

# Briefing Space Weather - 2021/09/20

---



## Briefing Space Weather - 2021/09/20

---

### Sun

#### Responsible: José Roberto Cecatto

09/13 – Fast ( $\leq 500$  km/s) wind stream; 7 CME can have component toward the Earth;

09/14 – Fast ( $< 500$  km/s) wind stream; 4 CME can have component toward the Earth;

09/15 – Fast ( $< 450$  km/s) wind stream; 5 CME can have component toward the Earth;

09/16 – No fast wind stream; no CME toward the Earth;

09/17 – “Fast” ( $\sim 400$  km/s) wind stream; 4 CME can have component toward the Earth; Arrival of CME Sept. 13.

09/18 – No fast wind stream; 11 CME can have component toward the Earth;

09/19 – No fast wind stream; 3 CME can have component toward the Earth;

09/20 – No fast wind stream; no CME toward the Earth;

Prev.: Fast wind stream expected for Sept. 23, 24; for while low (1% M, 1% X) probability of M / X flares next 2 days; also, occasionally some other CME can present a component toward the Earth. On Sept. 21 at 14:00Z expected arrival of CME from Sept. 18.

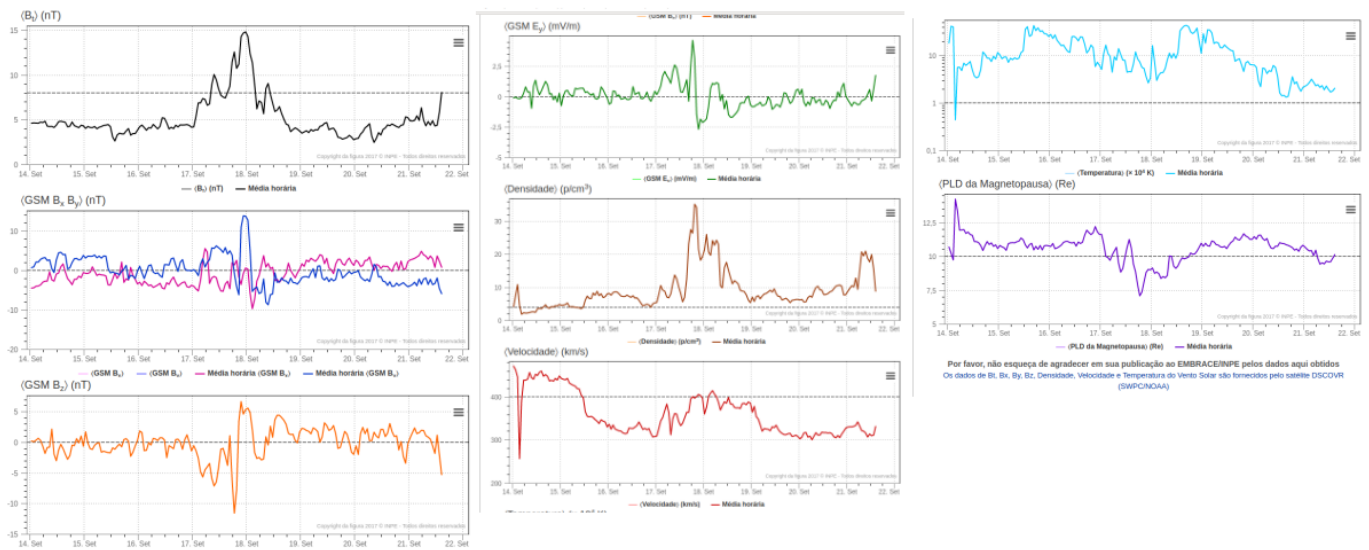
#### Responsible: Douglas Silva

- CME:
  - Partial halo coronal mass ejection was observed around 10:36 UT on September 13 in LASCO imagery.
- WSA-ENLIL (Prediction for CME 2021-09-13T10:36Z)
  - The simulation indicates that the CME arrival forecast will occur on the following date: 2021-09-17T09:00Z (-9.0h, +9.0h)
- Coronal holes:
  - Observed in the center of the solar disk the coronal hole ch1 between the 13th and 20st of September which evolves from an area of 7,3 to 8,6 % of the solar disk

---

### Interplanetary Medium

#### Responsible: Paulo Jauer



- The interplanetary region in the last week showed a moderate/low level of plasma perturbations due to the passage of the CME and HSS structures identified by the DISCOVERY satellite in the interplanetary region along with sector boundary crossing.
- The component of the IMF Bz fluctuated mostly around zero. A bz peak of -11.59 nT was observed on September 17th at 18:30.
- The occurrence of the change of sector in the BxBy components took place on September 17th at 20:30. During the rest of the period, the components fluctuated around zero.
- The Vsw density has oscillations with a maximum value on September 17th at 19:30 of 35.12 p/cm<sup>3</sup> and a second peak on September 21st at 7:30 am ~ 20p/cm<sup>3</sup>. In the rest of the period the density oscillated with values less than 10p/cm<sup>3</sup>.
- The solar wind speed Vsw remained mostly below 400km/s with a peak at the beginning of the period on September 14th at 00:30 of 470km/s, on September 17th at 21:30 405km/s and on the 18th of September at 04:30 at 413 km/s.
- The subsolar Mp showed maximum compression on September 17th at 18:30 from ~ 7.08 Re. It exhibited a maximum expansion of 14 Re on September 14th at 03:30. For the remainder of the period, Mp fluctuated around typical values.

