Briefing Space Weather

2022/09/06

1 Sun

1.1 Responsible: José Cecatto

08/29 – M3.3, M8.6, M2.5, M4.7 flares; Fast wind stream (=< 550 km/s); 1 CME c.h.c. toward the Earth;
08/30 – M1.5, M2.1 flares; Fast wind stream (=< 650 km/s); 12 CME c.h.c. toward the Earth;
08/31 – No flare (M/X); Fast wind stream (=< 600 km/s); 6 CME c.h.c. toward the Earth;
08/01 – No flare (M/X); Fast wind stream (=< 600 km/s); 4 CME c.h.c. toward the Earth;
08/02 – No flare (M/X); Fast wind stream (=< 450 km/s); 3 CME c.h.c. toward the Earth *;
08/03 – No flare (M/X); Fast wind stream (=< 600 km/s); 3 CME c.h.c. toward the Earth;
08/04 – No flare (M/X); Fast wind stream (=< 700 km/s); Sem CME toward the Earth;
08/05 – No flare (M/X); Fast wind stream (=< 600 km/s); Sem CME toward the Earth;
Prev.: Fast wind stream expected up to September 06; 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 : 2022-08-27T02:23Z)
  - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-08-29T04:00Z and 2022-08-29T18:00Z.
- WSA-ENLIL (Prediction for CME : 2022-03-03T00:14Z)
  - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-09-05T00:30Z and 2022-09-05T14:30Z.
- WSA-ENLIL (Prediction for CME 2022-09-04T08:48Z)
  - The simulation indicates that Coronal Mass Ejection will reach the DSCOVR mission between 2022-09-06T14:00Z and 2022-09-07T04:00Z.

Coronal holes (SPOCA):

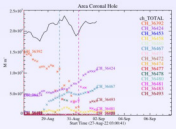


Figura: The solid line in black shows the products of the sum of areas for each detection interval performed by SPOCA between August 27 and September 02, 2022.

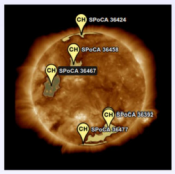


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 00:00 UT on August 30, 2022 (blue dot line).

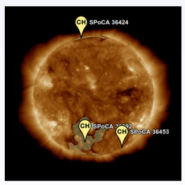


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 04:00 UT on August 27, 2022 (red dot line).

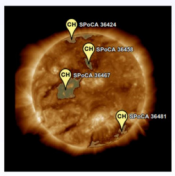
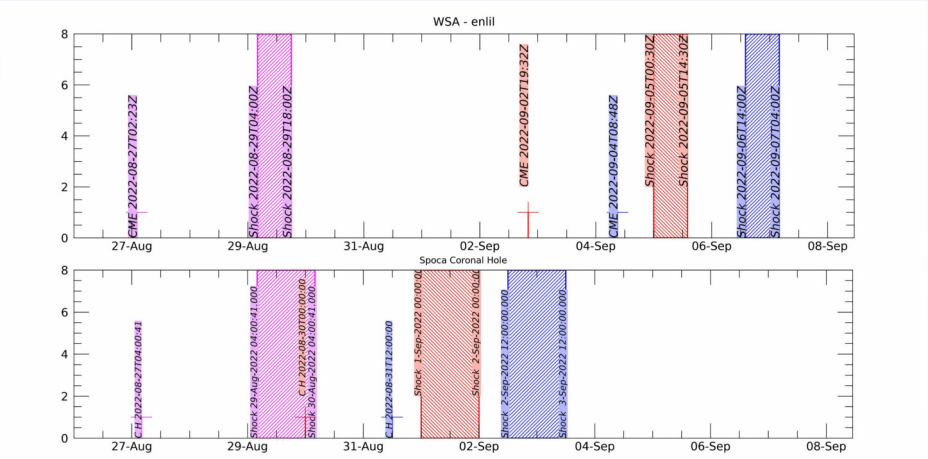


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 12:00 UT on August 31, 2022 (pink dot line).

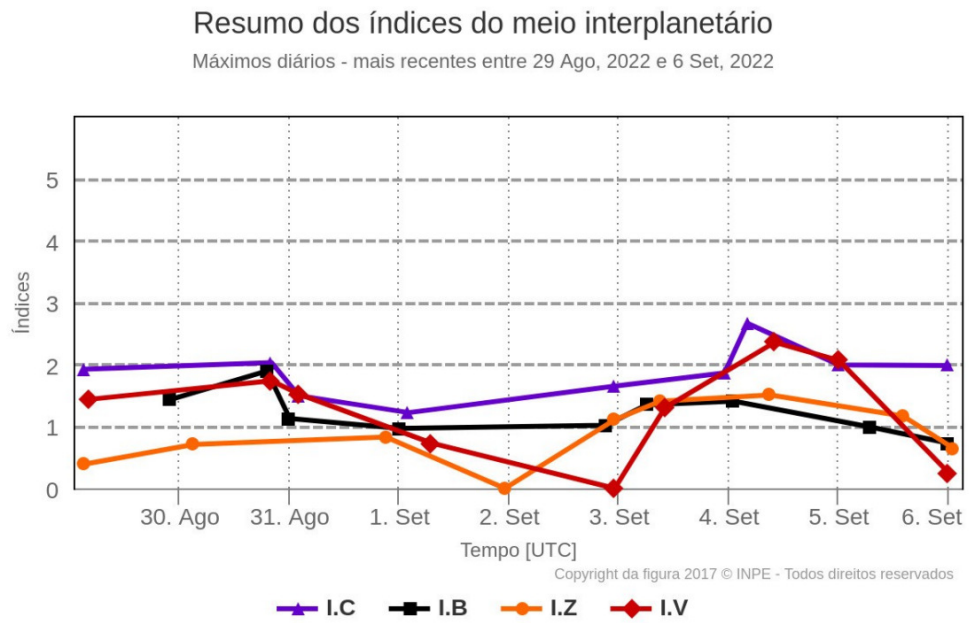
WSA - ENLIL SPOCA



3 Interplanetary medium

3.1 Responsible: Paulo Jauer

- The modulus of the interplanetary magnetic field component peaked on 30/Aug at 20:30 UT of ∼ 14nT.
- The bxby components presented a sector change on September 2th at 15:30 UT, remaining oscillating in the interval ∼ [10,-10] nT.
- The component of the bz field remained oscillating mostly in the interval ∼ [-7.8, 7.8] nT.
- The solar wind density peaked at 21 p/cm^3 on September 3th at 01:30 UT. However, oscillating on average below 15 p/cm^3.
- The solar wind speed mostly fluctuated above 400km/s during the analyzed period with a peak around 666.7 km/s on September 4th at 09:36 UT.
- The magnetopause position was on average below the typical position. The maximum compression was observed on September 4th at 04:30 UT from 7.6 Re.



