

Briefing Space Weather - 2021/09/27



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Sun

Responsible: José Roberto Cecatto

09/20 - No fast wind stream; 2 CME can have component toward the Earth;
09/21 - No fast wind stream; 1 CME can have component toward the Earth;
09/22 - No fast wind stream; 1 CME can have component toward the Earth;
09/23 - No fast wind stream; 5 CME; M3-flare (RA 2871) at 04:42 UT assoc type-II / IV bursts (CME);
09/24 - Fast (≤ 500 km/s) wind stream; 2 CME can have component toward the Earth;
09/25 - Fast (≥ 500 km/s) wind stream; 2 CME can have component toward the Earth;
09/26 - Fast (< 500 km/s) wind stream; 3 CME can have component toward the Earth;
09/27 - No fast wind stream; 1 CME can have component toward the Earth;

Prev.: Fast wind stream expected for Sept. 27-28; for while low (5% M, 1% X) probability of M / X flares next 2 days; also, occasionally some other CME can present a component toward the Earth.

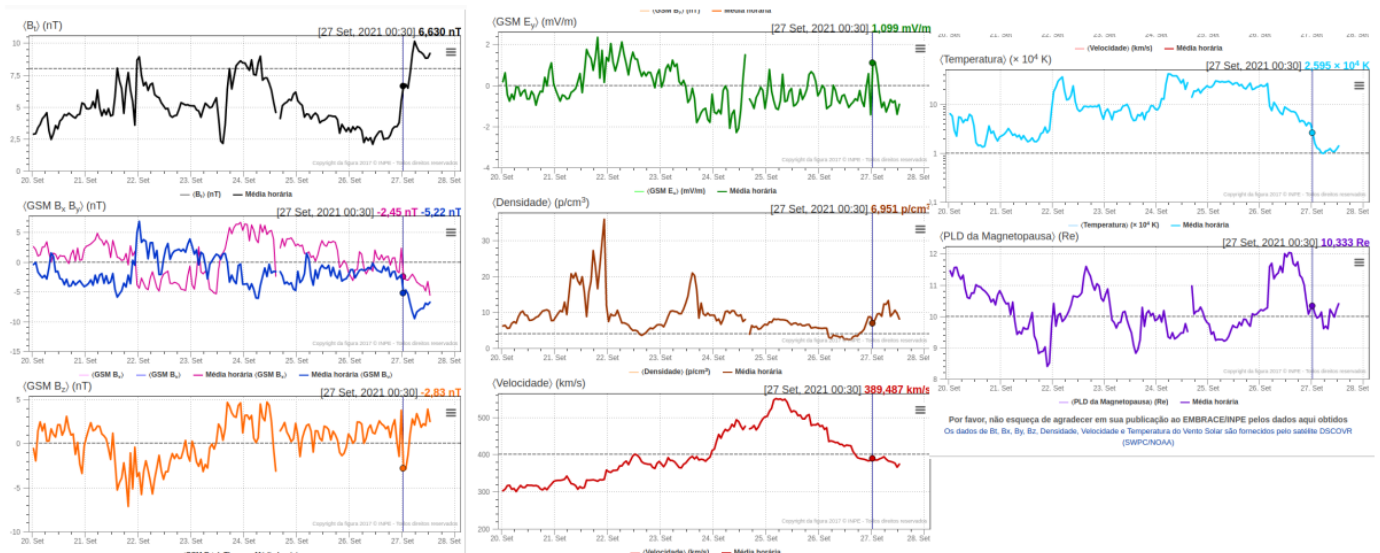
Responsible: Douglas Silva

- CME:
 - No CME was observed directed to the Earth with the LASCO images.
- WSA-ENLIL (Prediction for CME 2021-09-23T05:48Z)
 - The simulation indicates that the CME arrival forecast will occur on the following date: 2021-09-27T15:00Z (-9.0h, +9.0h)
- WSA-ENLIL (Prediction for CME 2021-09-23T16:53Z)
 - The simulation indicates that the CME arrival forecast will occur on the following date: 2021-09-26T23:30Z (-7.0h, +7.0h)
- WSA-ENLIL (Prediction for CME 2021-09-26T18:00Z)
 - The simulation indicates that the CME arrival forecast will occur on the following date: 2021-09-30T06:00Z (-7.0h, +7.0h)
- Coronal holes:

- A north polar extension of coronal hole 34147 was observed between the 22nd and 23rd of September.
- Coronal hole 34519 was observed in the centre of the solar disk between September 20th and 23rd.

