Briefing Space Weather

2022/08/23

1 Sun

1.1 Responsible: José Cecatto

08/15 – Flares M1.0, M2.7, M1.1; Fast wind stream (=< 500 km/s); 9 CME c.h.c. toward the Earth;
08/16 – Flares M5.0, M1.8; No fast wind stream; 4 CME c.h.c. toward the Earth;
08/17 – Flares M2.0, M1.0; Fast wind stream (< 550 km/s); 6 CME c.h.c. toward the Earth;
08/18 – Flares M1.3, M1.5, M1.3; Fast wind stream (=< 600 km/s); 9 CME c.h.c. toward the Earth;
08/19 – Flare M1.6; Fast wind stream (< 700 km/s); 7 CME c.h.c. toward the Earth;
08/20 – No flare (M/X); Fast wind stream (=< 650 km/s); 3 CME c.h.c. toward the Earth;
08/21 – No flare (M/X); Fast wind stream (=< 600 km/s); 4 CME c.h.c. toward the Earth;
08/22 – No flare (M/X); Fast wind stream (=< 600 km/s); No CME toward the Earth;
Prev.: Fast wind stream expected up to August 23-24; for the next 2 days (10% M, 1% 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 2022-08-16T02:24Z)
  - The simulation indicates that Coronal Mass Ejection will reach the DSCOVR mission between 2022-08-18T15:28Z and 2022-08-19T05:28Z.
- WSA-ENLIL (CMEs 2022-08-15T11:36Z, 2022-08-15T17:12Z)
  - The simulation results indicate that the flanks of combined Coronal Mass Ejections will reach the DSCOVR mission between 2022-08-18T00:18Z and 2022-08-18T14:18Z.
- WSA-ENLIL (CME 2022-08-16T15:24Z)
  - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-08-19T16:00Z and 2022-08-20T06:00Z.
- WSA-ENLIL (Prediction for CME 2022-08-17T14:53Z)
  - The simulation indicates that Coronal Mass Ejection will reach the DSCOVR mission between 2022-08-19T23:35Z and 2022-08-20T13:35Z.
- WSA-ENLIL (Prediction for CME :2022-08-18T11:00Z)
  - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-08-20T20:00Z and 2022-08-21T10:00Z.
- WSA-ENLIL (Prediction for CME : 2022-08-19T07:30Z)
  - The simulation results indicate that the flank of CME will reach the DSCOVR mission between 2022-08-22T08:00Z and 2022-08-22T22:00Z.

Coronal holes (SPOCA):

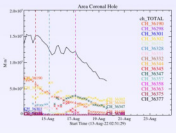


Figura: The solid line in black shows the products of the sum of areas for each detection interval performed by SPOCA between August 13 and 20, 2022.

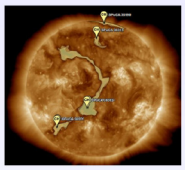


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 04:46 UT on August 15, 2022 (blue dot line).

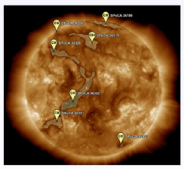


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 02:46 UT on August 14, 2022 (red dot line).

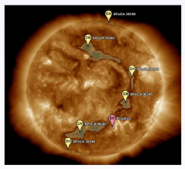
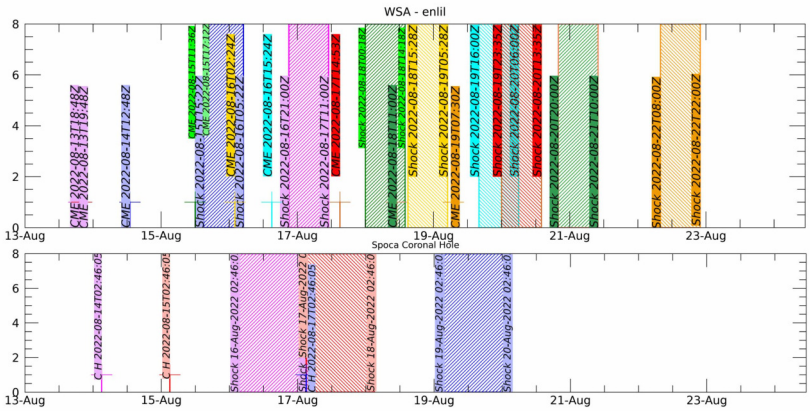


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 02:46 UT on August 17, 2022 (pink dot line).