4 Radiation Belts

4.1 Responsible: Ligia Alves da Silva

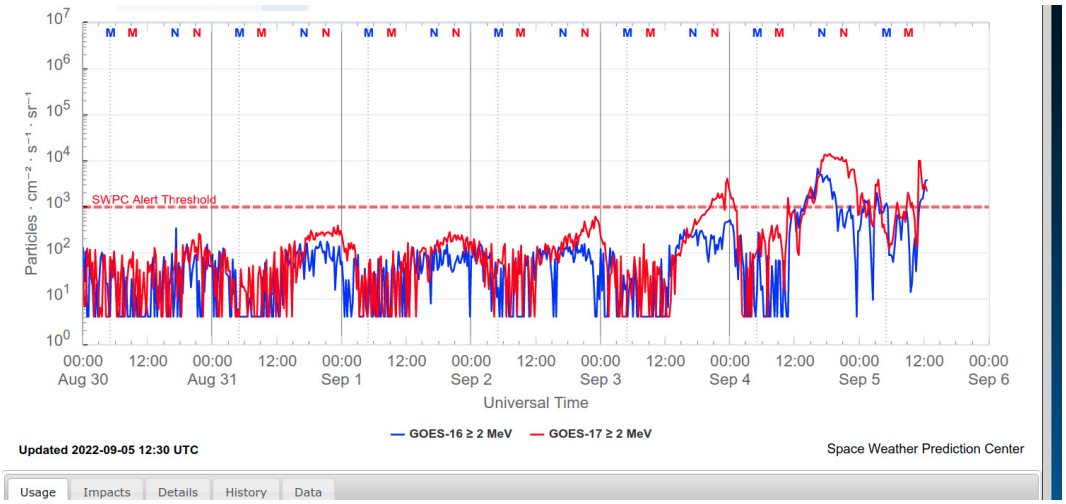


Figura 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-17 satellite. Source: `https://www.swpc.noaa.gov/products/goes-electron-flux`

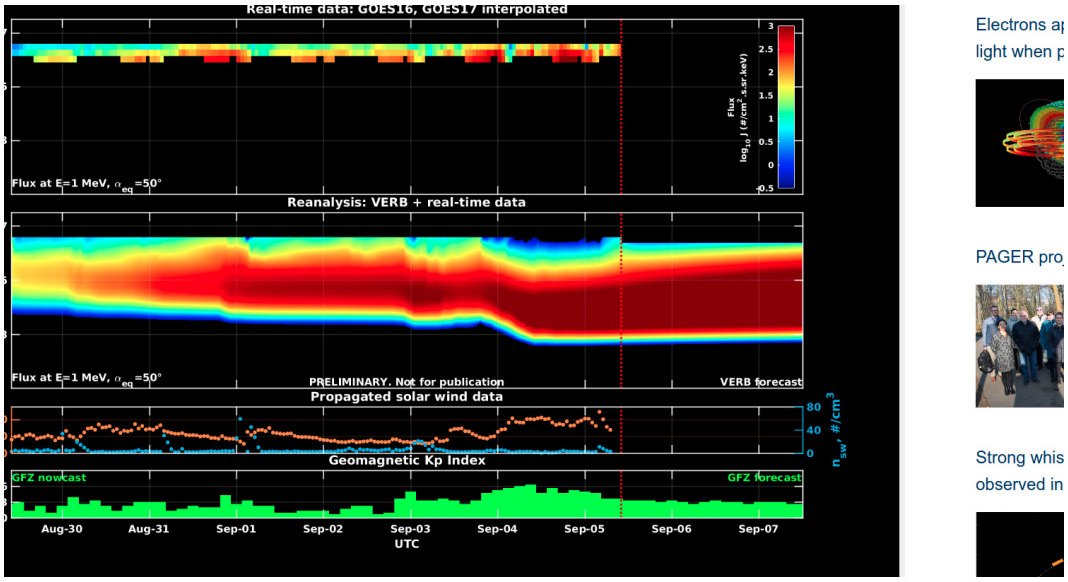


Figura 2: high-energy electron flux data (real-time and interpolated) obtained from GOES-16 and GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: `https://rbm.epss.ucla.edu/realtime-forecast/`

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 below 10^3 particles/$(cm^2 ssr)$ between August 30th and the beginning of September 3rd. Slight electron flux increases are observed on August 31st and September 1st - 2nd, all considerably in a short time and below 103 particles/(cm2 s sr). Electron flux increases were observed on September 3rd - 4th, which exceeded 10^3 and 10^4 particles/$(cm^2 ssr)$, 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 slight electron flux increases occur only at the outer boundary of the outer radiation belt. On the other hand, the electron flux variabilities observed from the end of September 3rd reached L-shells deeper. 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

