Briefing Space Weather

2022/09/14

1 Sun

1.1 Responsible: José Cecatto

09/05 – M1.1 flare; Fast wind stream (=<650 km/s); 6 CME c.h.c. toward the Earth;
09/06 – No flare (M/X); Fast wind stream (=< 600 km/s); 5 CME c.h.c. toward the Earth;
09/07 – No flare (M/X); Fast wind stream (=< 600 km/s); No CME toward the Earth;
09/08 – No flare (M/X); Fast wind stream (=< 550 km/s); 3 CME c.h.c. toward the Earth;
09/09 – No flare (M/X); Fast wind stream (=< 550 km/s); 3 CME c.h.c. toward the Earth;
09/10 – No flare (M/X); Fast wind stream (=< 500 km/s); 2 CME c.h.c. toward the Earth;
09/11 – No flare (M/X); Fast wind stream (=< 500 km/s); 3 CME c.h.c. toward the Earth;
09/12 – No flare (M/X); No fast wind stream; No CME toward the Earth;
Prev.: Fast wind stream expected on September 16; for the next 2 days (20% 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 : 2022-09-07T22:36Z)
  - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-09-11T09:00Z and 2022-09-11T23:00Z.
- WSA-ENLIL (Prediction for CME : 022-09-09T07:24Z))
  - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-09-13T14:00Z and 2022-09-12T04:00Z.

Coronal holes (SPOCA):

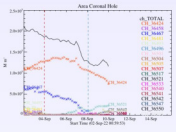


Figura: The solid line in black shows the products of the sum of areas for each detection interval performed by SPOCA between September 02 and 10, 2022.

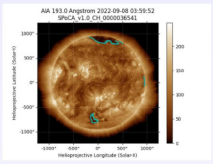


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 00:00 UT on September 08, 2022 (blue dot line).

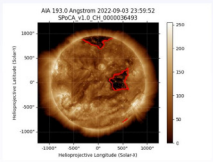


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 00:00 UT on September 04, 2022 (red dot line).

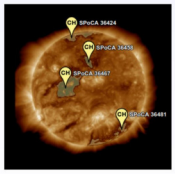
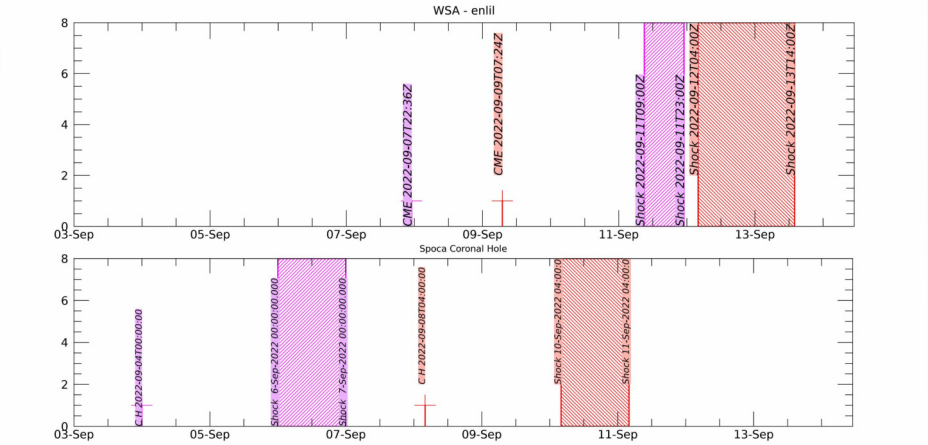


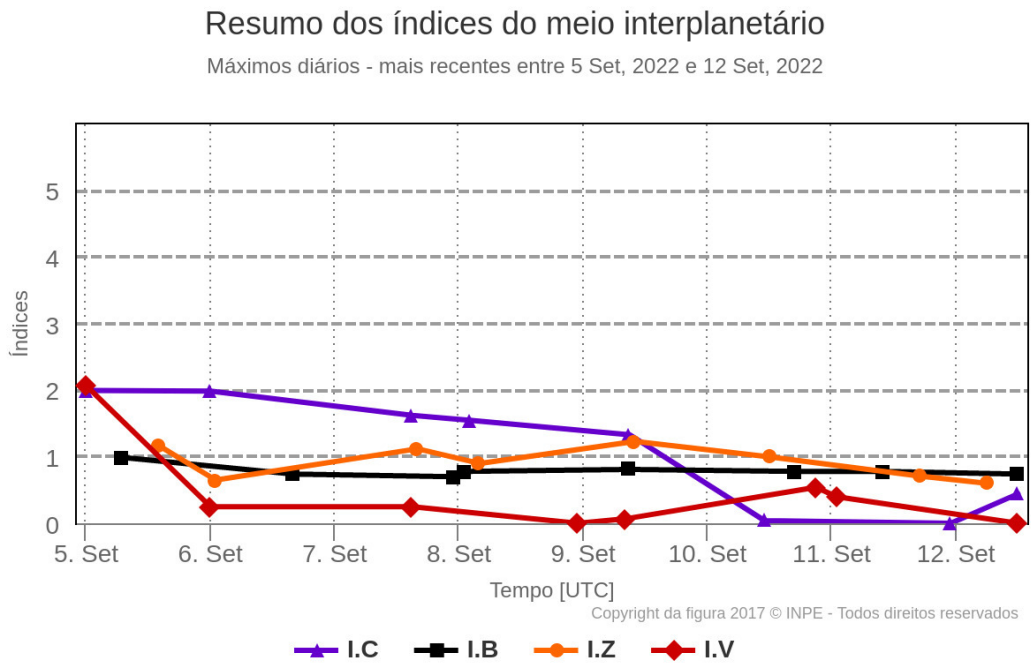
Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 12:00 UT on August 31, 2022 (pink dot line).

WSA - ENLIL SPOCA



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 HSS-like structures identified by the DISCOVR satellite in the interplanetary medium.
- The modulus of the interplanetary magnetic field component remained below 8 nT during the analyzed period.
- The BxBy components showed variations in the analyzed period, both remaining oscillating within the [+5, -5] nT interval, without the presence of sector switching.
- The Bz field component showed fluctuations oscillating mostly in the [-5nT, 5 nT] interval, HSS feature.
- The density of the solar wind showed variations with density oscillating below 11 p/cm^2.
- The solar wind speed decreasing throughout the week, with a maximum value around 642 km/s at 00:30 on 05/Sep. However, it remained on average above 400 km/s during the analyzed period.
- The magnetopause position was oscillating on average below the equilibrium position in the [8-10]Re interval.