WSA - ENLIL SPOCA



3 Radiation Belts

3.1 Responsible: Ligia Alves da Silva

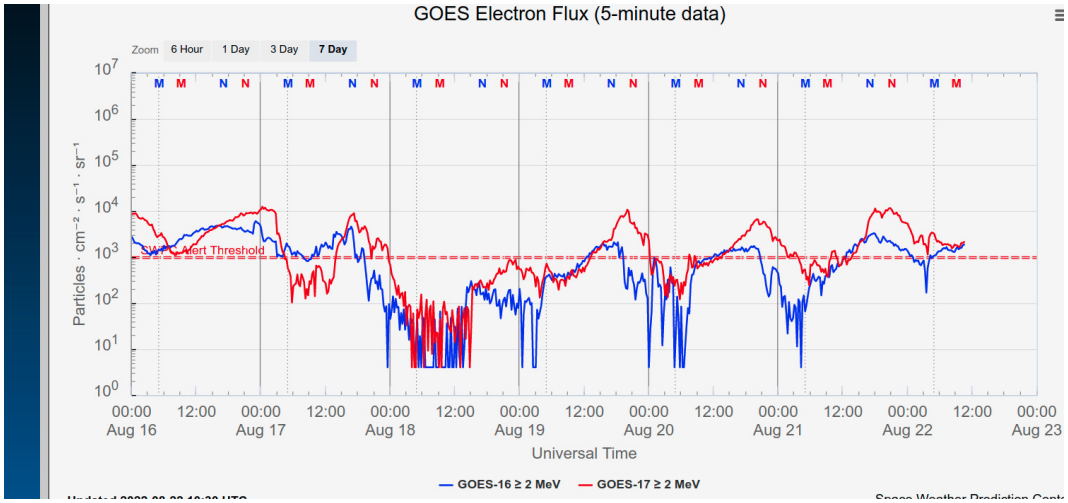


Figura 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-17 satellite. Source: `https://www.swpc.noaa.gov/products/goes-electron-flux`

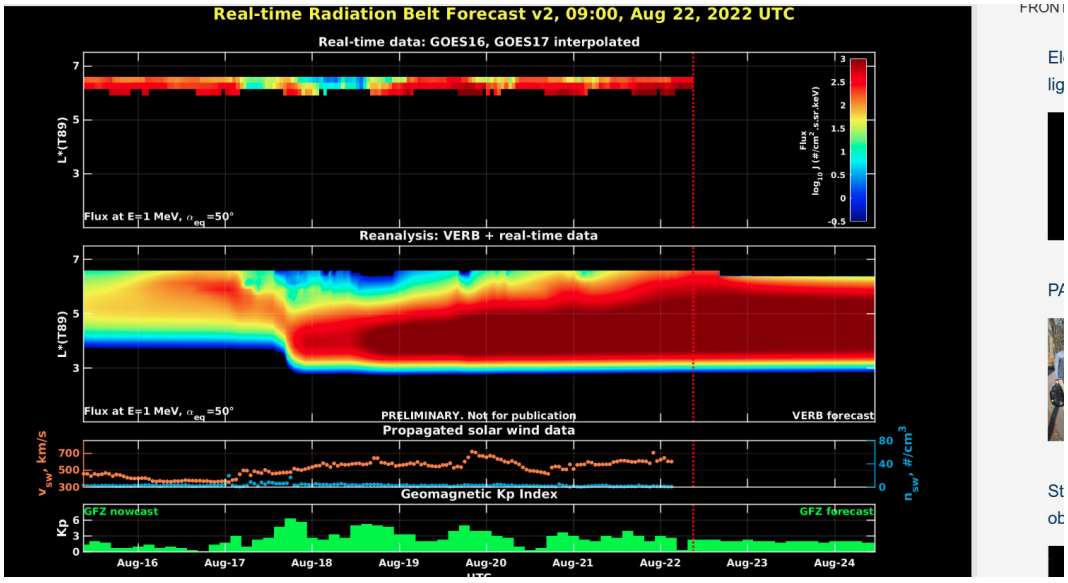


Figura 2: High-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES-16, GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: `https://rbm.epss.ucla.edu/realtime-forecast/`

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 between 10^3 and 10^4 particles/$(cm^2 ssr)$) on August 16th and beginning of August 17th. A slight dropout is observed at 03:00 UT on August 17th, followed by a strong dropout that starts at 17:00 UT on August 17th with more than three orders of magnitude. This strong dropout persisted until 12:00 UT on August 19th, followed by an electron flux variability between 10^3 and 10^2 particles/$(cm^2 ssr)$), which was observed until the end of the analyzed period.

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 dropout observed in the electron flux reaches $L - shell > 6.0$, while the strong dropout reaches $L - shell > 5.0$. The variability observed in electron flux from 12:00 UT on August 19th occurs only in the outer radiation belt, which coincides with the enhancement period of the belt in low L-shells.