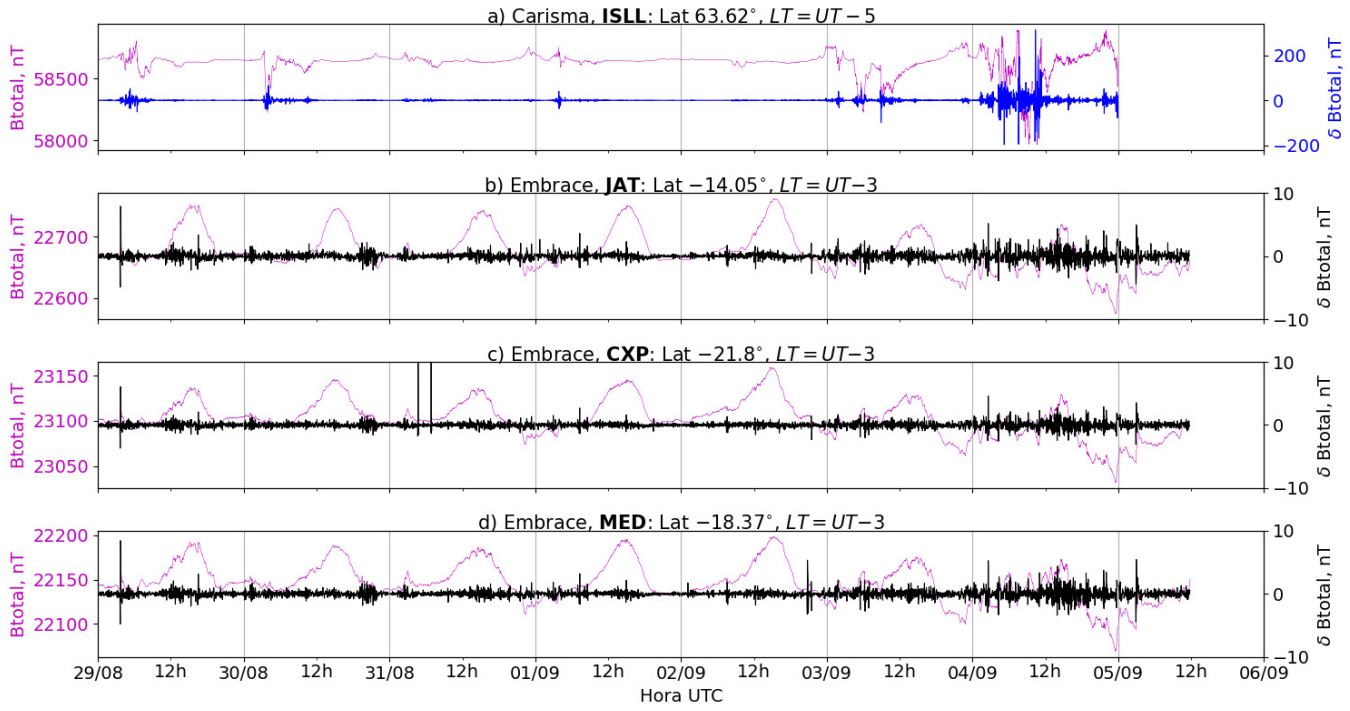


Figura 3: a) Timeseries of the geomagnetic field total component measured at ISLL station (Island Lake) of the CARISMA magnetometer network in magenta, along with the associated perturbation in the Pc5 band shown in blue. b-d) timeseries of the geomagnetic field total component measured at stations JAT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

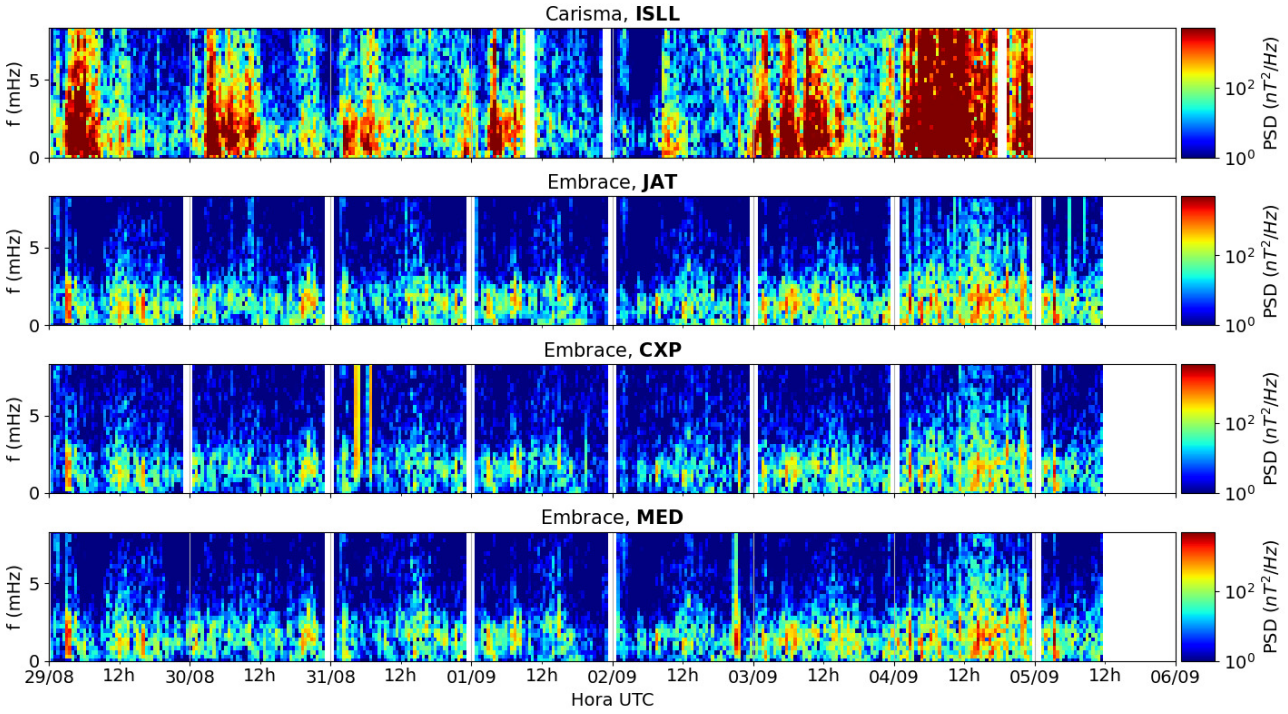


Figura 4: a-d) Time evolution of the power spectral density obtained from the filtered timeseries of the geomagnetic field total component (δ Btotal) for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE ([JAT, CXP, MED).