4 Radiation Belts

4.1 Responsible: Ligia Alves da Silva

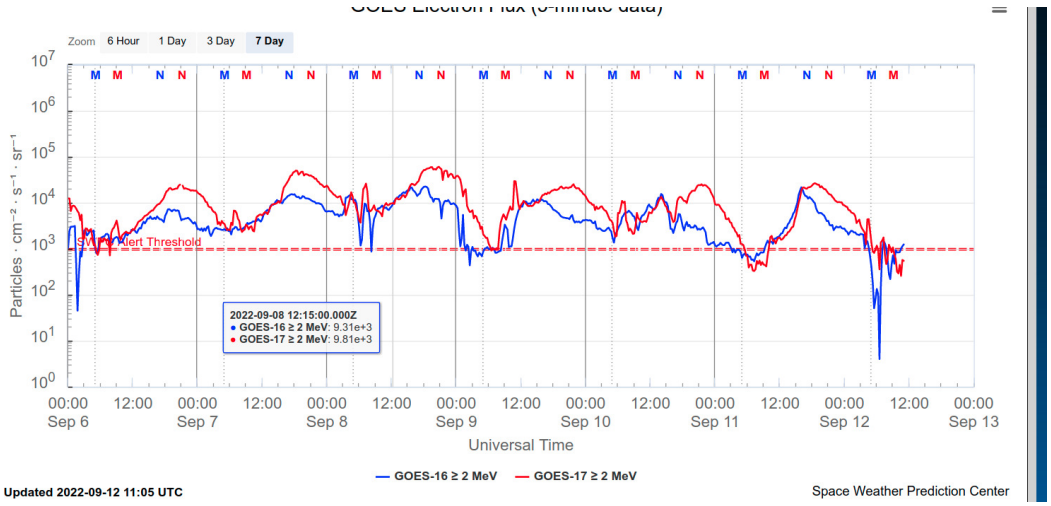


Figura 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-17 satellite. Source: `https://www.swpc.noaa.gov/products/goes-electron-flux`

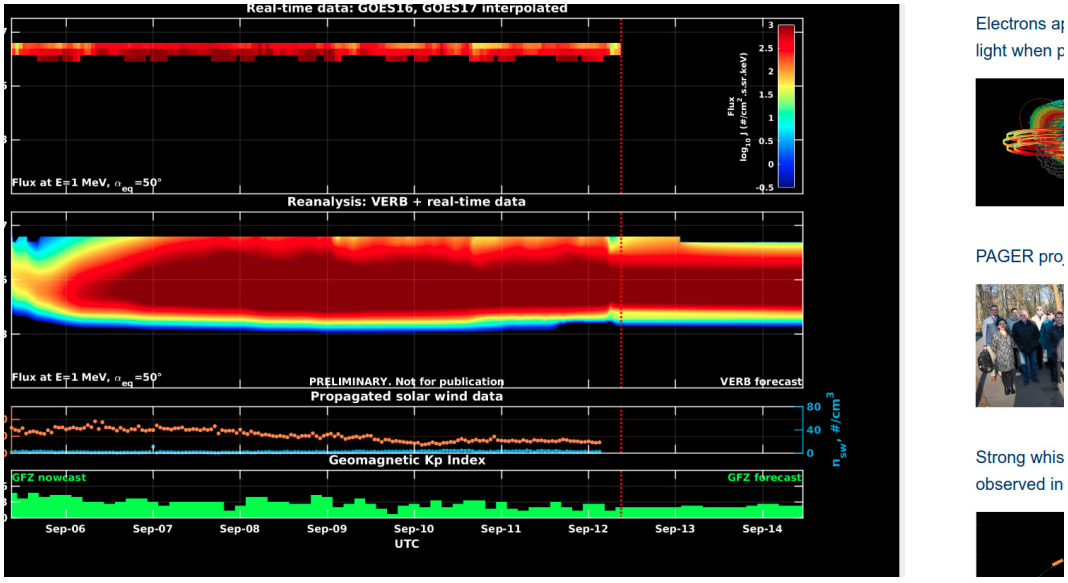


Figura 2: high-energy electron flux data (real-time and interpolated) obtained from GOES-16 and GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: `https://rbm.epss.ucla.edu/realtime-forecast/`

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 confined around the 104 particles/(cm2 s sr) almost throughout the analyzed period. Two electron flux decreases reach values below 10^3 particles/$(cm^2 ssr)$. The first was observed at 06:00 UT on September 11th and the second at 09:00 UT on September 12th, respectively.

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 electron flux variabilities observed in the outer radiation belt are confined at their boundary. These electron flux variabilities coincide with the arrival of solar wind structures and ULF wave activities.