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 ESW identified by the DSCOVR satellite in the interplanetary region along with sector boundary crossing.
- The total Bt magnetic field showed oscillations below 10 nT, with a peak value recorded on September 27th at 05:30 at 10,131nT.
- The component of the IMF Bz oscillated mostly positive. A Bz peak of -7.15 nT was observed on September 21st at 19:30.
- The occurrence of the change of sector in the BxBy components occurred on September 21st at 9:30 pm and September 23 at 1:30 pm. For the remainder of the period, the components fluctuated around zero.
- The Vsw density has fluctuations with a maximum value on September 21st at 22:30 of 35.89 p/cm³ and a second peak on September 23rd at 15:30 ~ 20.2 p/cm³. In the rest of the period, density oscillated with values lower than 15 p/cm³.
- The solar wind speed Vsw, showed an increasing increase with the first peak on September 22nd at 12:30 400.6km/s. However after the 23rd of September 23:30 it presented a peak on the 25th of September at 04:30 at 550.14km/s, soon after decreasing below 400km/s on the 26th of September at 16:30 399.4km /s.
- Subsolar Mp showed maximum compression on September 21st at 21:30 from ~ 8.39 Re and a second compression peak on September 23 at 14:30 from 8.8 Re. It showed a maximum expansion

of 12.02 Re on the 26th of September at 14:30. For the remainder of the period, Mp fluctuated around typical values.

Radiation Belts

Responsible: Ligia Alves da Silva

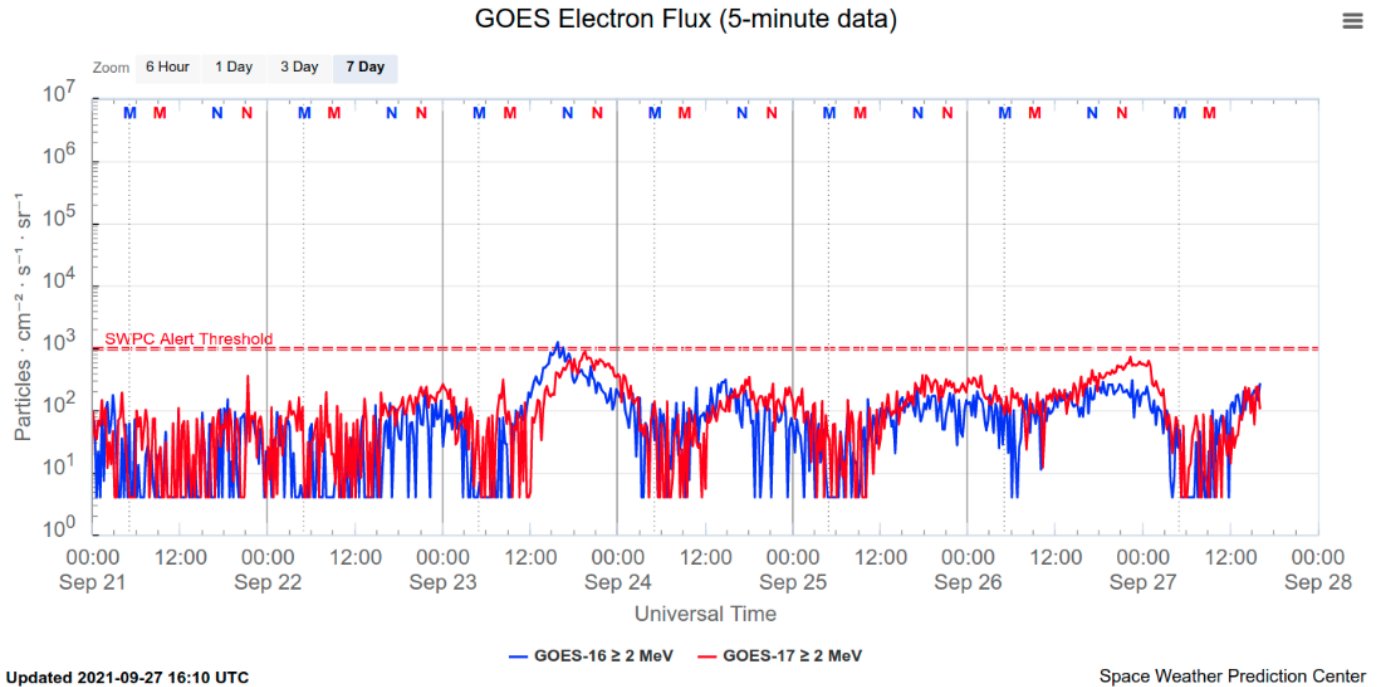


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES satellite. Source: <https://www.swpc.noaa.gov/products/goes-electron-flux>