## Radiation Belts

Responsible: Ligia Alves da Silva

# GOES Electron Flux (5-minute data)

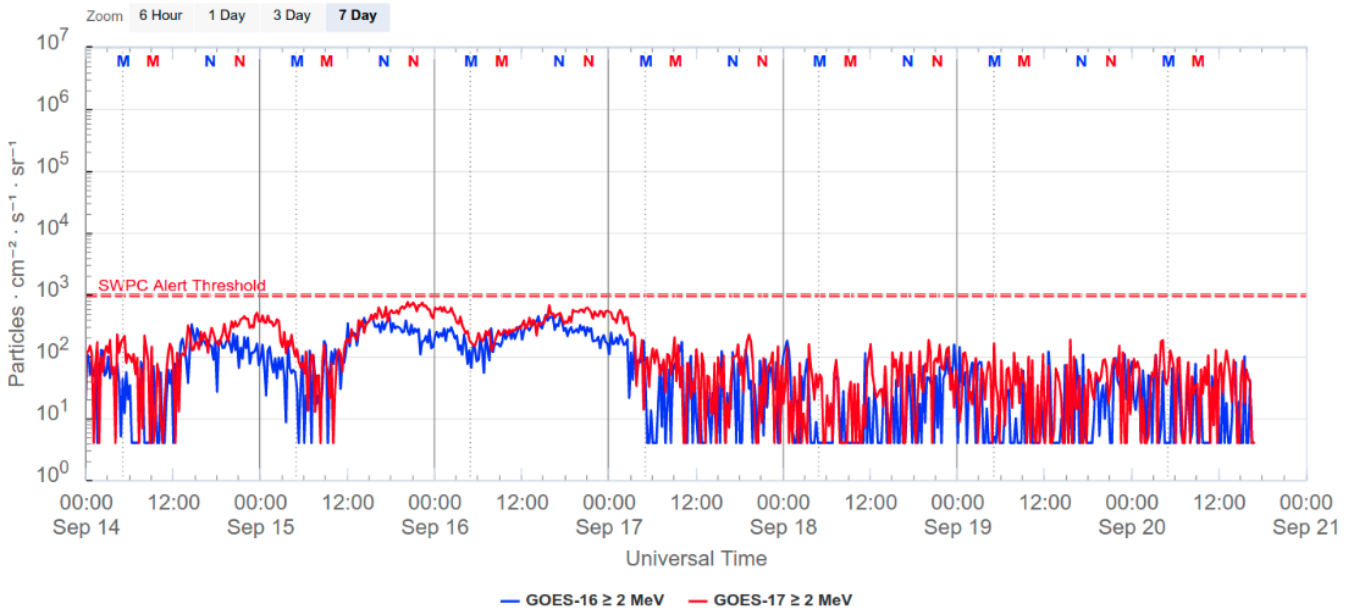


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES satellite. Source: <https://www.swpc.noaa.gov/products/goes-electron-flux>

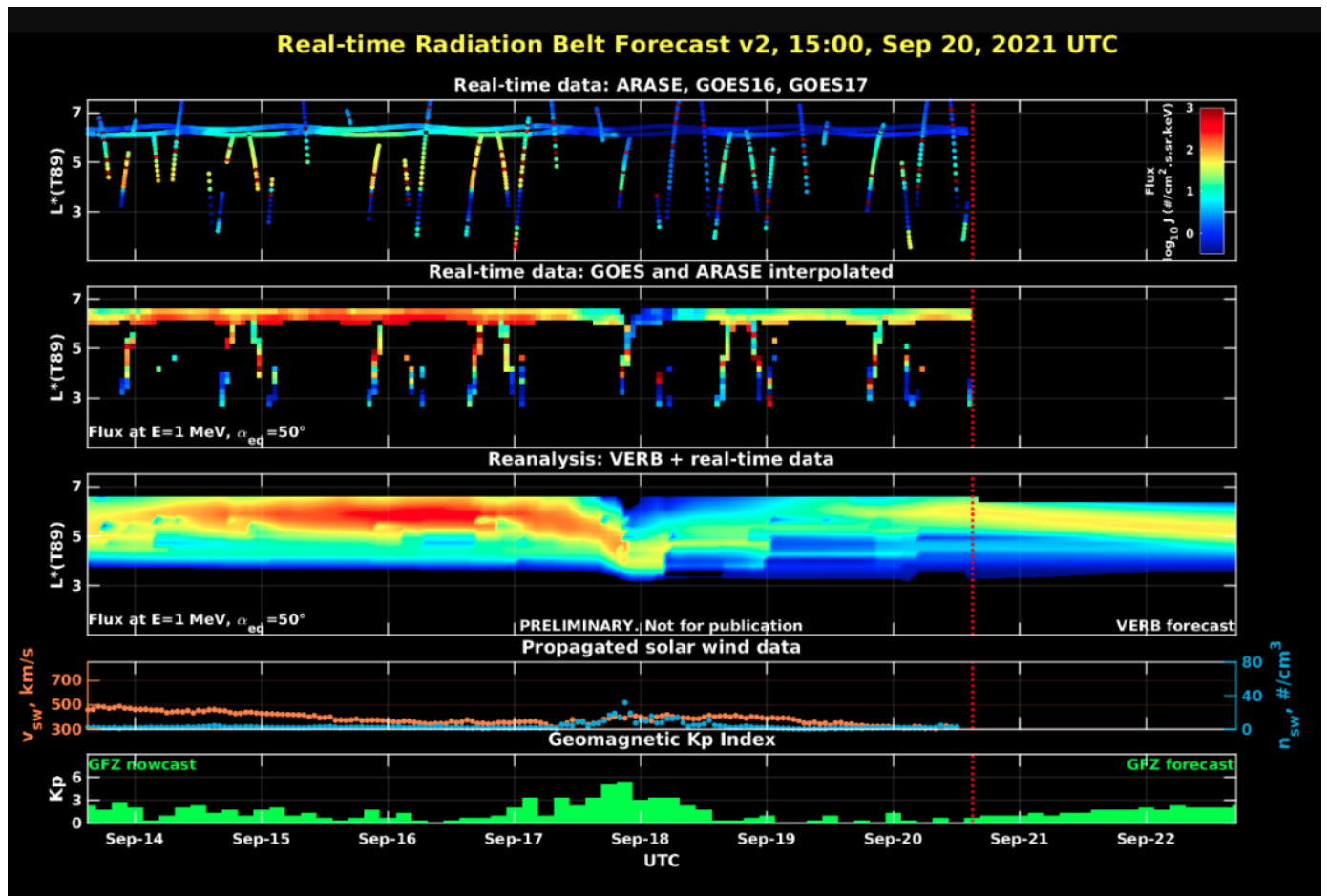


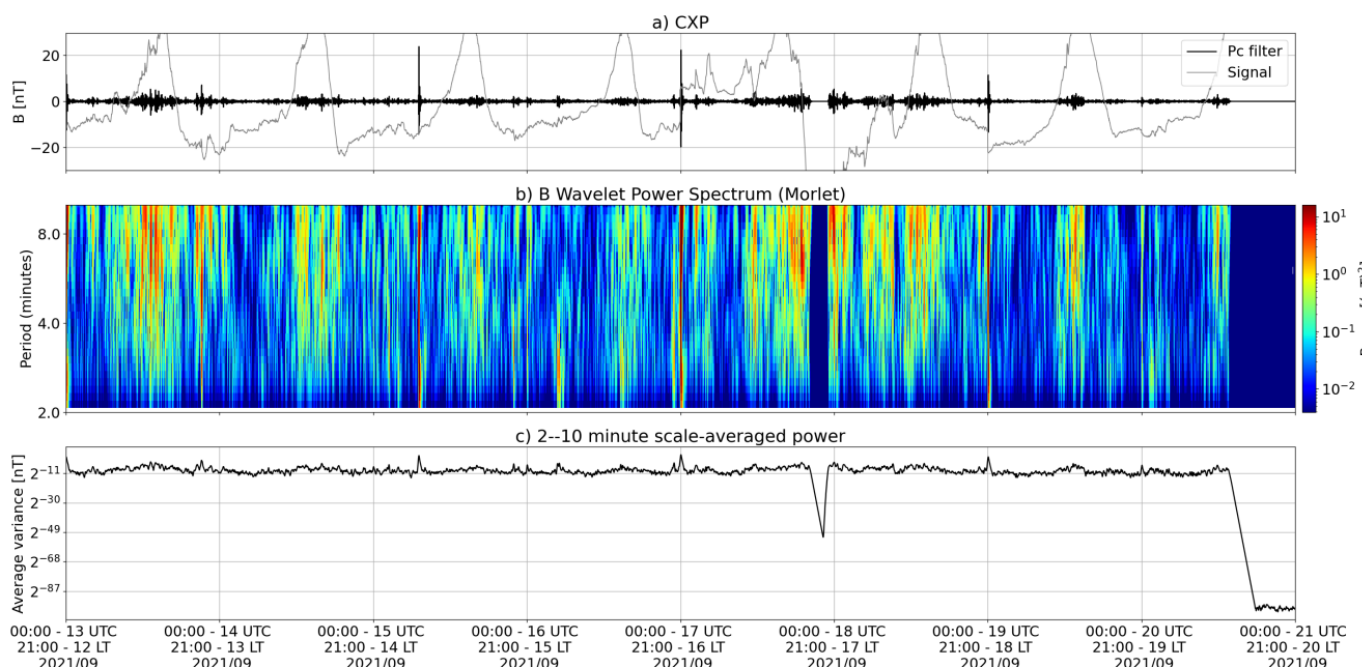
Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES 16 and 17, POES satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: Fonte: <https://rbm.epss.ucla.edu/realtime-forecast/>