4 ULF waves

4.1 Responsible: Graziela B. D. Silva

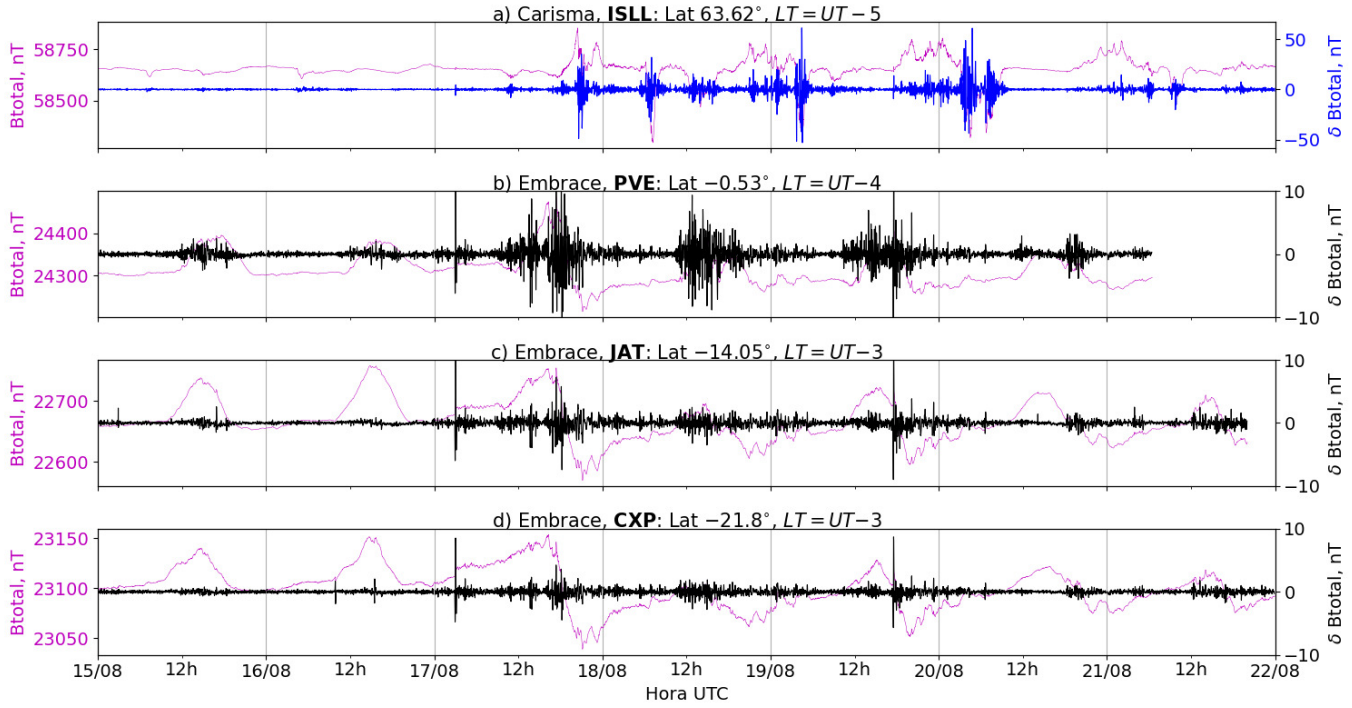


Figura 3: a) Timeseries of the geomagnetic field total component measured at ISLL station (Island Lake) of the CARISMA magnetometer network in magenta, along with the associated perturbation in the Pc5 band shown in blue. b-d) timeseries of the geomagnetic field total component measured at stations PVE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