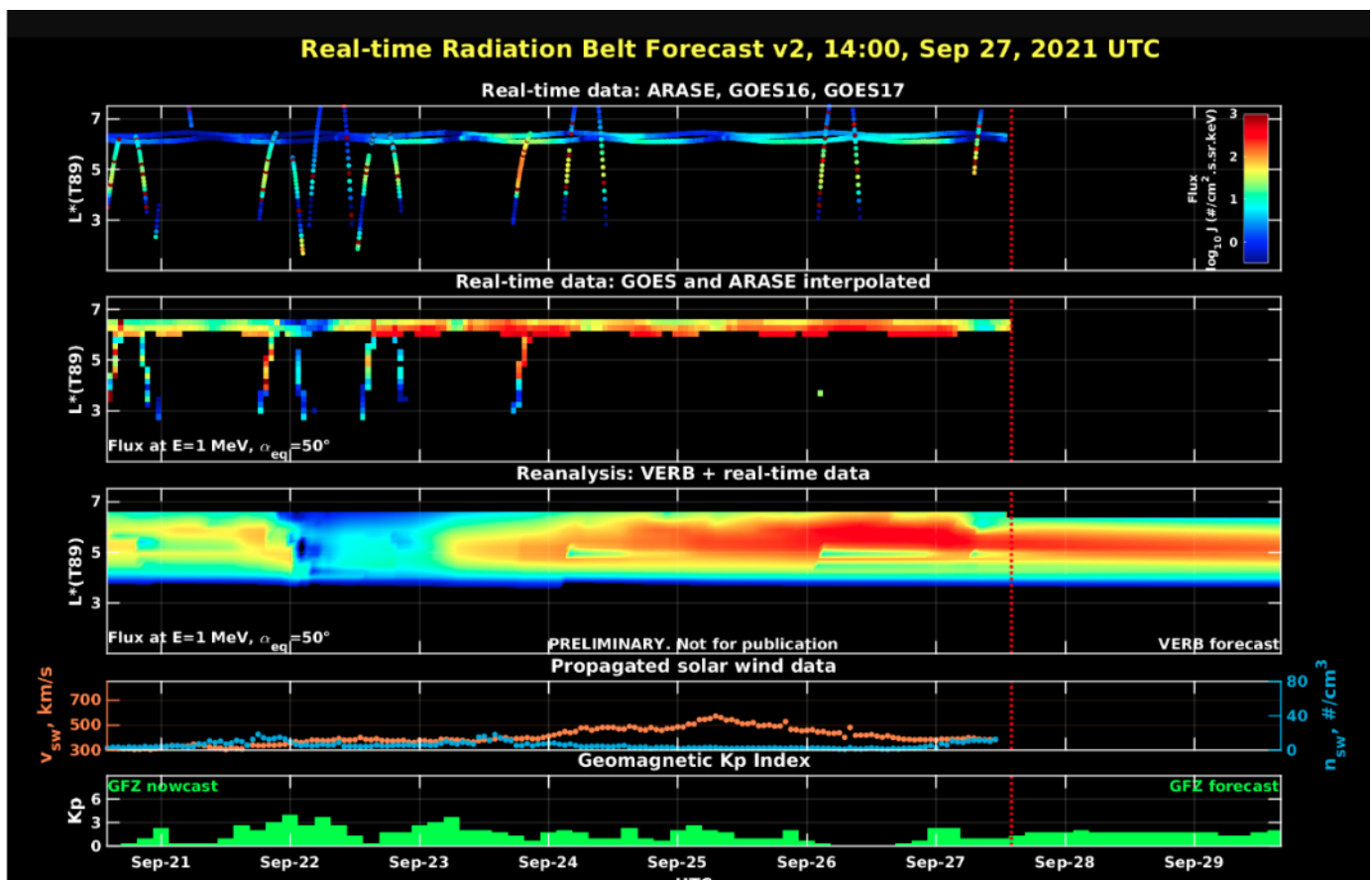


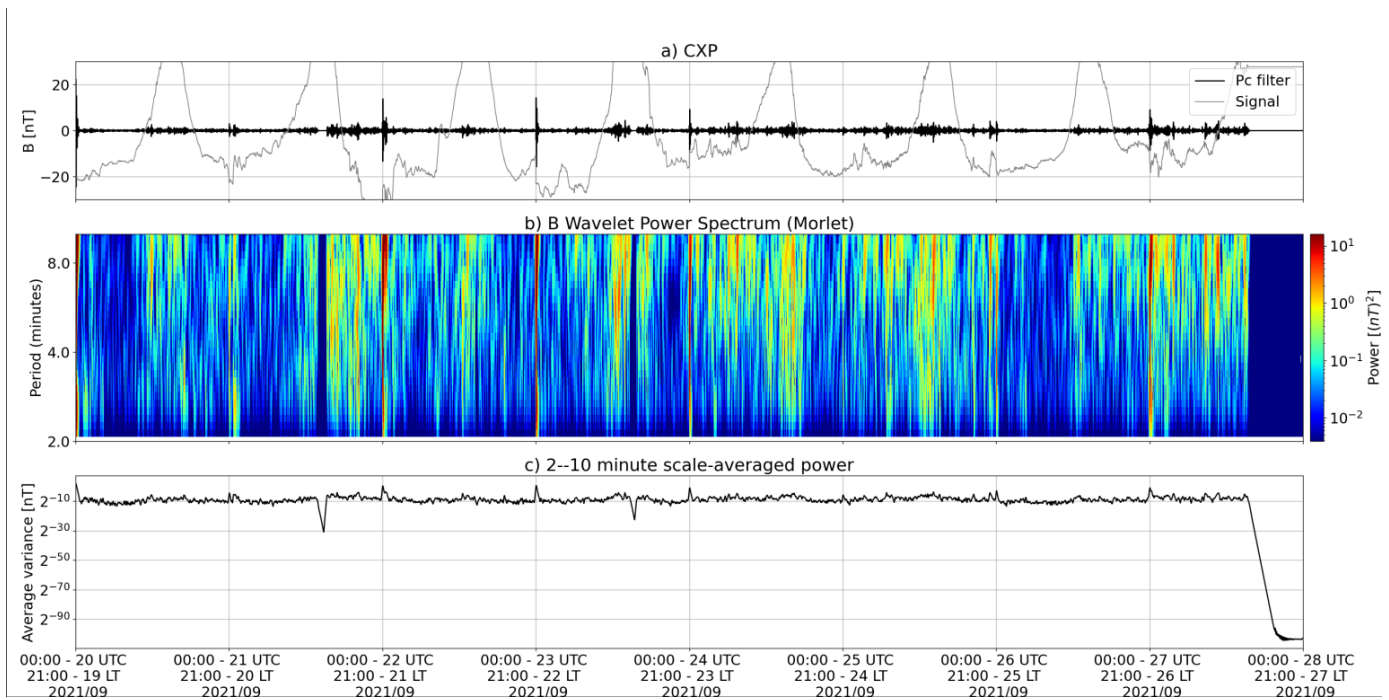
Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES 16 and 17, POES satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: Fonte: <https://rbm.epss.ucla.edu/realtime-forecast/>

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 below 102 particles/(cm² s sr) from September 21st, showing a slight electron flux increase on September 17th. From 03:00 UT on September 22nd. A second electron flux increase was observed (September 23rd), this time reaching the threshold of 103 particles/(cm² s sr) in the outer boundary of the outer radiation belt. An electron flux decrease is observed on September 27th, observed only in the outer boundary.