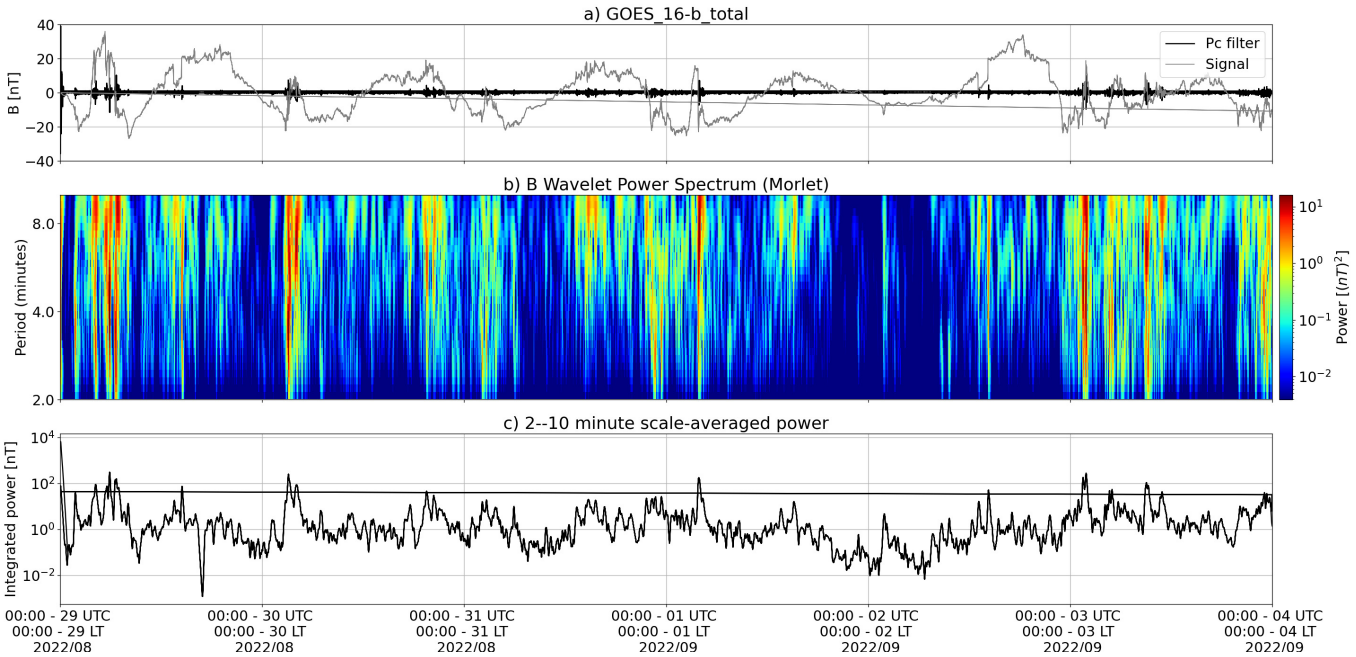


Figura 5: a) Timeseries of the geomagnetic field total component measured by GOES 16, together with the Pc5 fluctuation in black. b) Wavelet power spectrum of the filtered timeseries. c) Average ULF power in the period range from 2 to 10 minutes.

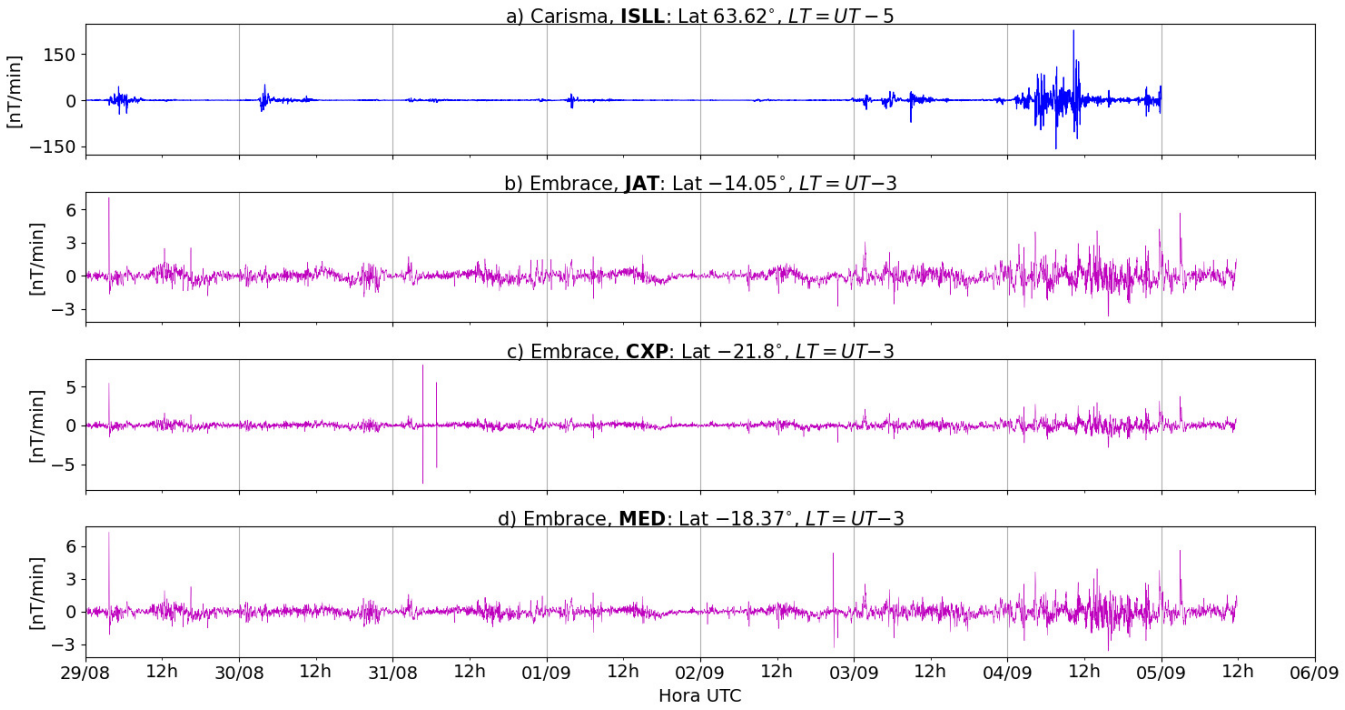


Figura 6: a-d) Rate of change of the geomagnetic field total component (dB/dt) obtained for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE ([JAT, CXP, MED).

- The GOES 16 satellite in geosynchronous orbit (L $\sim$ 6.6) registered an intense activity of Pc5 ULF waves throughout the week until September 3, except on Sep. 2.
- As observed on the ground, the ISLL station of the Carisma network (high latitude, L=5.15) registered significant ULF wave activity throughout the week, which was highly enhanced on Sep. 4.
- The low latitude stations of Embrace also reported intense ULF wave activity over the week, especially on Sep. 4.
- We report a shock-induced peak in dB/dt signals simultaneously observed at the ISLL station ($> \pm$ 25nT/min) down to low latitudes (6-7.5 nT/min) on August 29.
- The levels of dB/dt amplitude and ULF wave activity were observed to enhance at all considered stations in association with the geomagnetic storm of Sep. 4.

