stations in the Brazilian sector (Natal (RNNA), São Luis (SALU), Cuiabá (CUIB) and São José dos Campos (SJSP)), from November 13 to 19, 2022.