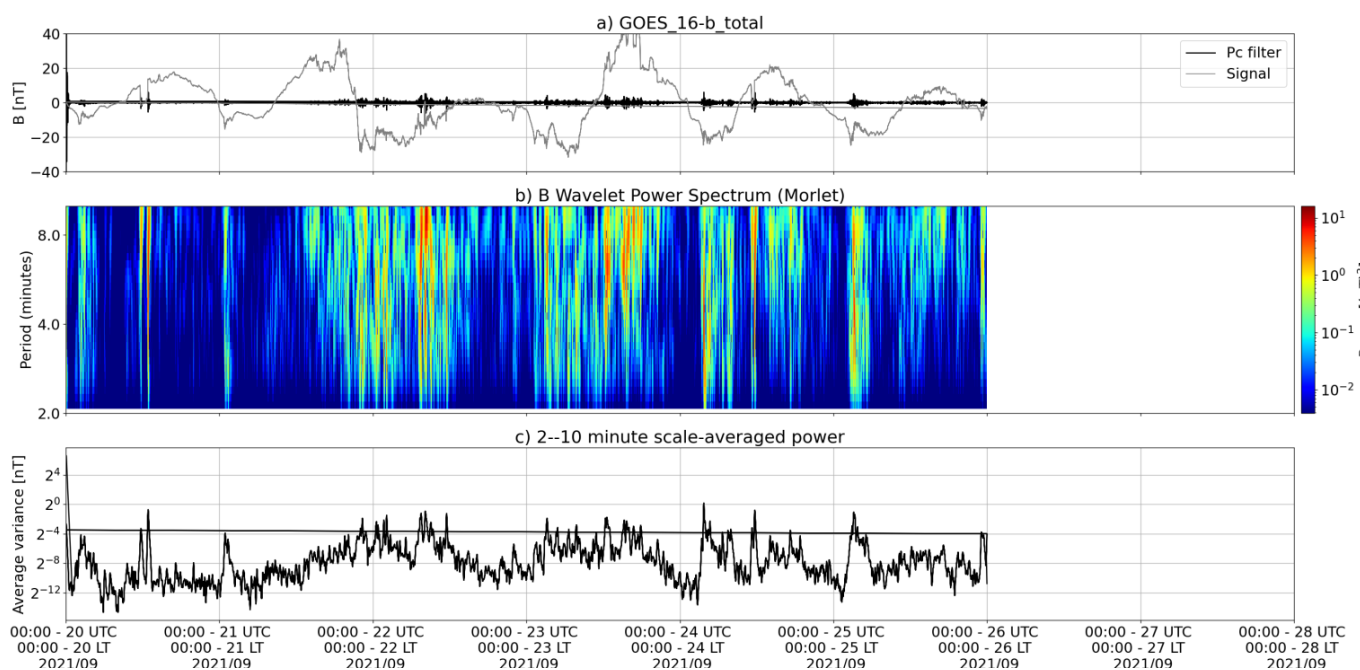
The GOES-16, GOES-17, and Arase satellite data are analyzed and interpolated to observe the high-energy electron flux variability (1 MeV) in the outer radiation belt (Figure 2). Additionally, the VERB code rebuilds this electron considering the Ultra Low Frequency (ULF) waves' radial diffusion. The electron flux increase observed on September 22nd reaches L-shell > 4.0 and occurs concomitantly with ULF wave activities. The electron flux decrease in the outer radiation belt coincides with the 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).

- Two periods with intense and abrupt activity: 22/09 and 23/09
 - Day 22 is related to an increase in the dynamic pressure of the solar wind and negative b_z component. It is also related to a slight increase in the flux of electrons in the external radiation belt
 - On the 23/09 there is a new HSS, the peak of activity coincides with the increase in the pressure of the solar wind and the wave activity also follows the increase in the speed of the

solar wind continuously. There is also a further increase in particle flux in the external radiation belt.

- Day 21 features continuous fluctuations from high latitudes and on the GOES satellite.