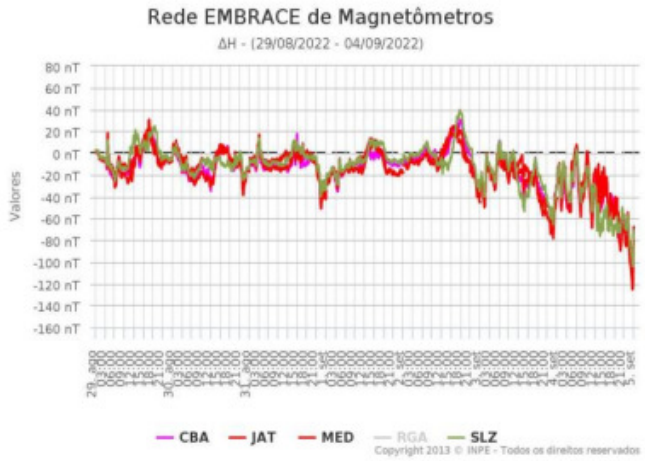
6 Geomagnetic activity

6.1 Responsible: Lívia Alves

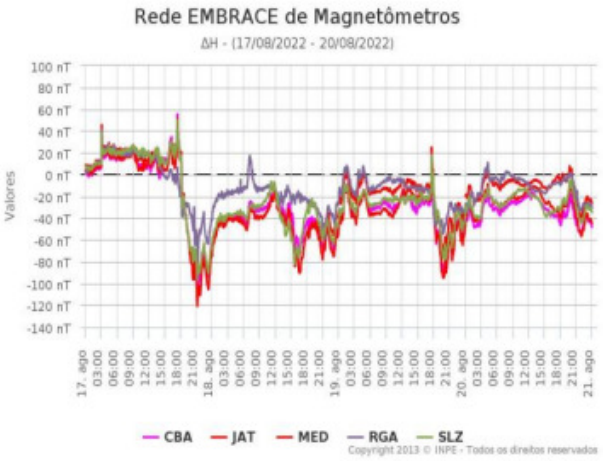
In the week of Aug 29 to Sep. 4, the following events related to geomagnetic activity stand out:

- The data from the Embrace magnetometer network registered a geomagnetic storm in Sep 02-04.
- On Sep. 3 the magnetometers of the Embrace network recorded a drop to values of -120 nT in the H component.
- The geomagnetic field was active, the AE index was reached 1000 nT for several hours on Sep 02-04. The Dst index reached -60 nT (Sep 02). The highest Kp of the week was 7+.
- The geomagnetic field measured at the GOES orbit shows instabilities on Sep 02-04.

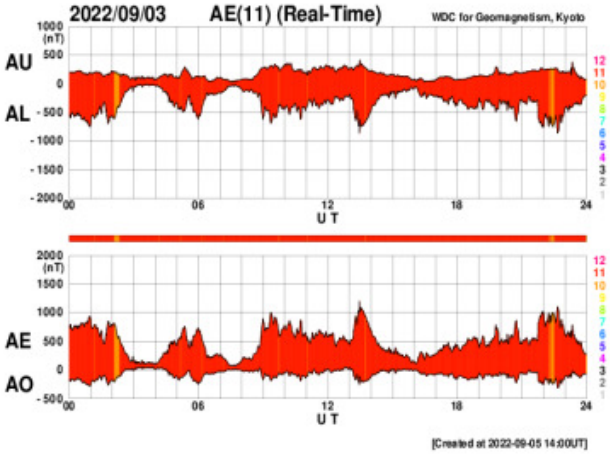
Briefing semana de 30/08 à 05/09 de 2022