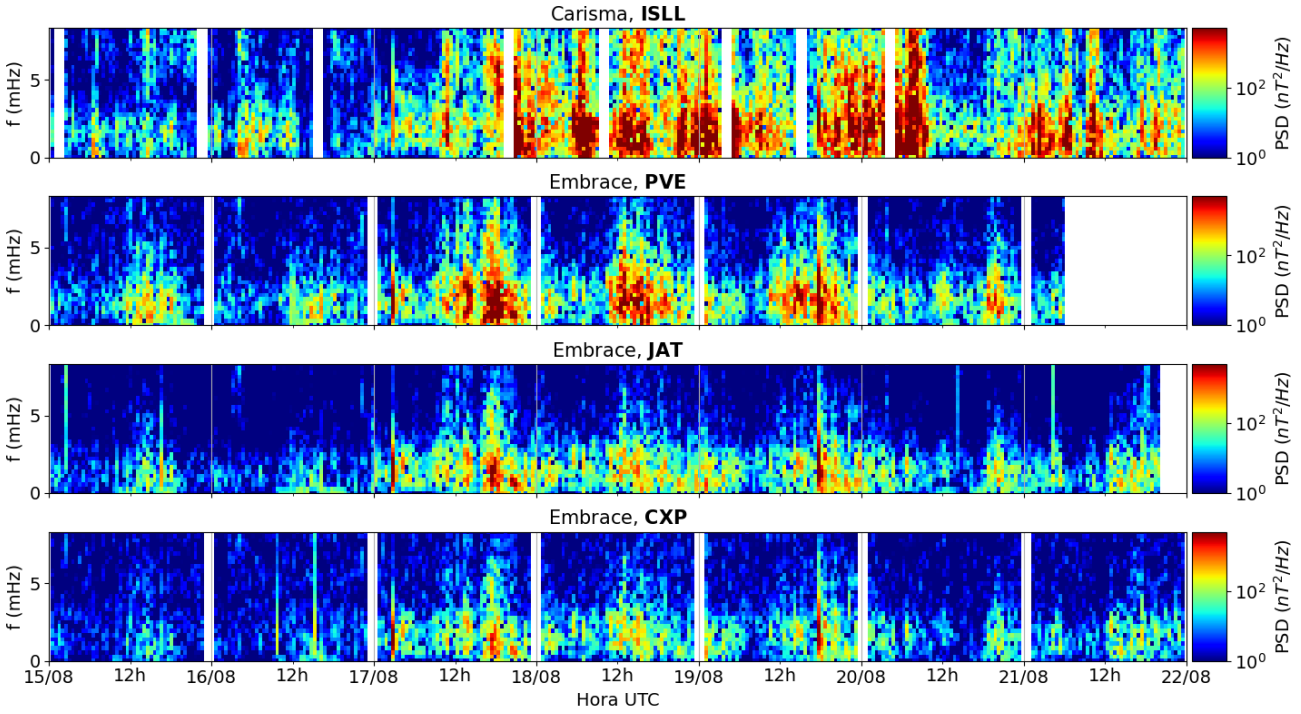


Figura 4: a-d) Time evolution of the power spectral density obtained from the filtered timeseries of the geomagnetic field total component (δ Btotal) for a) the high latitude station (ISLL-CARISMA), and b-d) for the low latitude stations of EMBRACE (PVE, JAT, CXP).

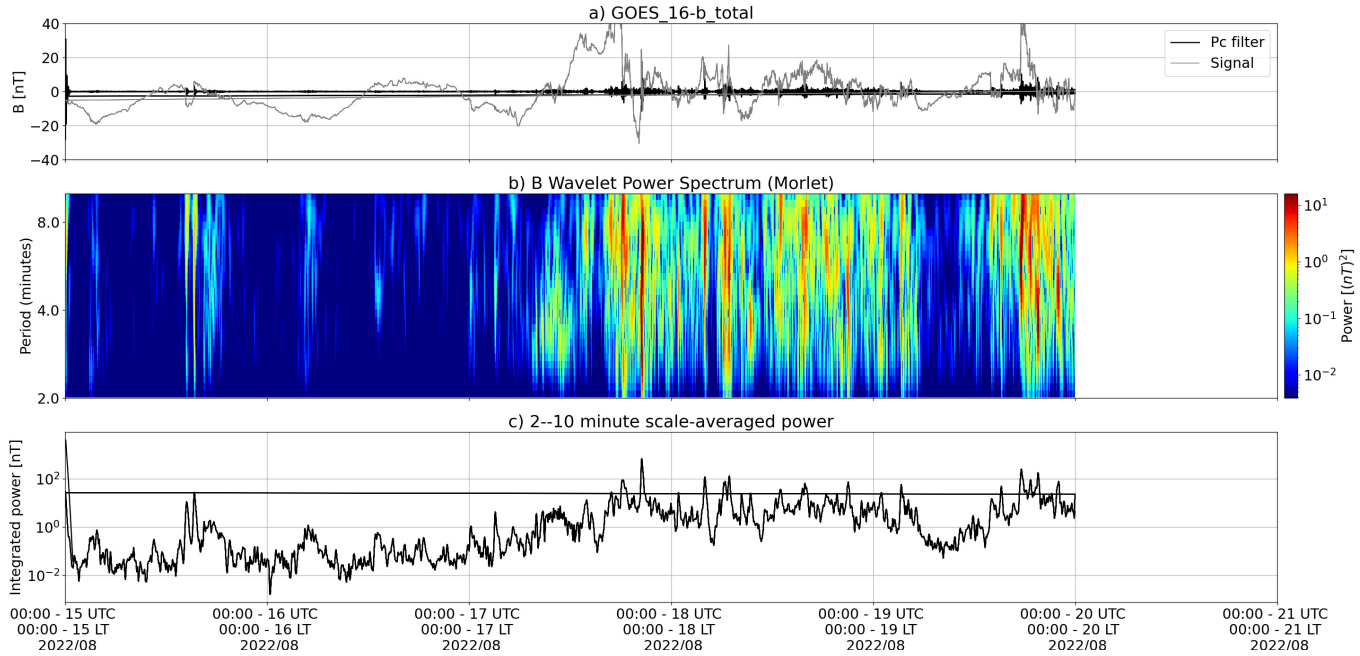


Figura 5: a) Timeseries of the geomagnetic field total component measured by GOES 16, together with the Pc5 fluctuation in black. b) Wavelet power spectrum of the filtered timeseries. c) Average ULF power in the period range from 2 to 10 minutes.