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 shown close above 102 particles/(cm<sup>2</sup> s sr) from September 14th, persisting with this population until the early hours on September 17th. From 03:00 UT on September 17th, there is an electron flux decrease at the outer boundary of the outer radiation belt, persisting below 102 particles/(cm<sup>2</sup> s sr) until today (September 20th). This electron flux occurs concomitant with the first magnetopause compression (0.7 RE) due to the arrival of a coronal mass ejection.

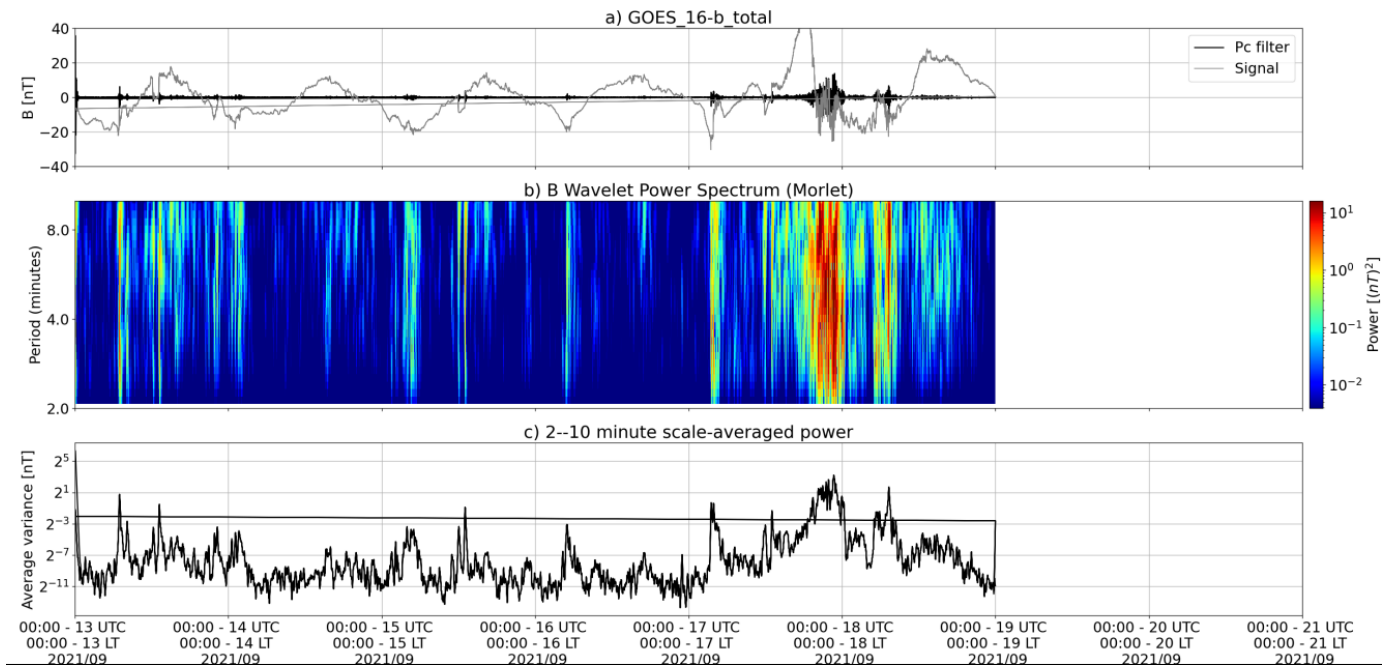
The GOES-16, GOES-17, and Arase satellite data are analyzed and interpolated to observe the high-energy electron flux variability (1 MeV) in the outer radiation belt (Figure 2). Additionally, the VERB code rebuilds this electron considering the Ultra Low Frequency (ULF) waves' radial diffusion. The electron flux decrease observed on September 17th reaches L-shell  $> 3.5$ , and occurs concomitantly with ULF wave activities.

## ULF waves in the magnetosphere

Responsible: José Paulo Marchezi



a) signal of the total magnetic field measured at the CXP Station of the EMBRACE network in gray, together with the fluctuation in the range of Pc5 in black. b) Wavelet power spectrum of the filtered signal. c) Average spectral power in the ranges from 2 to 10 minutes (ULF waves).



a) signal of the total magnetic field measured at the GOES 16 satellite in gray, together with the fluctuation in the range of Pc5 in black. b) Wavelet power spectrum of the filtered signal. c) Average spectral power in the ranges from 2 to 10 minutes (ULF waves).