Geomagnetism

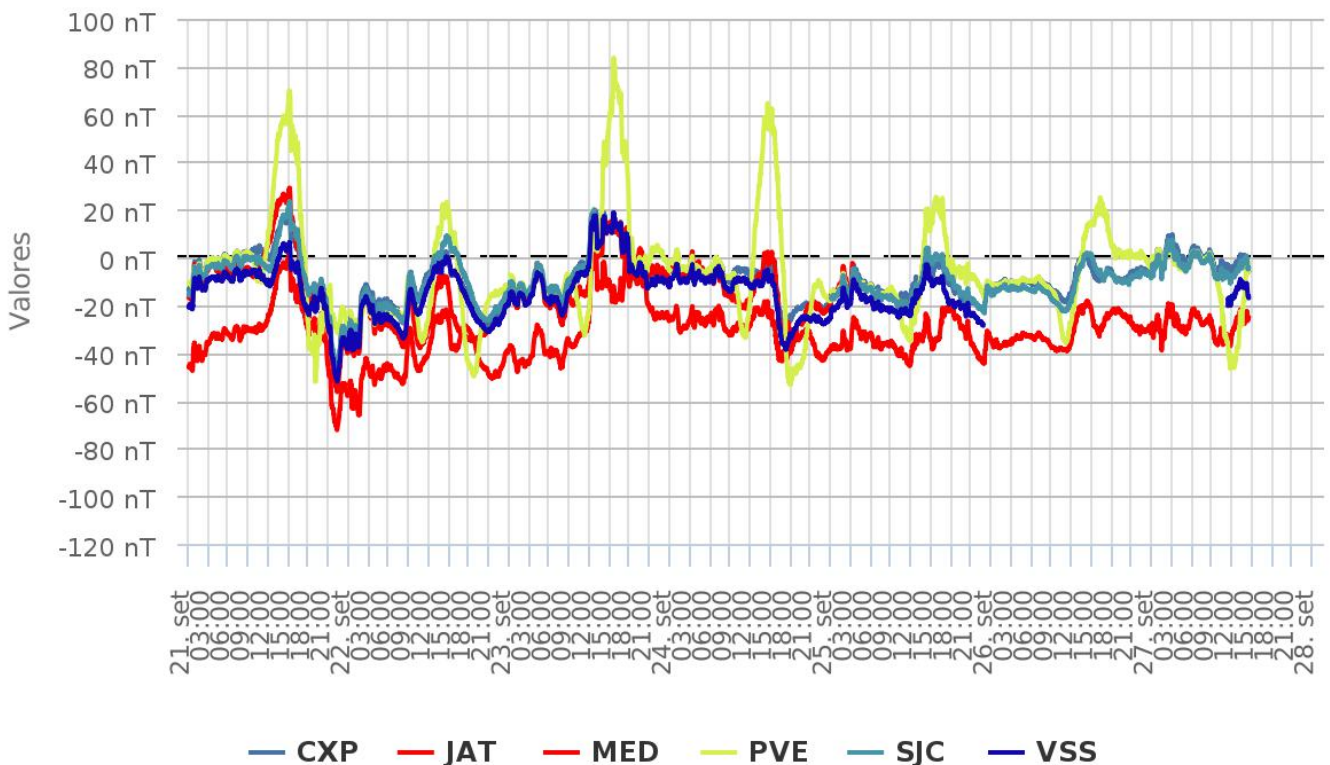
Responsible: Livia Ribeiro Alves

In the week of September 21st to 27th, the following events related to geomagnetic activity

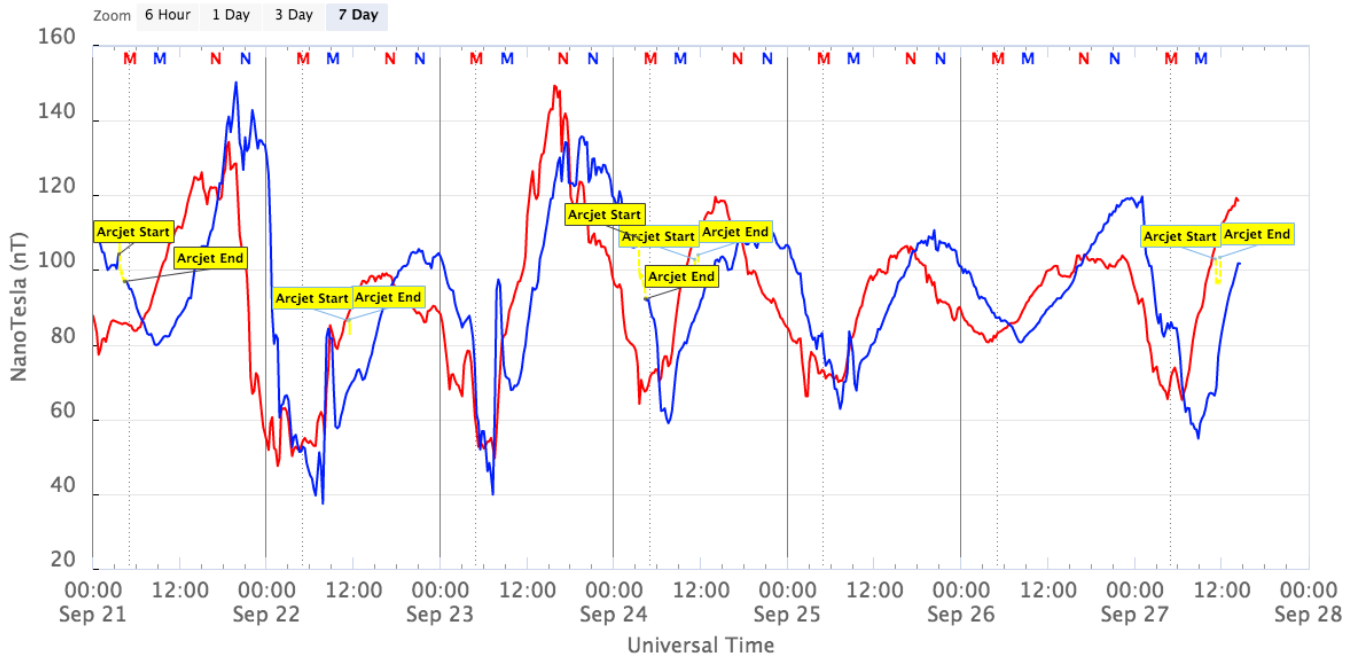
- Data from the Embrace magnetometer network showed instabilities throughout the period, with some highlighted events:
21, 22 e 23/09 increase in the H component in all stations
21 and 24/09 drop of component H at all stations
- Geomagnetic activity ranged from quiet to unstable during the week, with the Dst index reaching the lowest value of -32 nT on 09/21. The highest Kp of the week was the 4o recorded on 22/09
- The auroral activity remained stable throughout the period, with a slight increase on September 22nd and 23rd.
- Magnetic field measured in the GOES satellite's orbit showed several disturbances in the period, especially on September 21st and September 23rd.