- There was an intense activity of Pc5 ULF waves from August 17 at $\sim$ 8 UT, which remained intense until August 19, as reported with GOES 16 at geosynchronous orbit (L $\sim$ 6.6).
- For the ground-based stations, an intense activity of ULF waves was registered at ISLL station (high

latitude, L=5.15) throughout the reported week which was related to a long-lasting gemagnetic storm started on August 17.

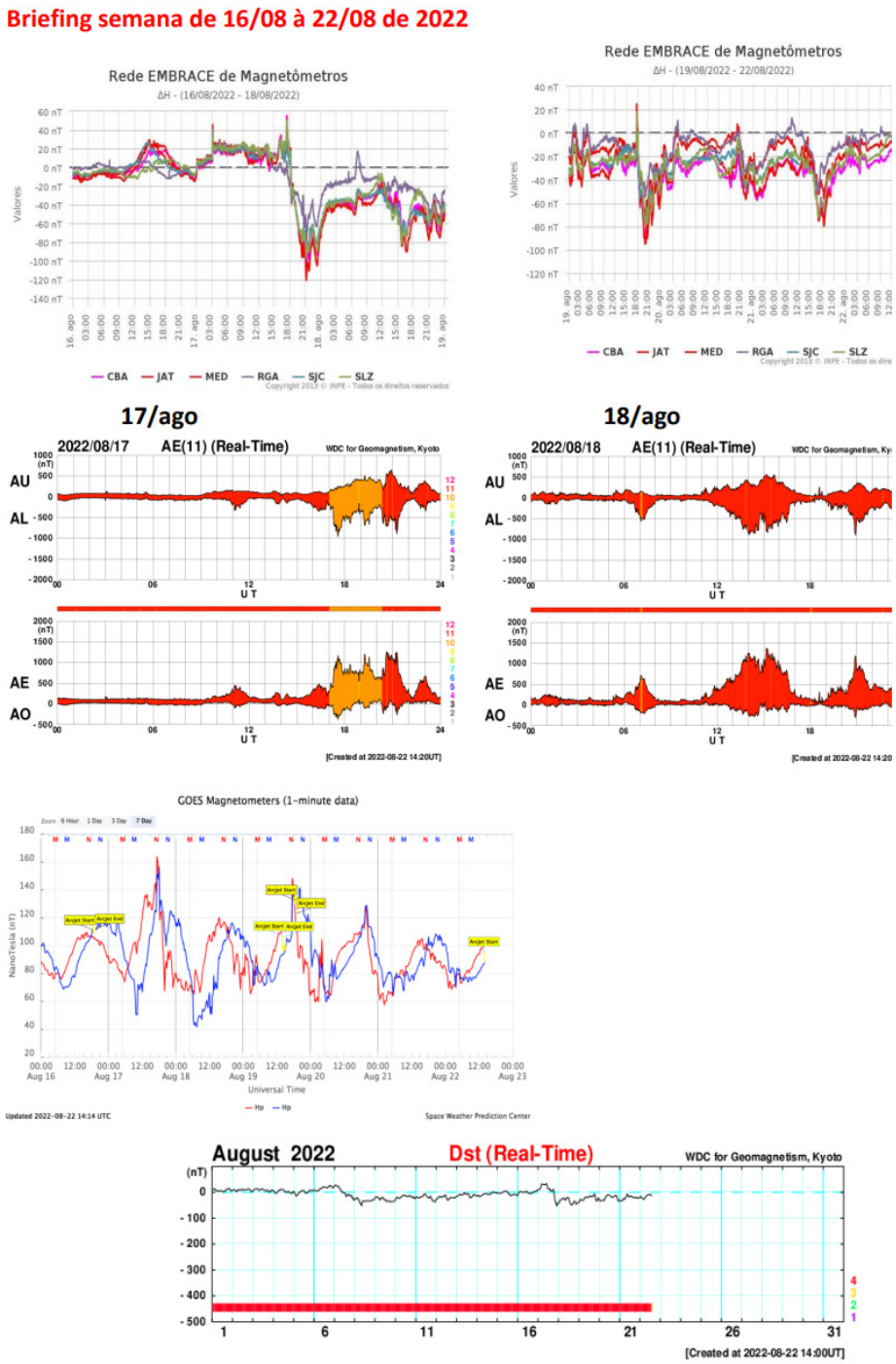
- The Embrace stations over the low latitude region of Brazil also registered significant ULF wave activity throughout the week, especially at PVE station.
- This result demonstrates the major influence of the electrojet current system on the data obtained over the magnetic equator (PVE station).