5 ULF waves

5.1 Responsible: Graziela B. D. Silva

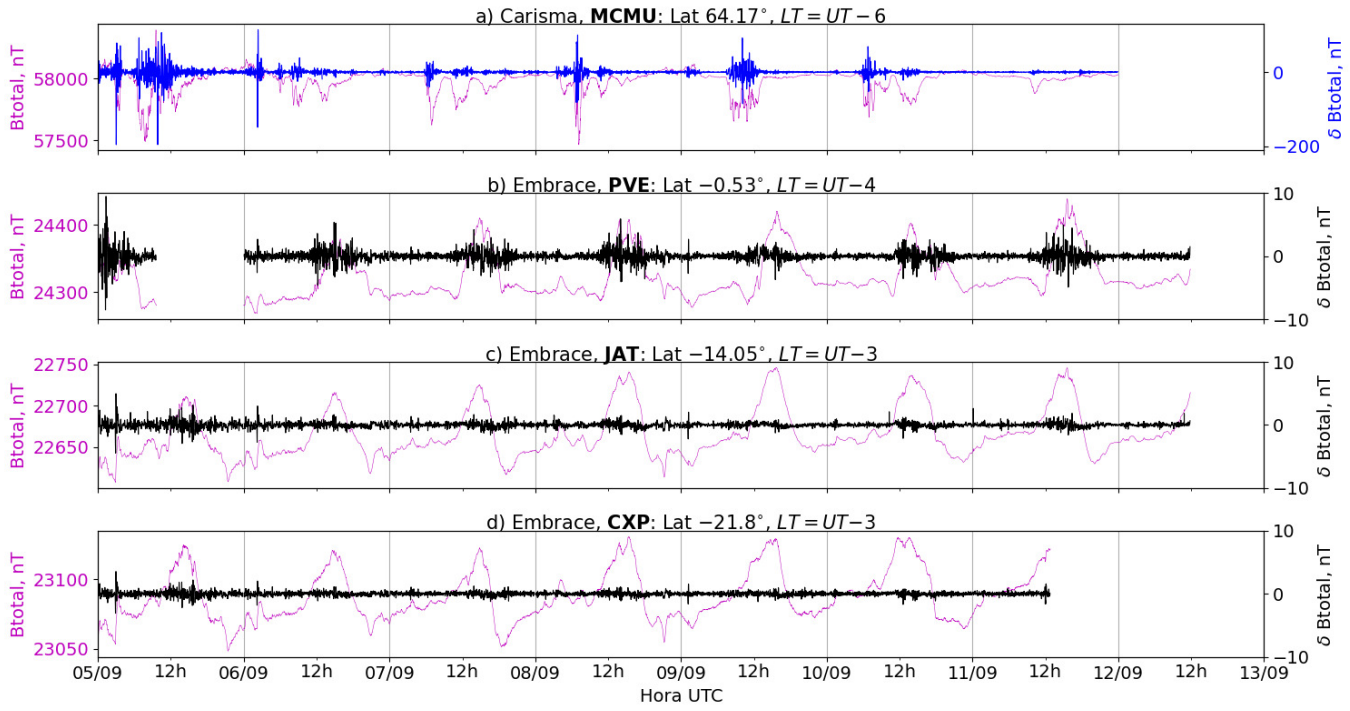


Figura 3: a) Timeseries of the geomagnetic field total component measured at MCMU station (Fort McMuray) of the CARISMA magnetometer network in magenta, along with the associated perturbation in the Pc5 band shown in blue. b-d) timeseries of the geomagnetic field total component measured at stations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

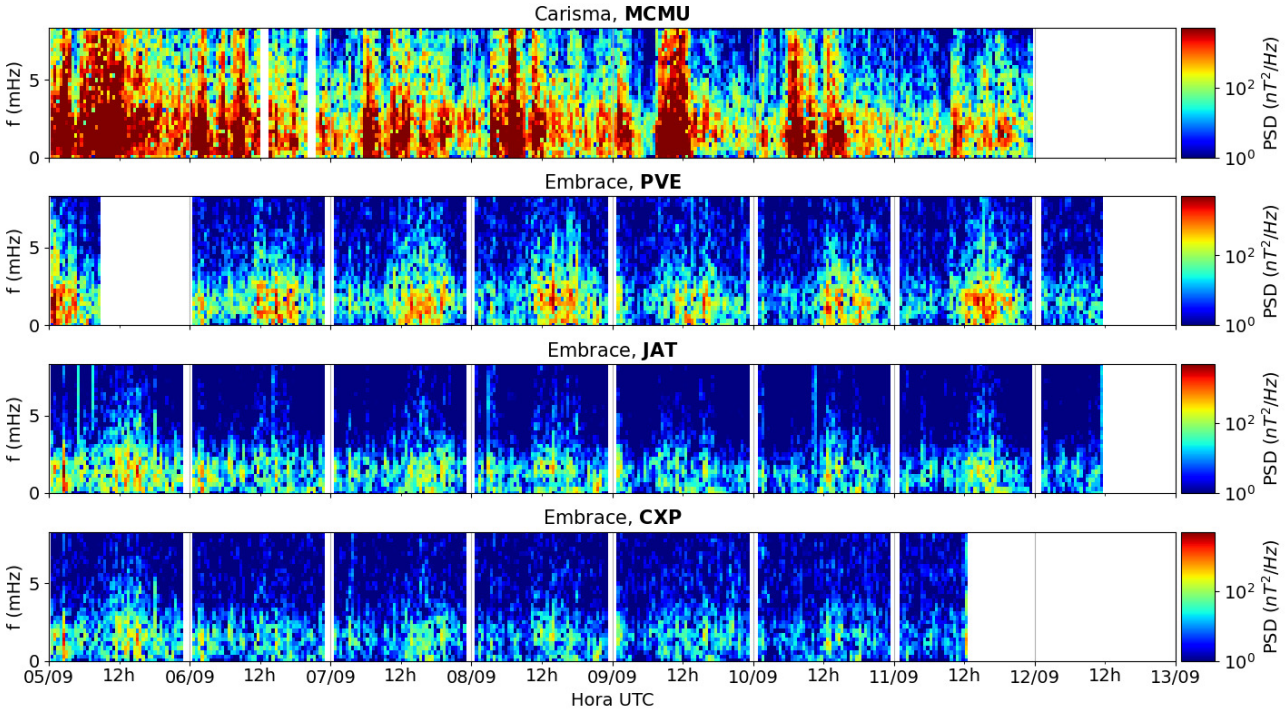


Figura 4: a-d) Time evolution of the power spectral density obtained from the filtered timeseries of the geomagnetic field total component (δ Btotal) for a) the high latitude station (MCMU-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, JAT, CXP).