Rede EMBRACE de Magnetômetros

ΔH - (21/09/2021 - 27/09/2021)

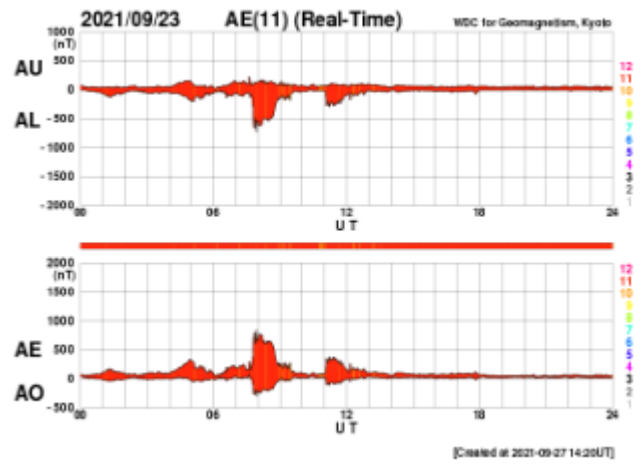
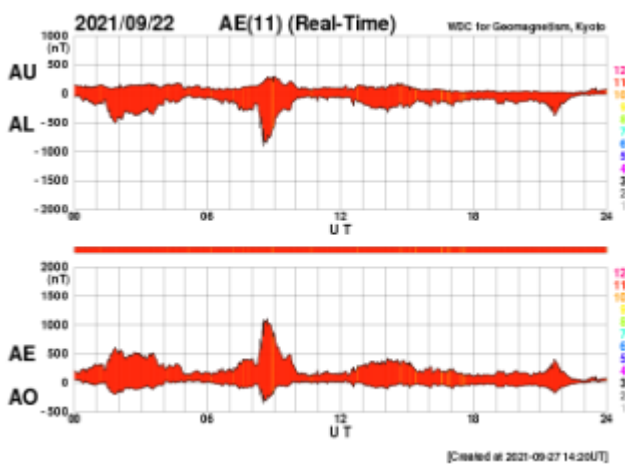


GOES Magnetometers (1-minute data)



Updated 2021-09-27 14:26 UTC

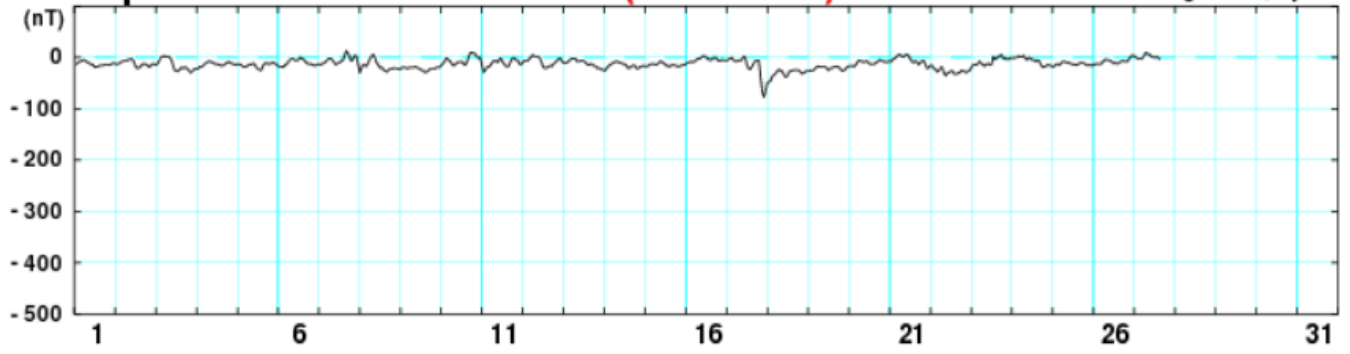
Space Weather Prediction Center



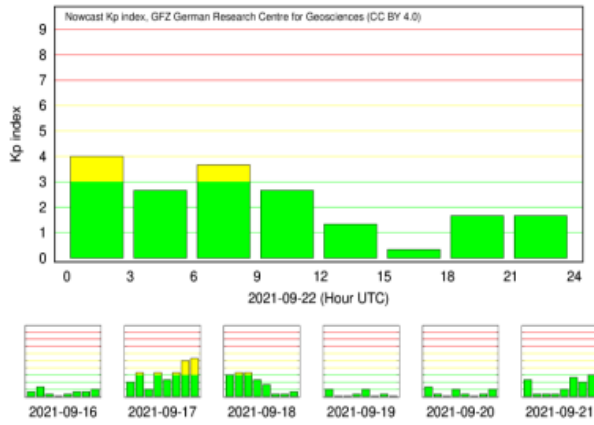
September 2021

Dst (Real-Time)