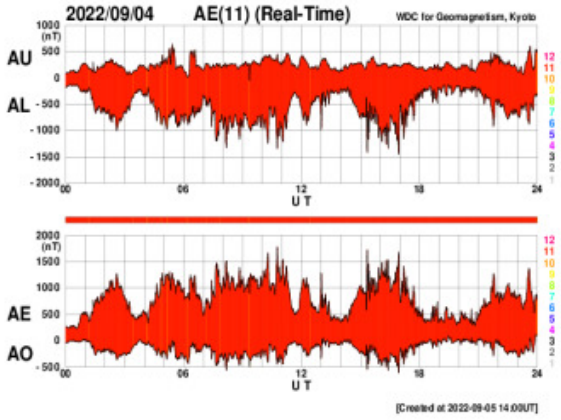


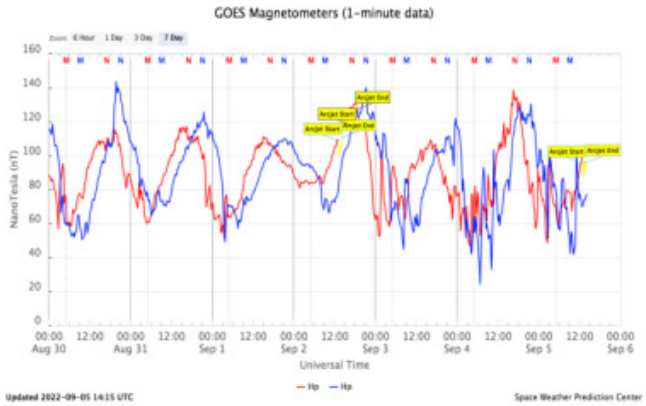
03/set

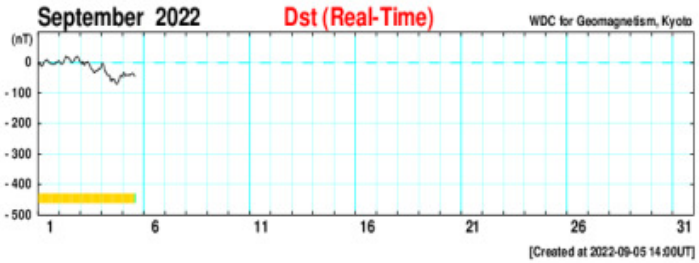


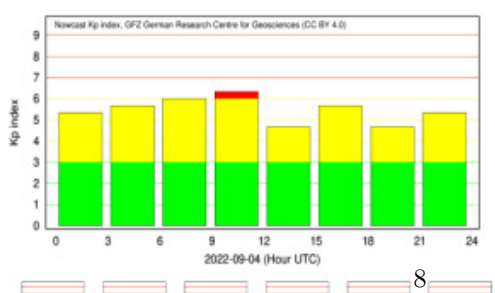
04/set

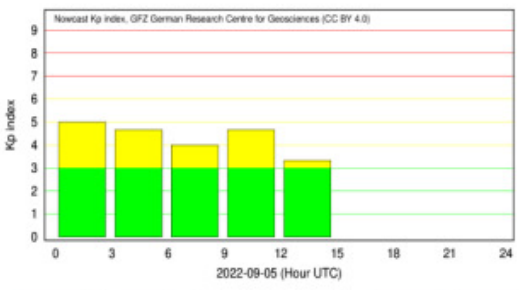


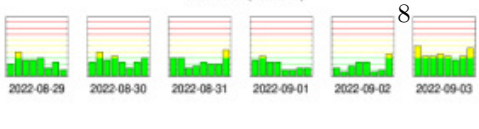


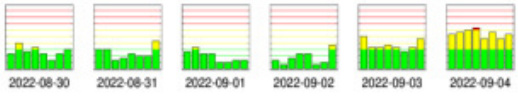










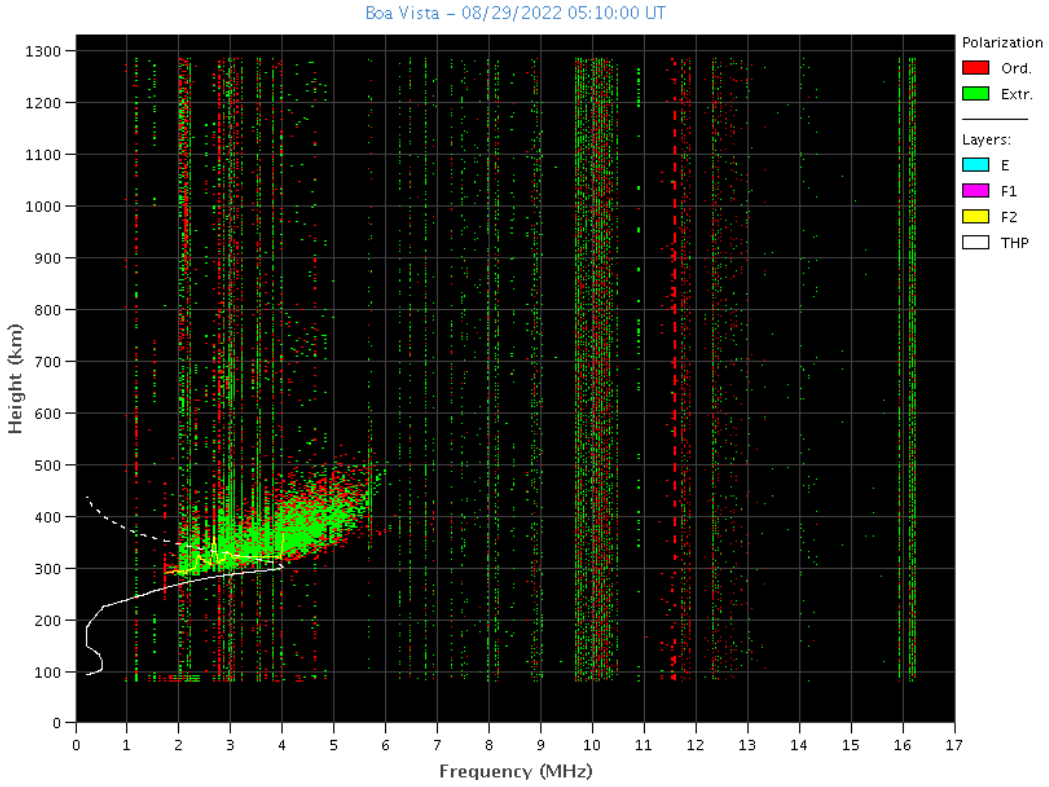


7 Ionosphere

7.1 Responsible: Laysa Resende

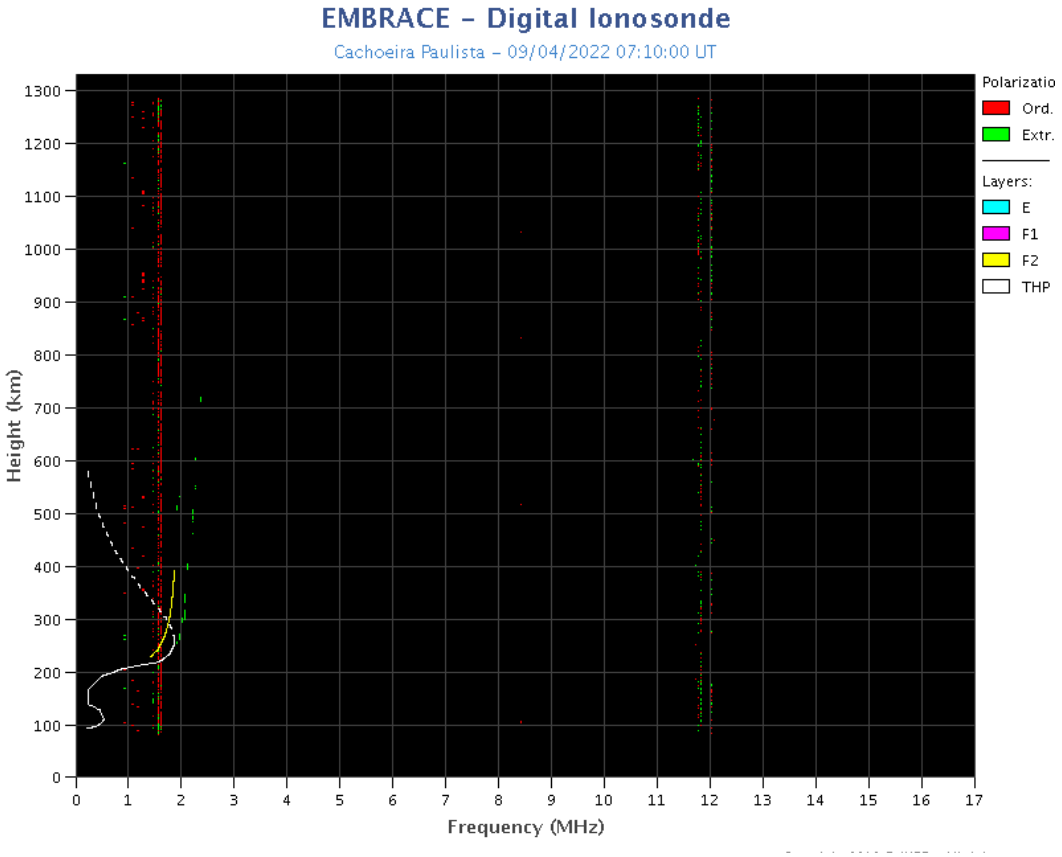
Boa Vista:

- The spread occurred on August 26 to 28.
- The Es layers reached scale 3 on August 30.