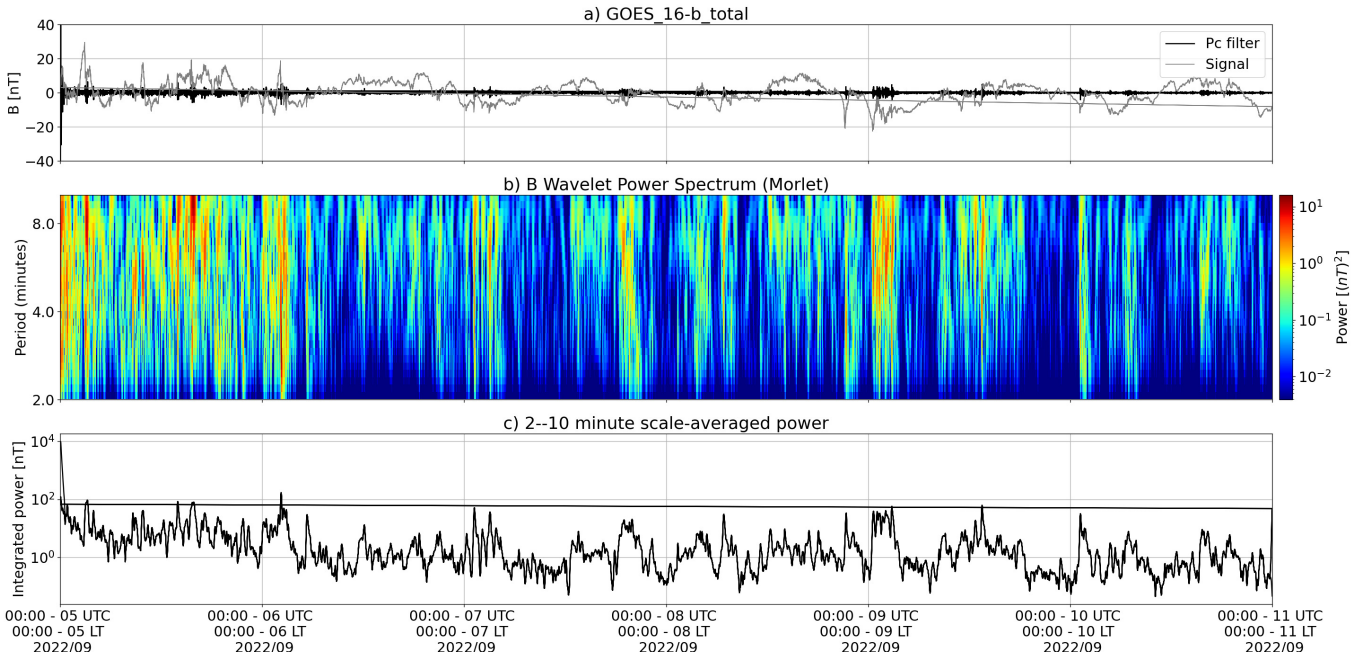


Figura 5: a) Timeseries of the geomagnetic field total component measured by GOES 16, together with the Pc5 fluctuation in black. b) Wavelet power spectrum of the filtered timeseries. c) Average ULF power in the period range from 2 to 10 minutes.

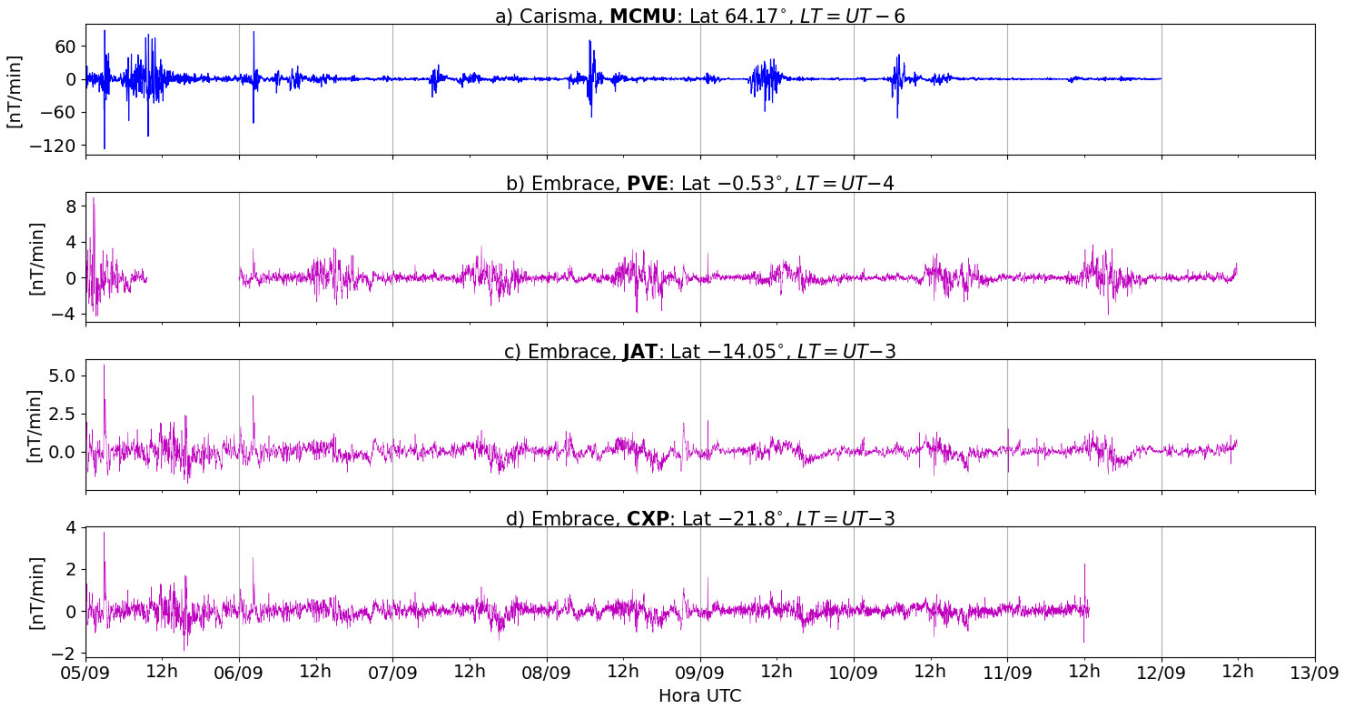


Figura 6: a-d) Rate of change of the geomagnetic field total component (dB/dt) obtained for a) the high latitude station (MCMU-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, CXP, MED).

- The GOES 16 satellite in geosynchronous orbit (L $\sim$ 6.6) registered an intense activity of Pc5 ULF waves throughout the week until September 10, especially in the interval from Sep. 5 until the first hours of Sep. 6.
- As observed on the ground, the MCMU station of the Carisma network (high latitude, L=5.35) registered significant ULF wave activity throughout the week, especially on Sep. 5.
- The low latitude stations of Embrace reported weak to moderate levels of ULF wave activity at JAT and CXP stations, whereas more intense levels were observed for PVE over the week.
- With exception of Sep. 5, the ULF waves observed at the PVE station on a daily basis were closely related to the rise of the Equatorial electrojet.
- Such recurrent wave activity reported at PVE generated prolonged periods of $\sim$ 6 hours of dB/dt amplitudes in the interval [-4,+4] nT/min.
- There were peaked dB/dt signals simultaneously observed from the MCMU station with amplitudes within [-120, +60] nT/min, down to low latitudes (¡ 8 nT/min) on Sep 5, 6 and 9.