- The 17th of September presents an impulsive pulse
  - From high to low latitudes
  - Possible decrease in the flow of electrons in the radiation belt
  - At the end of the day the waves are continuous, following the increase in the speed of the solar wind. Possible auroral activity
- On the 18th of September, there is a new wave activity in a wide range of frequencies and coverage in latitude
  - Related to the increase in the dynamic pressure of the solar wind and negative variations of the interplanetary magnetic field  $B_z$

## Geomagnetism

**Responsible: Livia Ribeiro Alves**

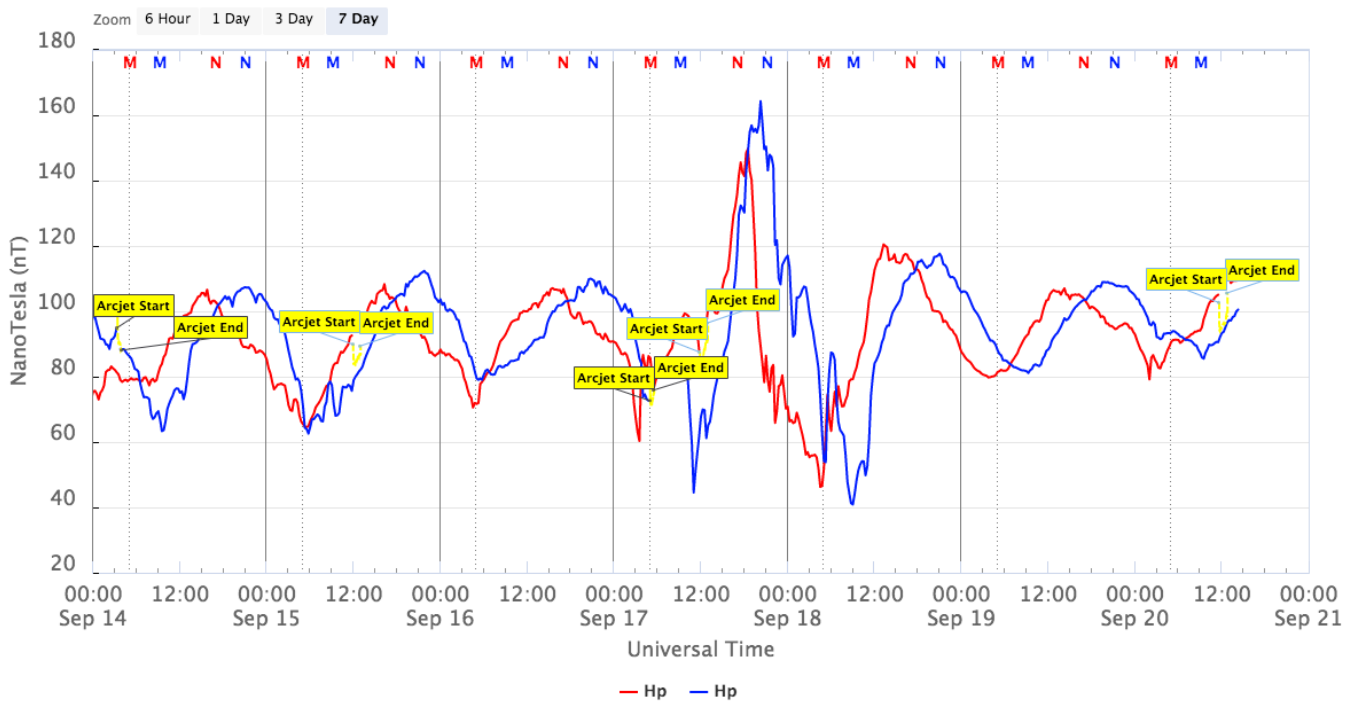
Geomagnetic Report - week of September 14-20.

The geomagnetic events that are representative of this period are listed below:

- 17/09 increase of component H from 03:00 UT on all stations, compatible with S1
- 09/17 drop of the H component down to -140 nT, around 22:00 UT
- Geomagnetic activity changed from quiet to active during the week, with the Dst index reaching its lowest value of -77 nT on 17/09. The highest Kp of the week was 5+ recorded on 17/09
- The auroral activity remained stable throughout the period, increasing on September 17th and 18th.

- Magnetic field measured in the GOES satellite orbit showed an increase in the H component on the dayside on 09/17

GOES Magnetometers (1-minute data)