5 Geomagnetic activity

5.1 Responsible: Lívia Alves

In the week of August 16-21, the following events related to geomagnetic activity stand out:

- The data from the Embrace magnetometer network showed 4 geomagnetic storms throughout the period, with emphasis on August 17, 19 and 21 - The magnetometers of the Embrace network recorded a drop down to -100 nT in the H component.
- The geomagnetic field was active, the AE index was reached 1000 nT for several hours on Aug 17, 18 and 19. The Dst index reached -50 nT (Aug 17). The highest Kp of the week was 6+.
- The gemagnetic field measured at the GOES orbit shows instabilities on August 17-19.



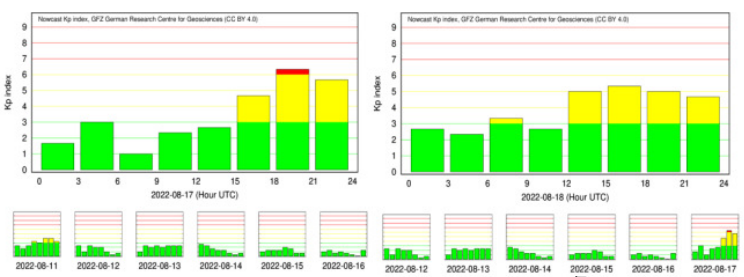


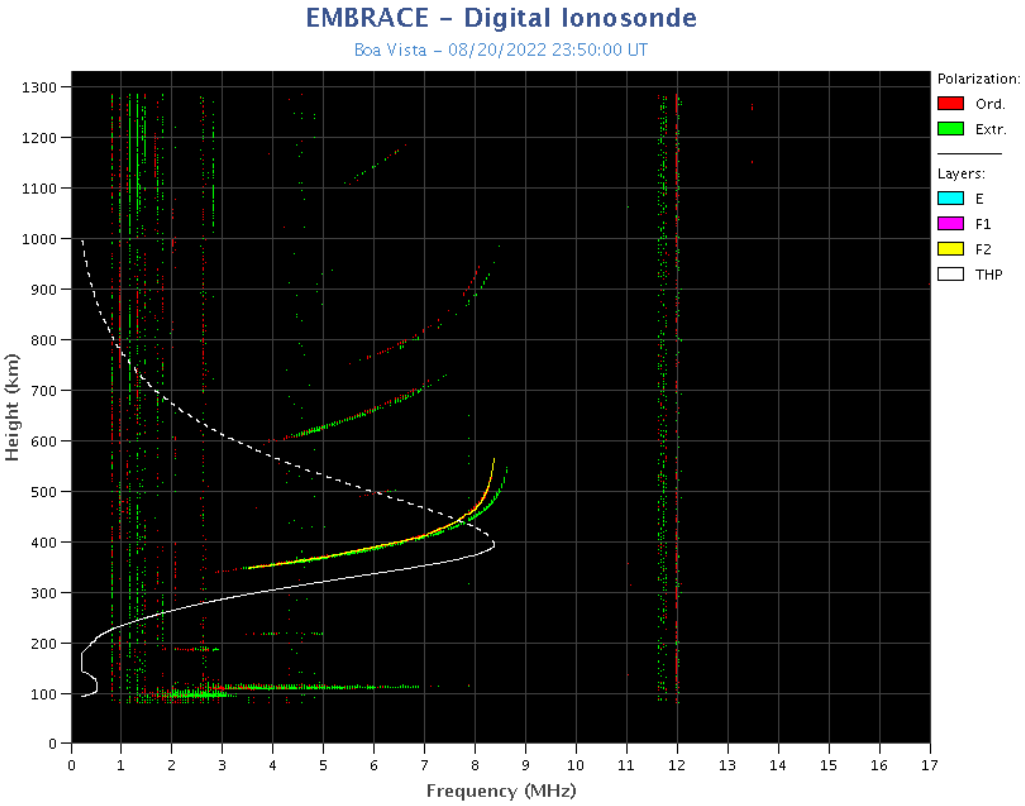
Figura 6: The figures from top to bottom show the weekly evolution of the geomagnetic field and of the geomagnetic indices.