6 Geomagnetic activity

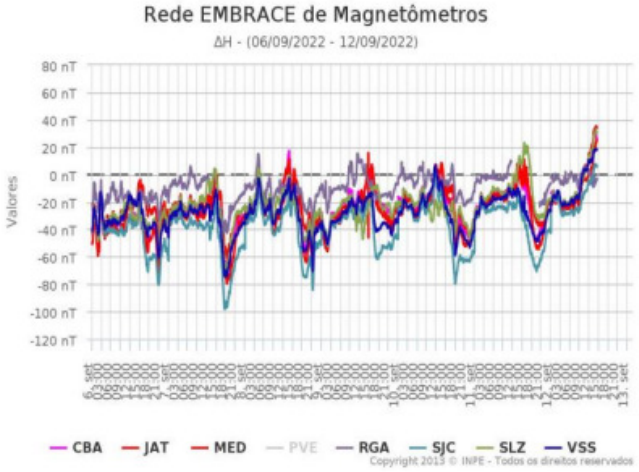
6.1 Responsible: Lívia Alves

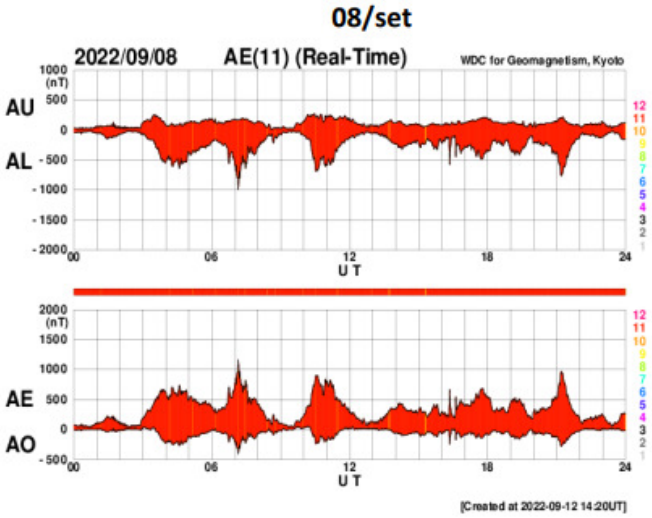
In the week of Sep. 6-12, the following events related to geomagnetic activity stand out:

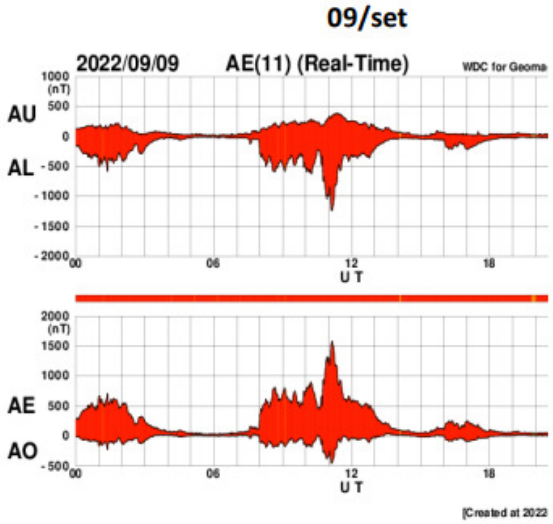
- The data from the Embrace magnetometer network registered instabilities in Sep 7 and 10.
- On Sep. 7, the magnetometers of the Embrace network recorded a drop to values of -80 nT in the H component.
- The geomagnetic field was active, the AE index reached 1000 nT for several hours on Sep 8-10. The Dst index reached -50 nT (Sep 10). The highest Kp of the week was 4o.

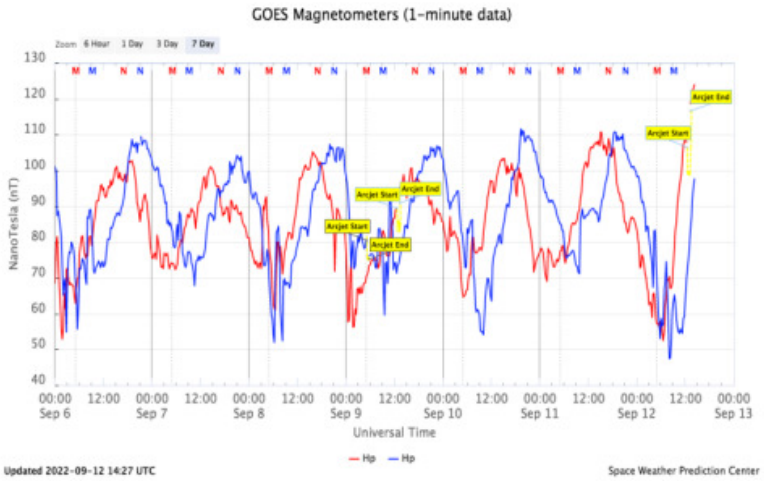
- The geomagnetic field measured at the GOES orbit shows instabilities throughout the week.

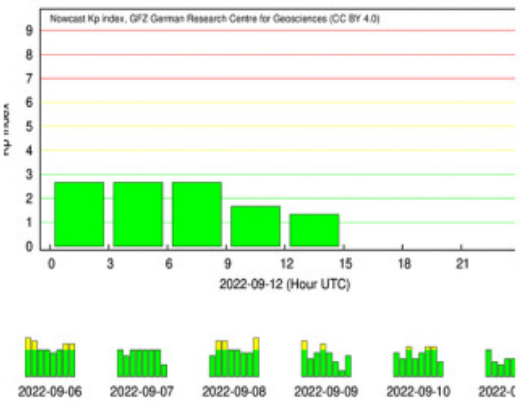
Briefing semana de 06/09 à 12/09 de 2022