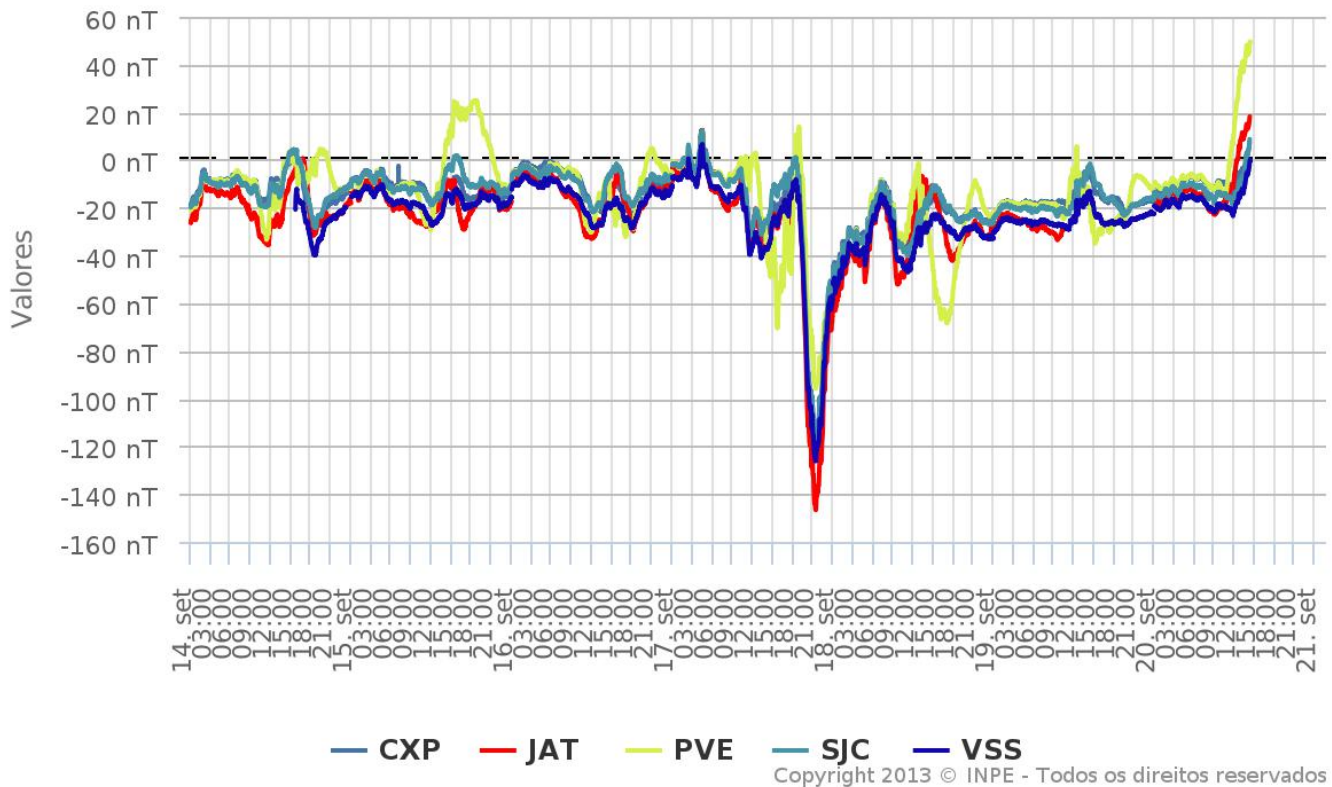


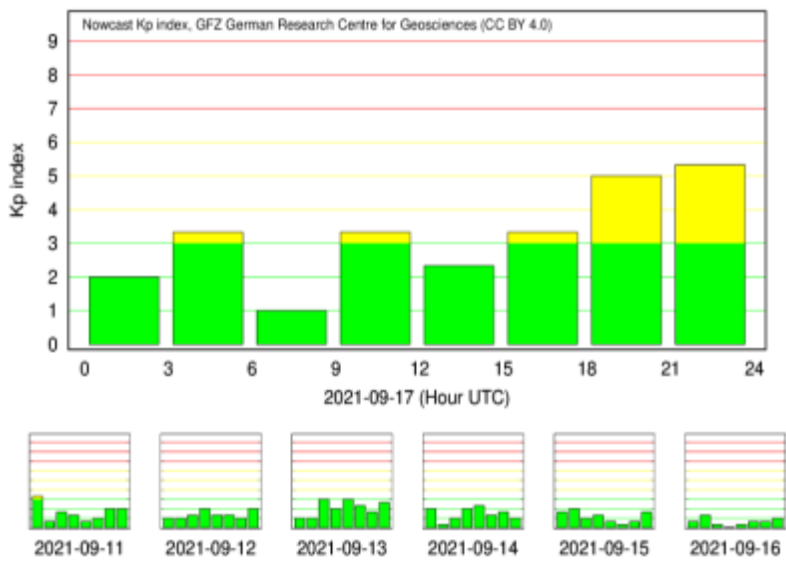
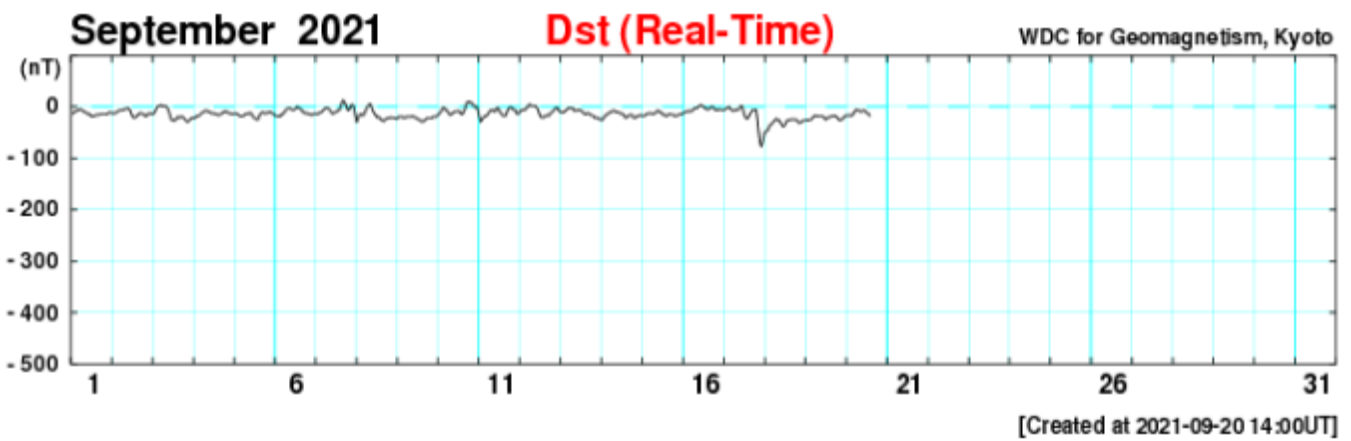
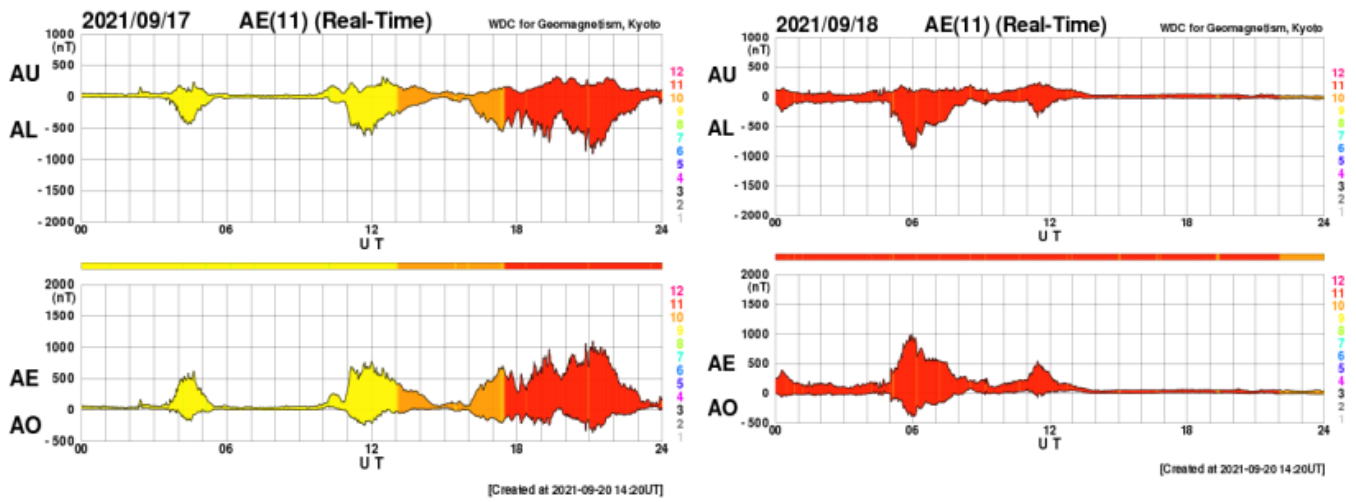
Updated 2021-09-20 14:23 UTC

Space Weather Prediction Center

## Rede EMBRACE de Magnetômetros

$\Delta H$  - (14/09/2021 - 20/09/2021)