6 Ionosphere

6.1 Responsible: Laysa Resende

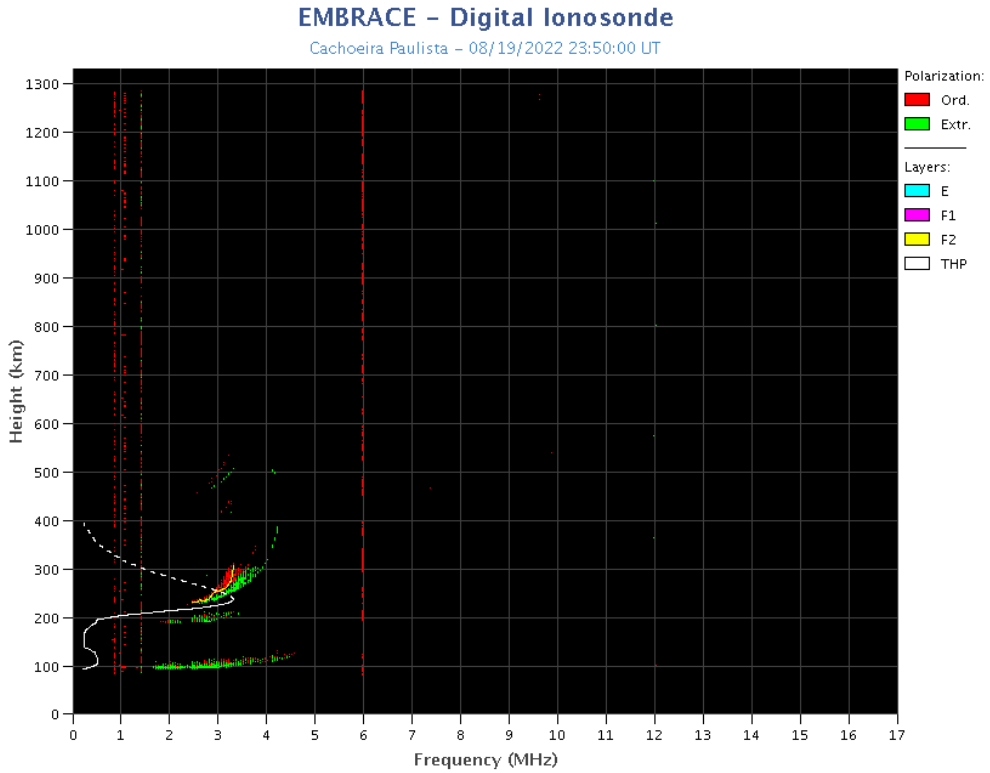
Boa Vista:

- The spread did not occur in this week.
- The Es layers reached scale 4 on August 20.



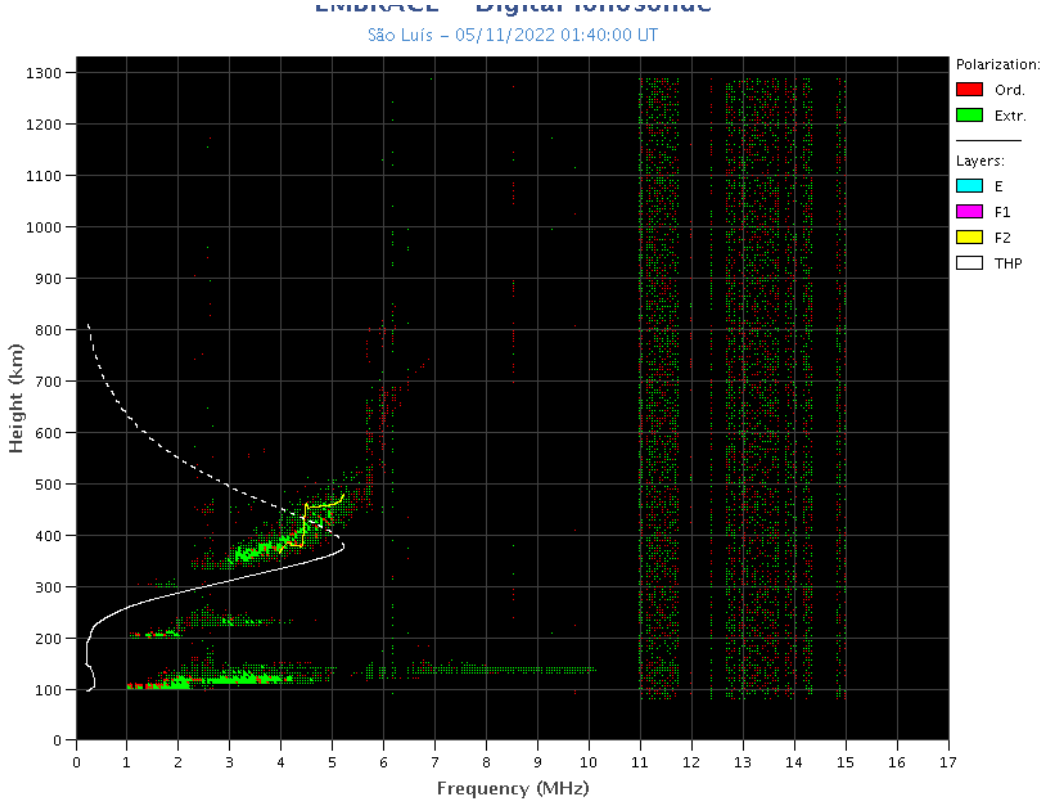
Cachoeira Paulista:

- The spread did not occur in this week.
- The Es layers reached scale 3 on August 18, and 19.