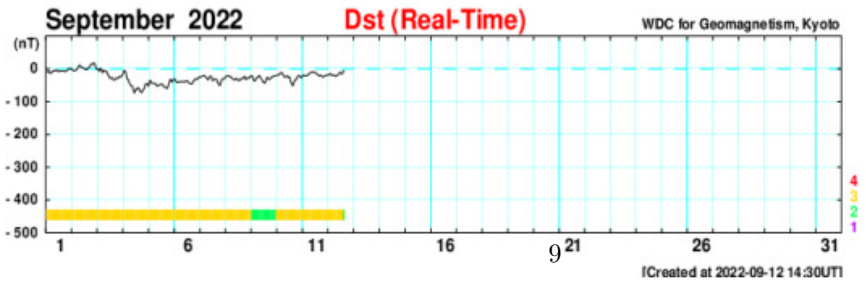










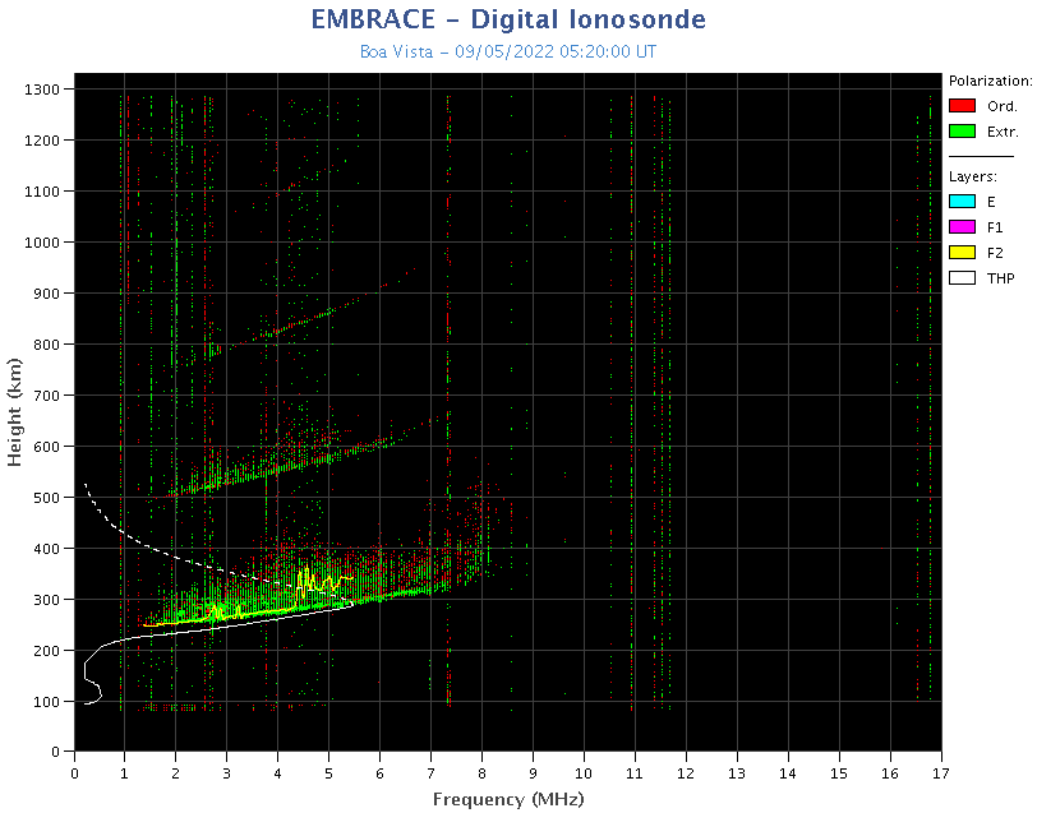


7 Ionosphere

7.1 Responsible: Laysa Resende

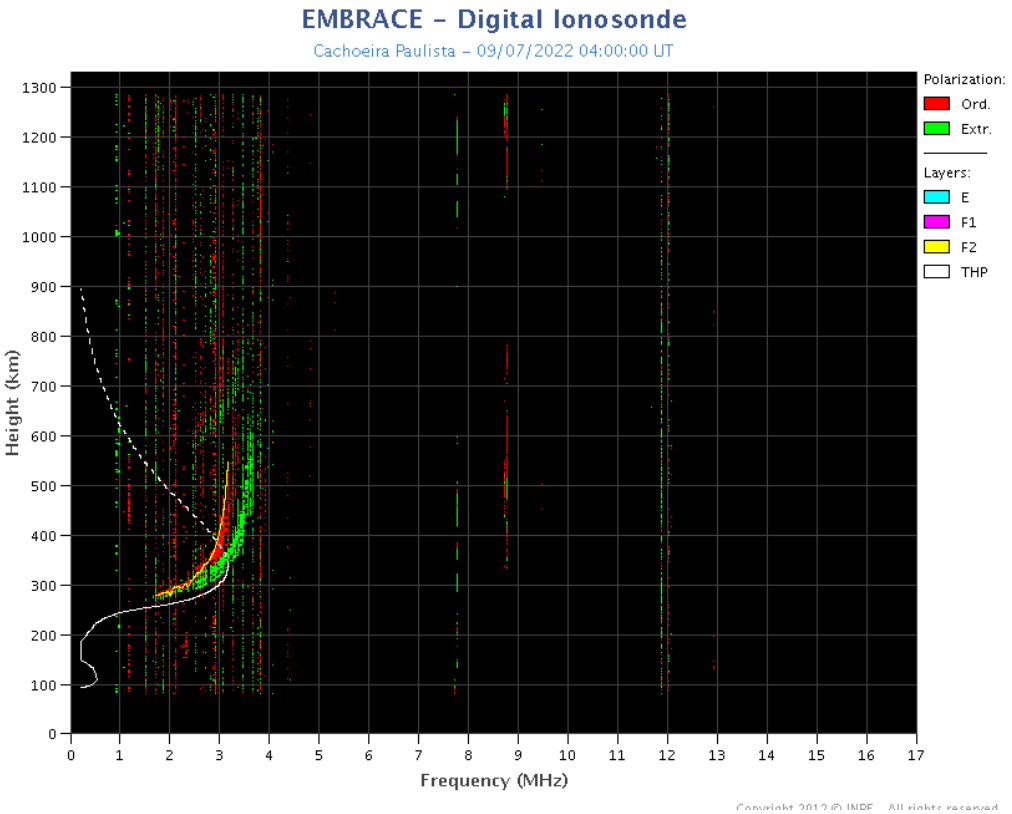
Boa Vista:

- The spread occurred all days during this week.
- The Es layers reached scale 3 during this week.