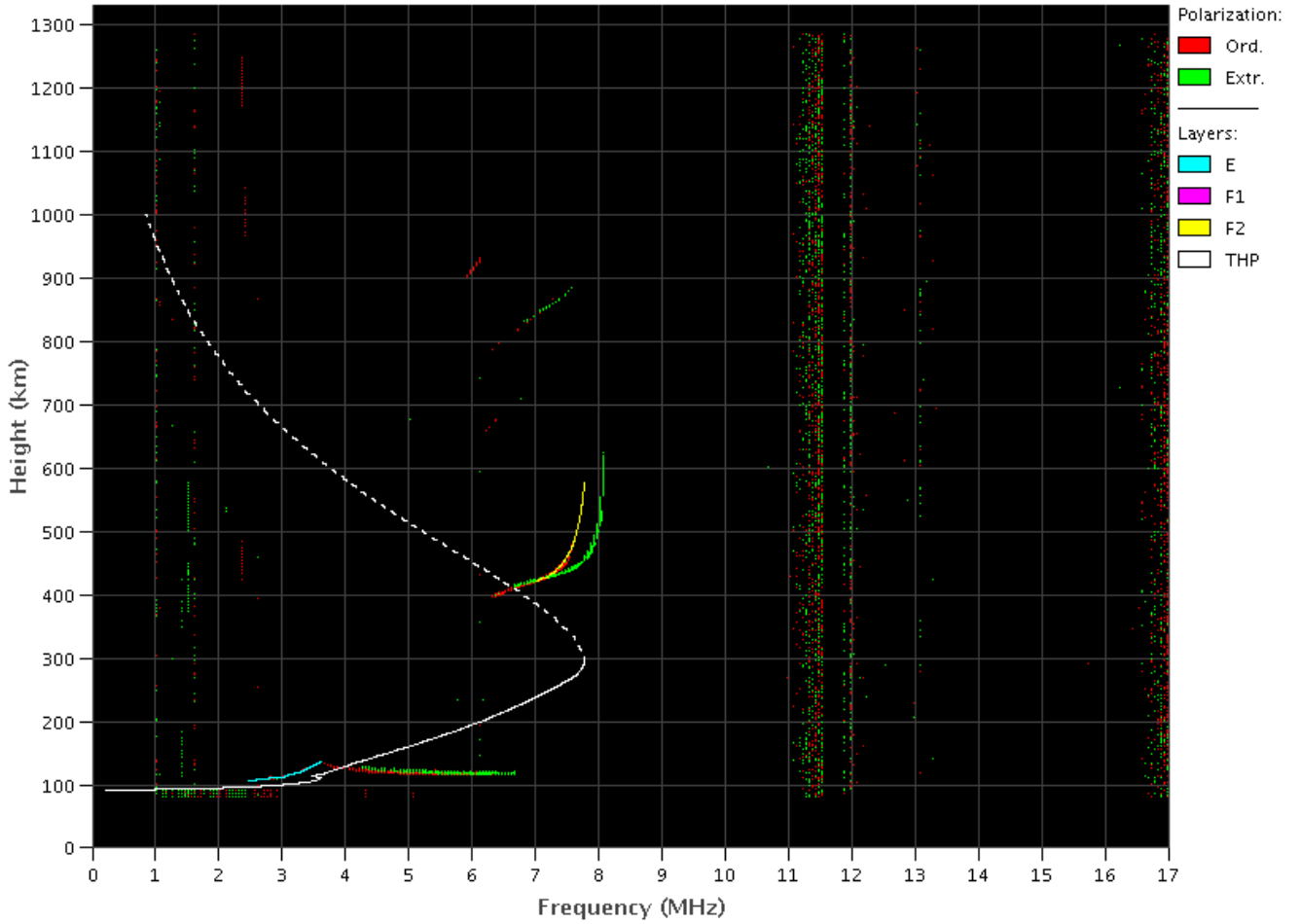


## Ionosphere

Responsible: Laysa Resende

Boa Vista

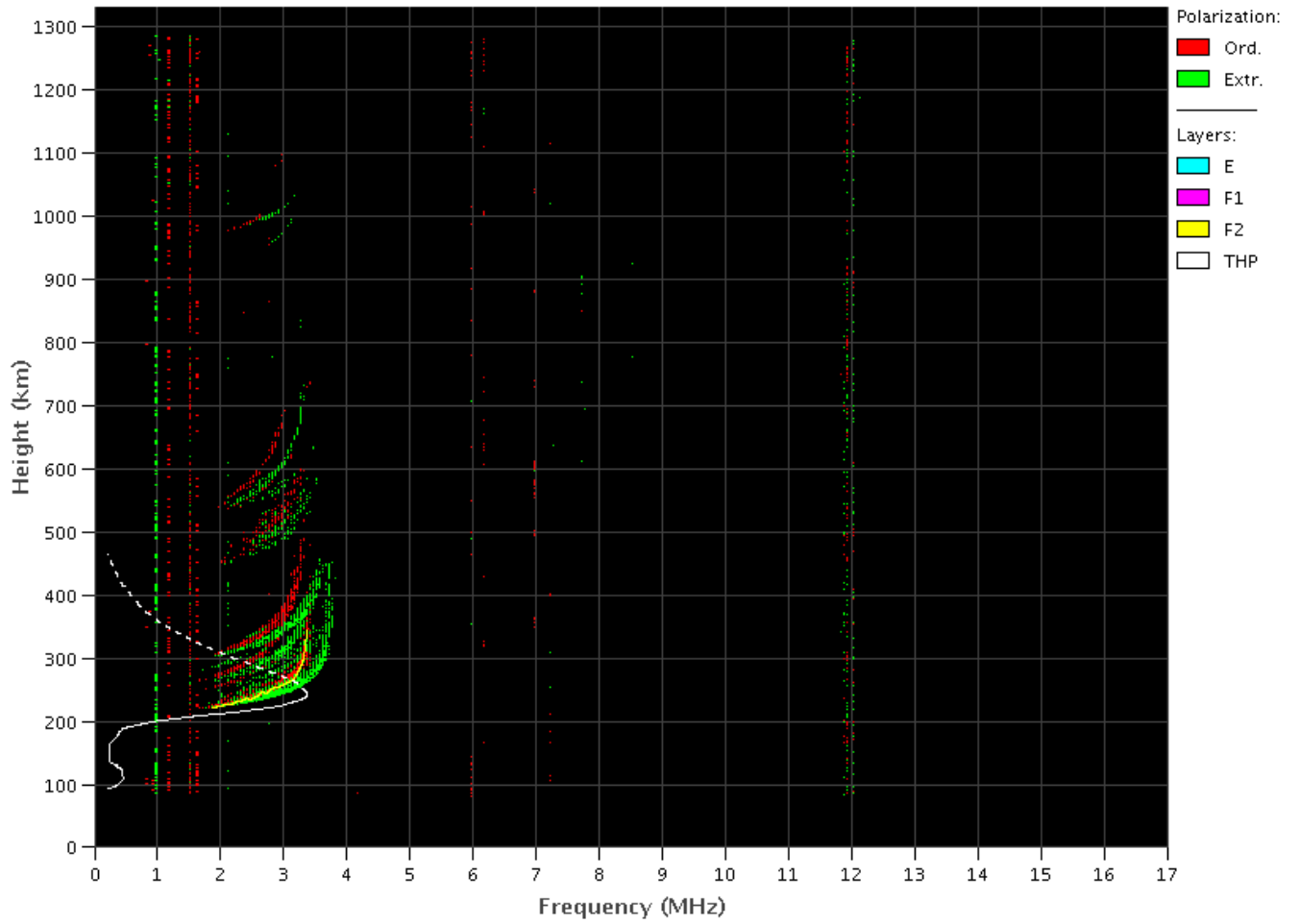
- There was not spread F.
- The Es layers reached scale 3 on September 15.