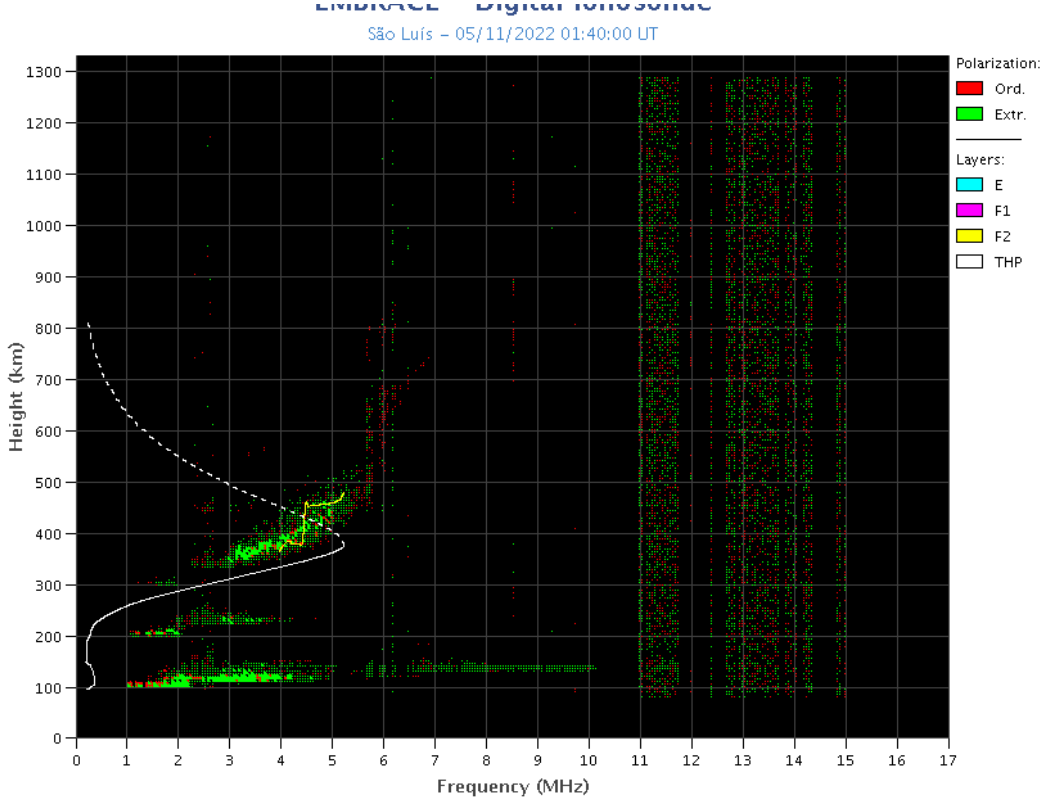
Cachoeira Paulista:

- The spread-F occurred on September 04.
- The Es layers reached scale 2 during this week.



São Luís:

- There were a spread F during this week.
- The Es layers reached scale 3 on August 31.



8 Scintilation

8.1 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 $\sim$ 360 m. The S4 index levels gradually increased throughout the week in all stations, this effect being well-marked in SLMA and STCB (Figure 1). This behavior may be related to the increase in solar and geomagnetic activity recorded during the same period. Between 2100 UT on 09/02 and 0400 UT on the following day, a scintillation event was recorded in all analyzed stations showing different degrees of severity (Figure 2). As we enter the month of September, scintillation events should appear more frequently following the beginning of the bubble period in the South American hemisphere.

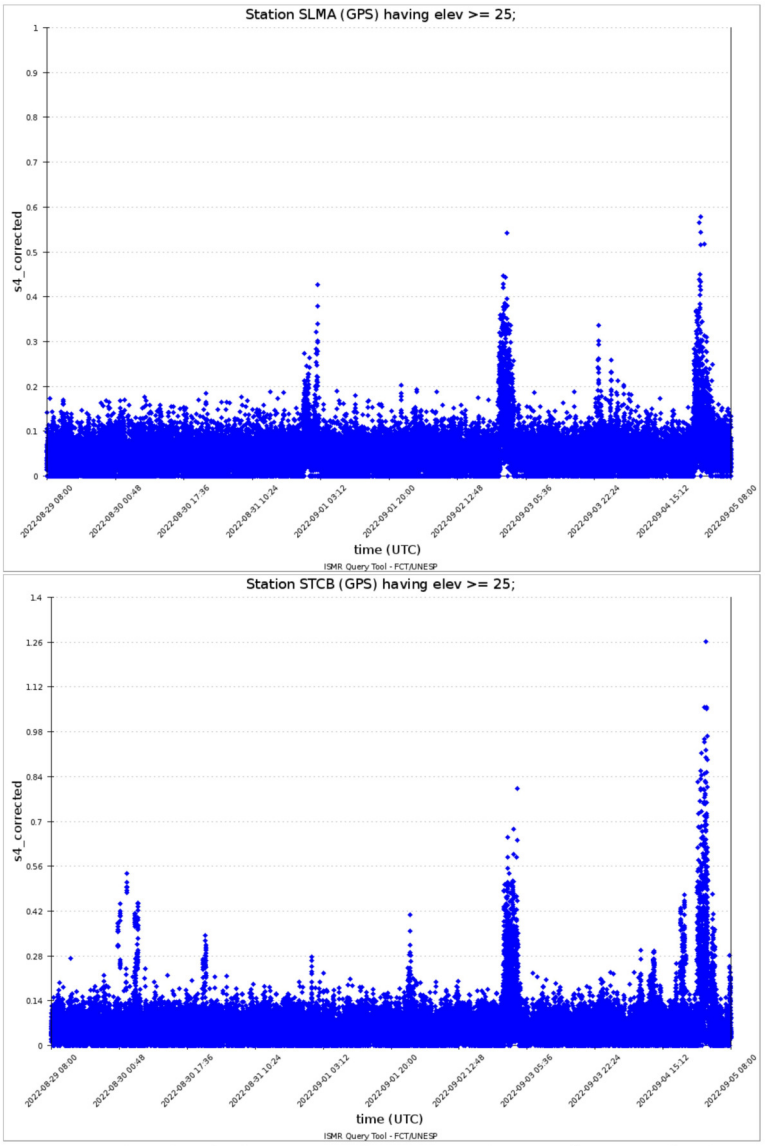


Figure 1: S4 index values for the GPS constellation measured at SLMA (upper panel) and STCB (lower panel) during the week 08/29 – 09/05.