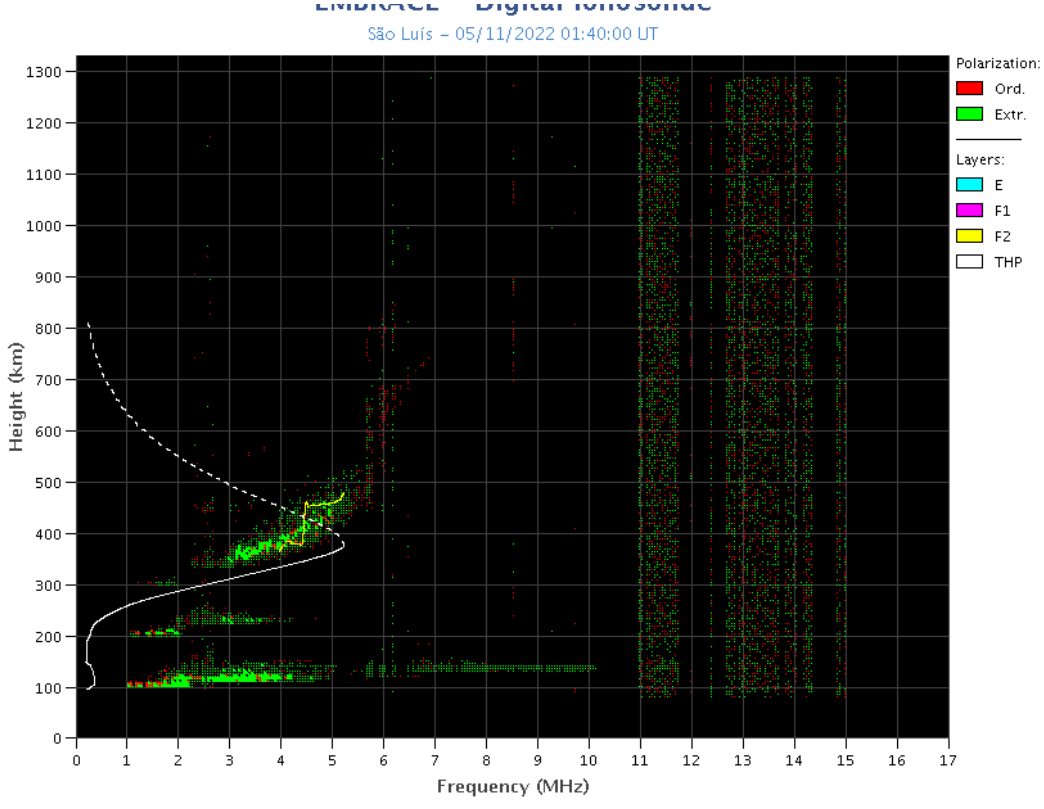
Cachoeira Paulista:

- The spread-F did not occurred during this week.
- The Es layers reached scale 2 during this week.



São Luís:

- There were spread F during this week.
- The Es layers reached scale 4 on September 10.



8 Scintilation

8.1 Responsible: Siomel Savio Odriozola

In this report on the S4 scintillation index, data from SLMA in São Luiz/MA, STNT in Natal/RN, 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 $\sim$ 360 m. The only station that did not show any S4 measurements above 0.2 was SJCE. The rest showed moderate to strong and even very intense scintillation events on different days of the week (Figure 1). Between 2200 UT on 09/09 and 0300 UT on the following day, a flickering event was recorded in SLMA, STNT and STCB (Figure 2), being this the most prominent event of the week

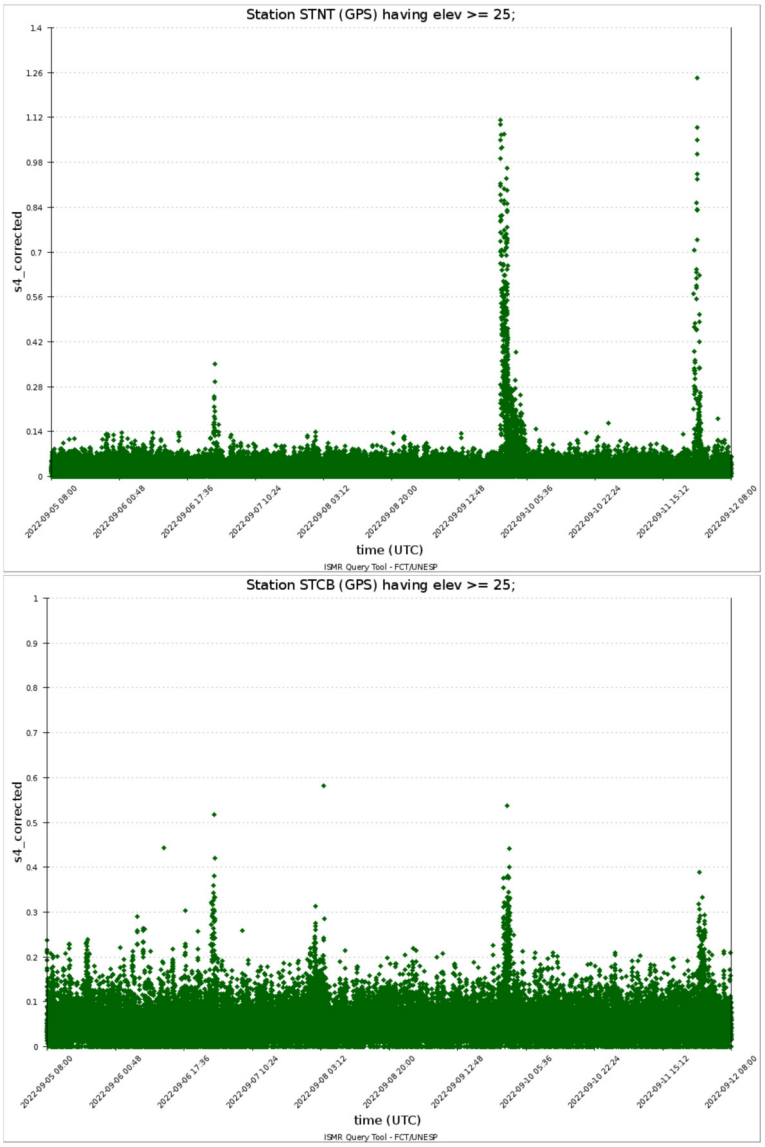


Figure 1: S4 index values for the GPS constellation measured at STSN (upper panel) and STCB (lower panel) during the week 09/05 – 09/12.