São Luís:

- There were a spread F on August 16, 17, and 18.
- The Es layers reached scale 4 on August 17 and 21.



7 Scintilation

7.1 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 SLMA station showed a weak scintillation behavior at the end of day 16 with values around 0.3 (Figure 1). The rest of the week showed no manifestation of scintillation events. The UFBA and SJCE stations did not display any behavior of S4 above 0.2. Finally, STCB exhibited mild scintillation values just after local noon on day 18 (Figure 1).

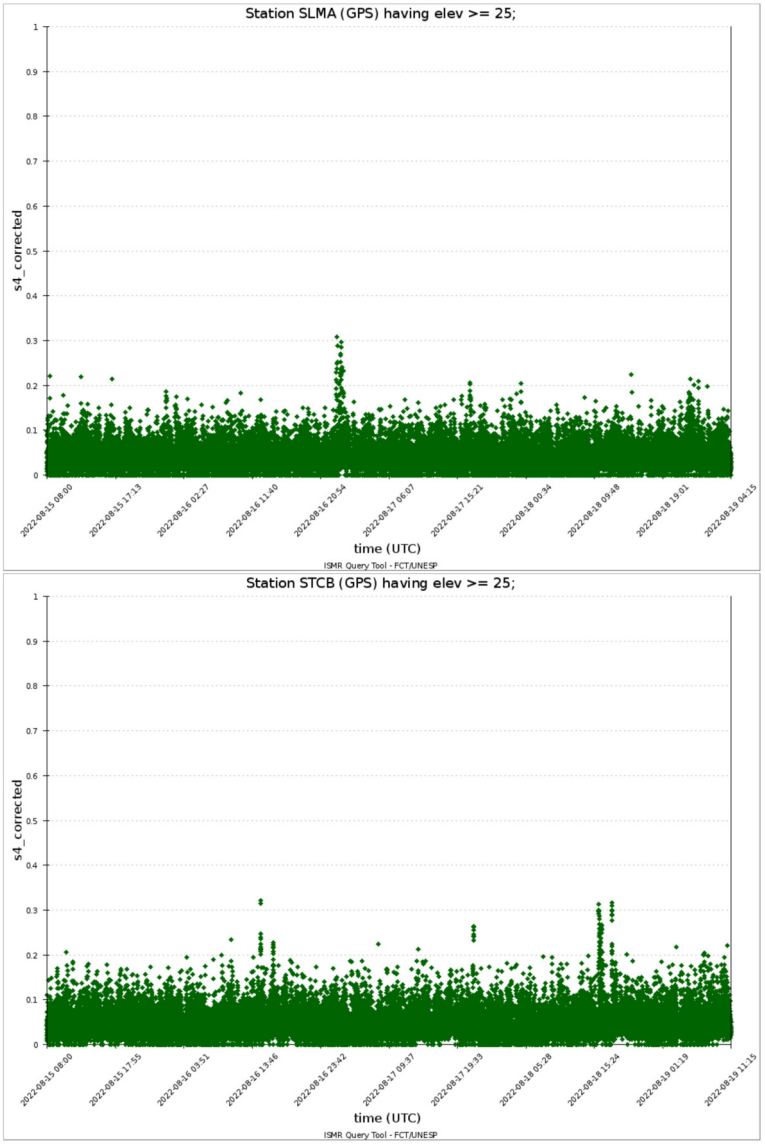


Figure 1: S4 index values for the GPS constellation measured at SLMA (upper panel) and STCB (lower panel) during the week 15-22/08/2022.

8 All-Sky Imager

8.1 Responsible: LUME

All-Sky Imager EPBs Observation
Observações das EPBs por meio do imageador All-Sky
August 14 - August 20, 2022 || 14 de agosto - 20 de agosto, 2022

Observatory Observatório	August 14 Agosto 14	August 15 Agosto 15	August 16 Agosto 16	August 17 Agosto 17	August 18 Agosto 18	August 19 Agosto 19	August 20 Agosto 20
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 August 20.
- 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.
- It was observed plasma bubbles on August, 20th. Besides, the equatorial anomaly was observed every day.

9 ROTI

9.1 Responsible: Carolina de Sousa do Carmo

- On August 16, 2022, plasma bubble appeared in the equatorial region of Brazil between 23:00 UT and 00:00 UT of August 17.
- On August 20, 2022, there were irregularities over the same region, between 22:00 UT and 00:00 UT of August 21.