### Cachoeira Paulista

- There was spread F from September 16.
- The Es layers reached scale 2 during all day in the week.

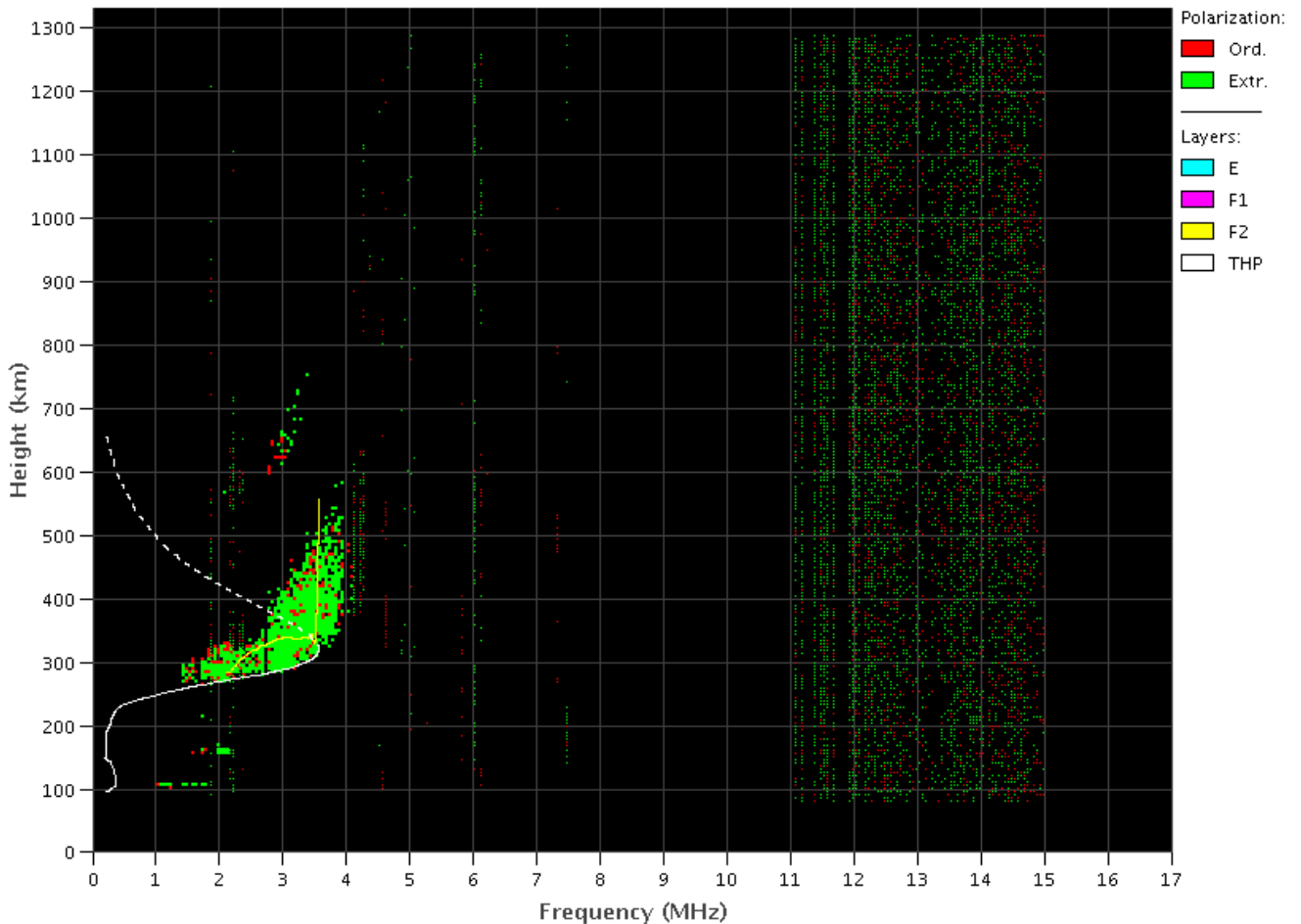




### São Luis

- There was spread F during this week.
- The Es layers reached scale 3 on September 15.

São Luís – 09/13/2021 04:50:00 UT



## Cintillation S4

**Responsible: Siomel Savio Odriozola**

In this report on the S4 scintillation index, data from the SLMA stations in São Luís / MA, STSN in Sinop /MT, UFBA, in Bahia / BA and SJCE in São José dos Campos / SP were presented. The S4 index tracks the presence of irregularities in the ionosphere having a spatial scale  $\sim 360$  m.

The STSN, SLMA and UFBA stations showed moderate scintillations on different days during the analyzed period beginning on September 14th.

In the case of the SLMA station, S4 values in the range 0.3--0.4 (moderate scintillation) were observed in the time after sunset on September 15, 16 and 18 (Figure 1). For the STSN station, S4 values above 0.3 were recorded in the last hours of those same days, the strongest being in the night of September 18th until the early hours of the morning of the 19th (Figure 2). Finally, the UFBA station only reported moderate scintillation values for the early morning of September, 16th (Figure 3).