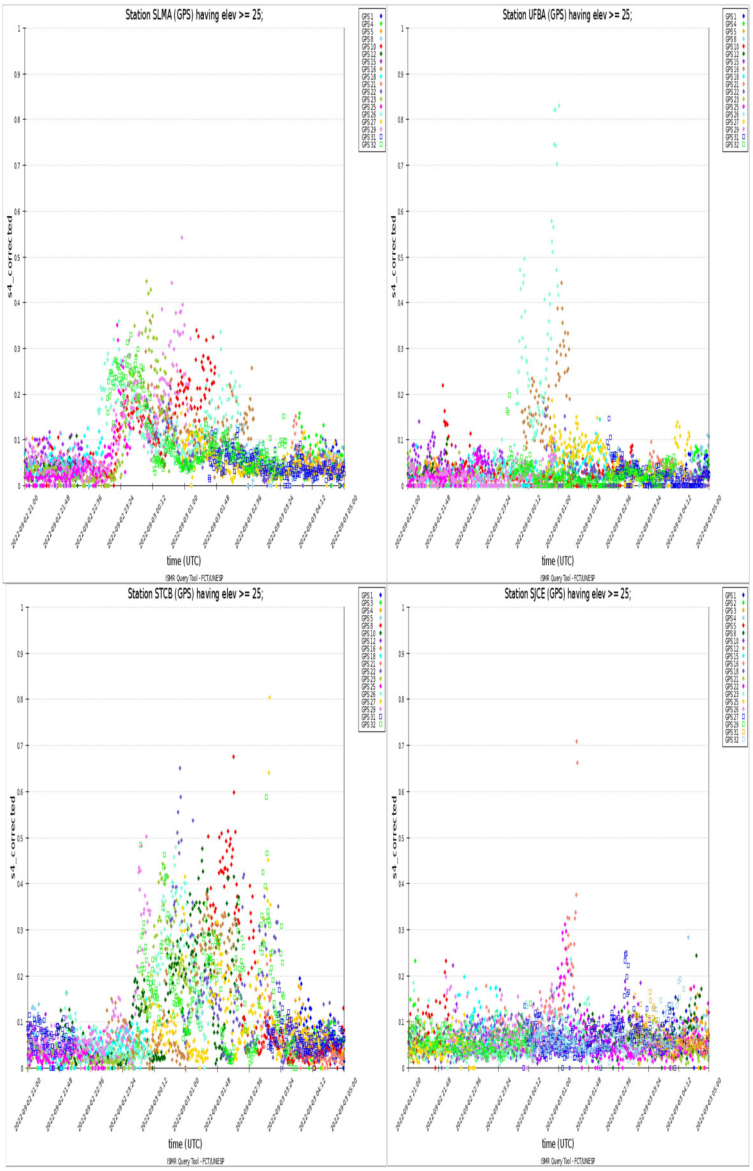


Figure 2: S4 index values for the GPS constellation measured at SLMA (left upper panel), UFBA right upper panel), STCB (left lower panel) and SJCE (right lower panel), on 09/02 between 2100 and 0500 UT

9 All-Sky Imager

9.1 Responsible: LUME

All-Sky Imager EPBs Observation
Observações das EPBs por meio do imageador All-Sky
August 28 - September 03, 2022 || 28 de agosto - 03 de setembro, 2022

Observatory Observatório	August 28 Agosto 28	August 29 Agosto 29	August 30 Agosto 30	August 31 Agosto 31	September 1 Setembro 1	September 2 Setembro 2	September 3 Setembro 3
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

- At the Sao Joao do Cariri observatory, plasma bubble was observed on the August 31.
- 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, no geophysical phenomena such as plasma bubbles and traveling ionospheric disturbances were observed during the period.
- Plasma bubbles were observed on August, 31. Besides, the equatorial ion- ization anomaly was observed everyday.

10 ROTI

10.1 Responsible: Carolina de Sousa do Carmo

In the week 2225 (August 28 to September 3, 2022) there were ionospheric irregularities (Plasma Bubble), every day, at different times. Table 1 shows the occurrence of irregularities and Figure 1 shows an example of the occurrence of plasma bubbles on September 3, 2022, using keograms at latitudes of -5^o and 15^o.

Sunday	2022/08/28	03:00-05:00
Monday	2022/08/29	02:00-04:30
Tuesday	2022/08/30	02:30-05:00
Wednesday	2022/08/31	22:00-24:00
Thursday	2022/09/01	00:00-02:30;23:30-24:00
Friday	2022/09/02	00:00-03:30; 23:00-24:00
Saturday	2022/09/03	00:00-04:00; 23:00-24:00

Tabela 1: Sep 03, 2022).

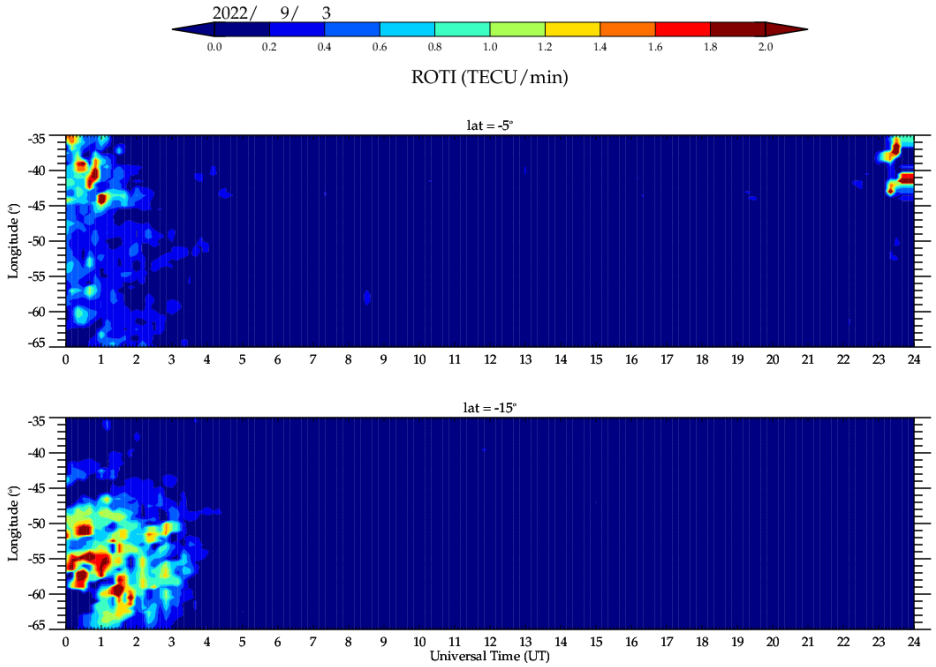


Figura 8: Keogram of September 3, 2022, for latitudes of -5º and -15