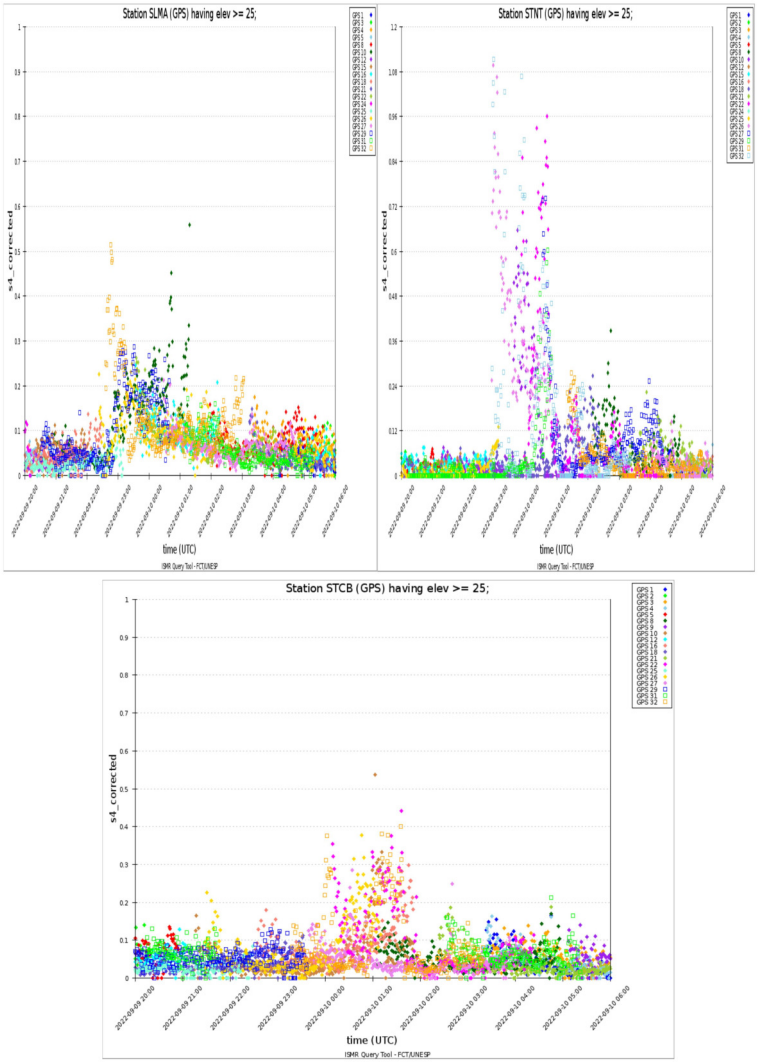


Figure 2: S4 index values for the GPS constellation measured at SLMA (left upper panel), STNT right upper panel) and STCB (lower panel) on 09/09 between 2000 and 0600 UT

9 All-Sky Imager

9.1 Responsible: LUME

All-Sky Imager EPBs Observation
Observações das EPBs por meio do imageador All-Sky
September 04 - September 10, 2022 || 04 de setembro - 10 de setembro, 2022

Observatory Observatório	September 04 Setembro 04	September 05 Setembro 05	September 06 Setembro 06	September 07 Setembro 07	September 08 Setembro 08	September 09 Setembro 09	September 10 Setembro 10
CA	✓❍✳☾	✓⛅✳☾	✓❍✳☾	✓❍✳☾	✓🌥✳☾	✗	✓❍✳☾
BJL	✗	✗	✗	✗	✗	✗	✗
CP	✓🌥☾	✓🌥☾	✓⛅✳☾	✓❍✳☾	✗	✗	✗
SMS	✓❍✳☾	✓🌥✳☾	✓🌥✳☾	✓❍☾	✓🌥✳☾	✗	✓❍✳☾

Definition of Symbols	
CA	São João do Cariri
BJL	Bom Jesus da Lapa
CP	Cachoeira Paulista
SMS	São Martinho da Serra
✓	Observation - Observação
✗	No Observation - Sem Observação
❍	Clear sky - Céu limpo
⛅	Partly Cloudy - Parcialmente Nublado
🌥	Cloudy - Nublado
🌧	Cloudy with Rain - Nublado com Chuva
✳	Blur image - Imagem Desfocada

- At the Sao Joao do Cariri observatory, plasma bubble was observed on the September 04.
- At the Bom de Jesus da Lapa observatory there was no observation due to technical problems.
- At the Cachoeira Paulista observatory, no geophysical phenomena such as plasma bubbles and traveling ionospheric disturbances were observed during the period.
- Finally, at the observatory of Sao Martinho da Serra observatory, was observed plasmas bubbles on September 04.
- Between September 4th and 10th, 2022, TEC maps showed plasma bubbles. In addition, during this period, the equatorial anomaly is observed during the day and part of the night in the magnetic southern hemisphere.

10 ROTI

10.1 Responsible: Carolina de Sousa do Carmo

In the week 2226 (September 4 to 10, 2022) there were ionospheric irregularities (plasma bubble), on September 4, 5, 9, and 10, 2022, as shown in Table 1. In addition, the Figure below shows an example of the plasma bubble occurrence on September 10, 2022, using keograms at -5º and 15º latitude.

Sunday	2022/09/04	22:30-24:00
Monday	2022/09/05	00:00-05:00
Tuesday	2022/09/06	-
Wednesday	2022/09/07	-
Thursday	2022/09/08	-
Friday	2022/09/09	22:30-24:00
Saturday	2022/09/10	00:00-05:00

Tabela 1: 10, 2022).

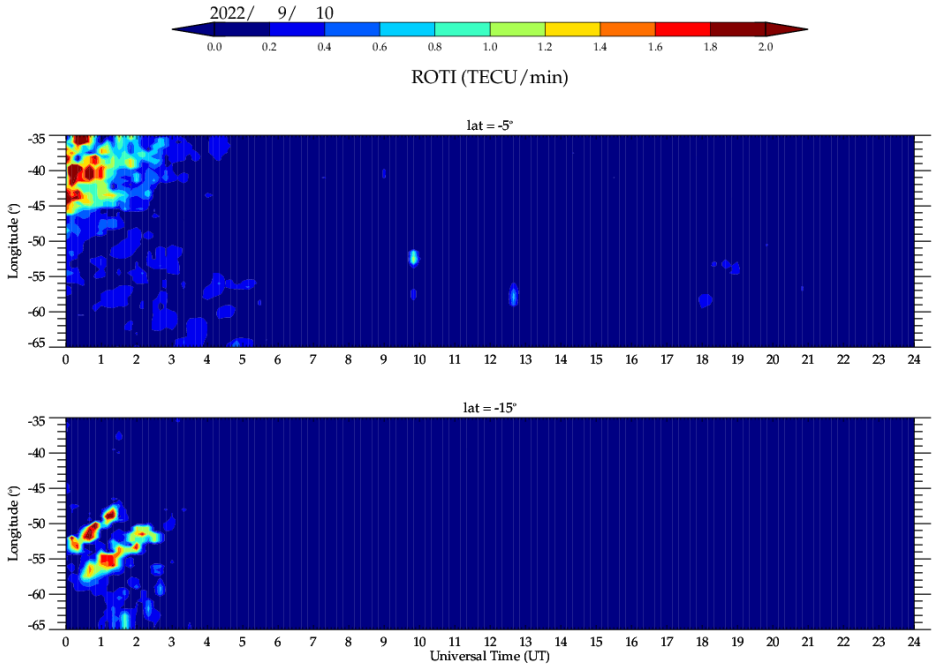


Figura 7: Keogram of September 10, 2022, for latitudes of -5º and -15