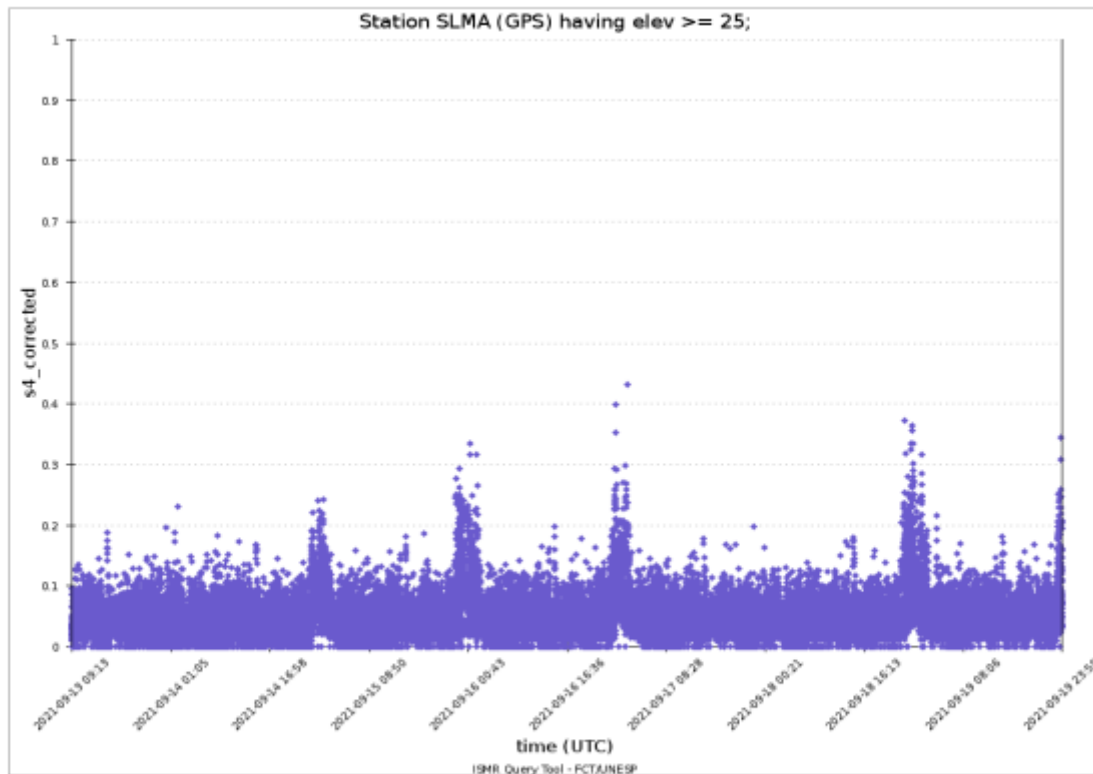


Figure 1: Values of the S4 index for the GPS constellation between September 13th and September 19th for the SLMA station in São Luís\MN.

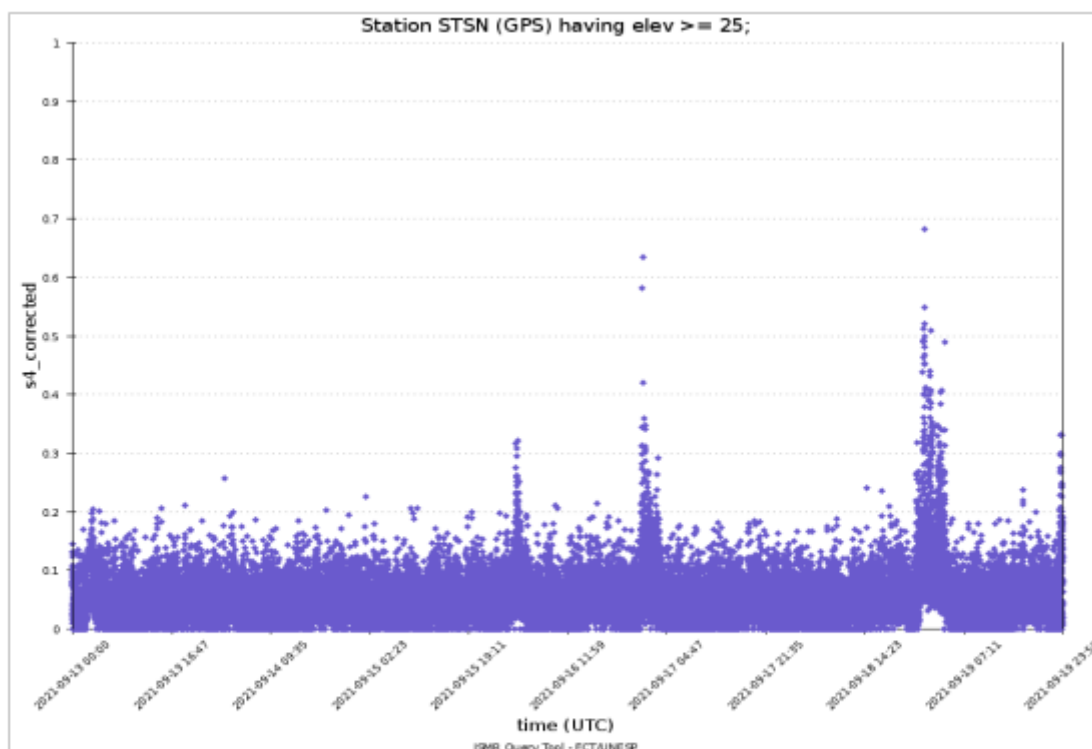


Figure 2: Values of the S4 index for the GPS constellation between September 13th and September 19th for the SNTP station in Sinop\MT.

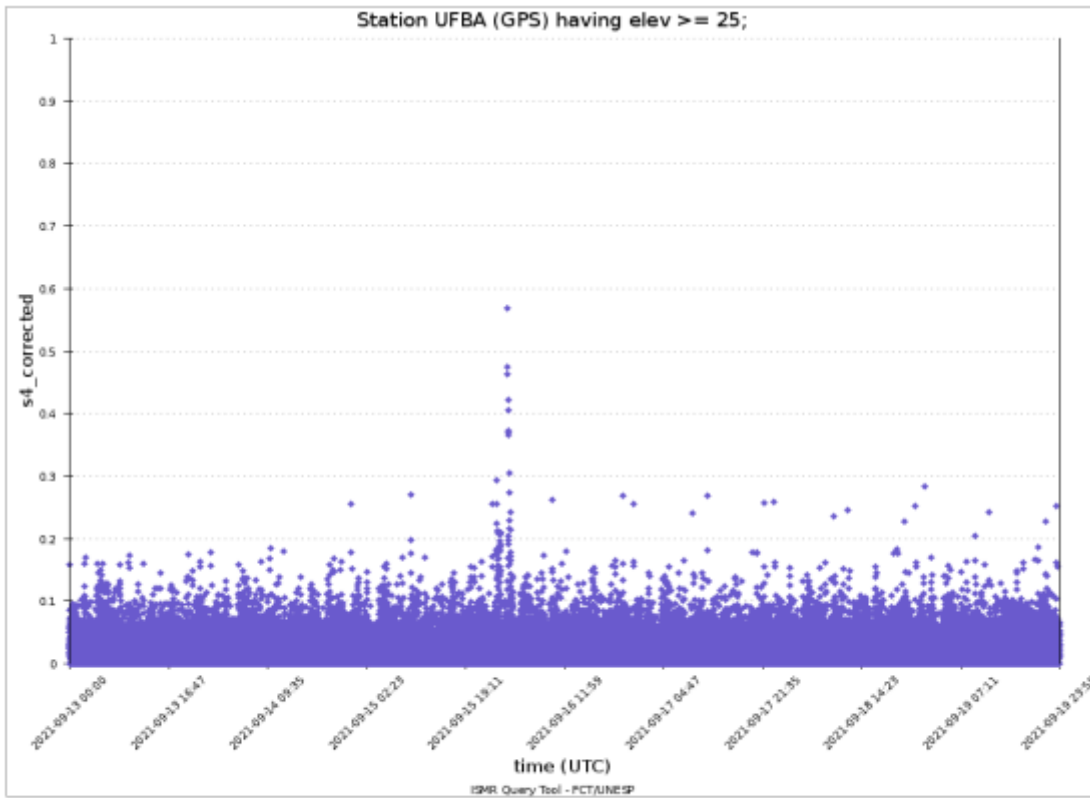


Figure 3: Values of the S4 index for the GPS constellation between September 13th and September 19th for the UFBA station in Salvador\ BA.