WDC for Geomagnetism, Kyoto



[Created at 2021-09-27 14:30UT]

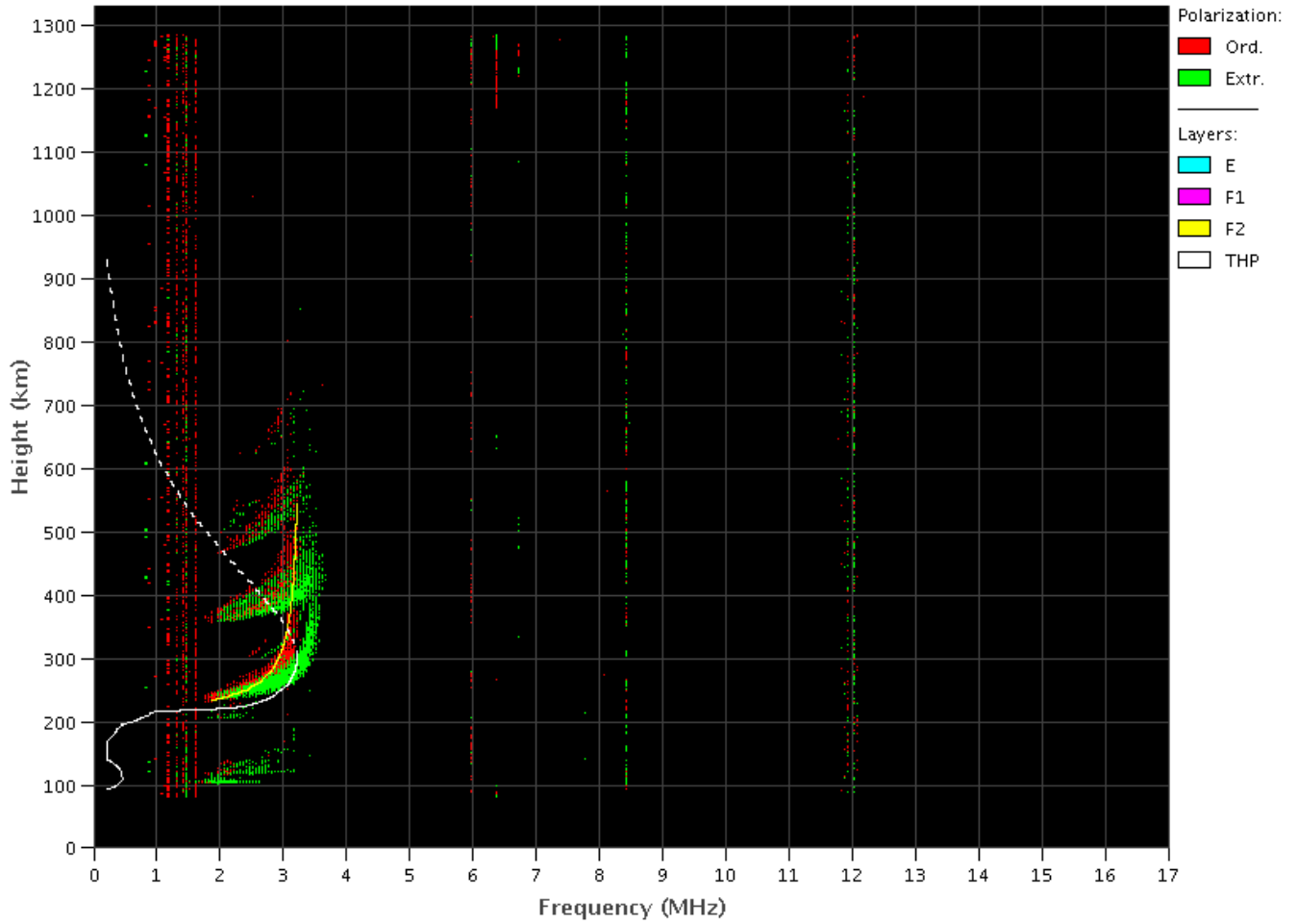


Ionosphere

Responsible: Laysa Resende

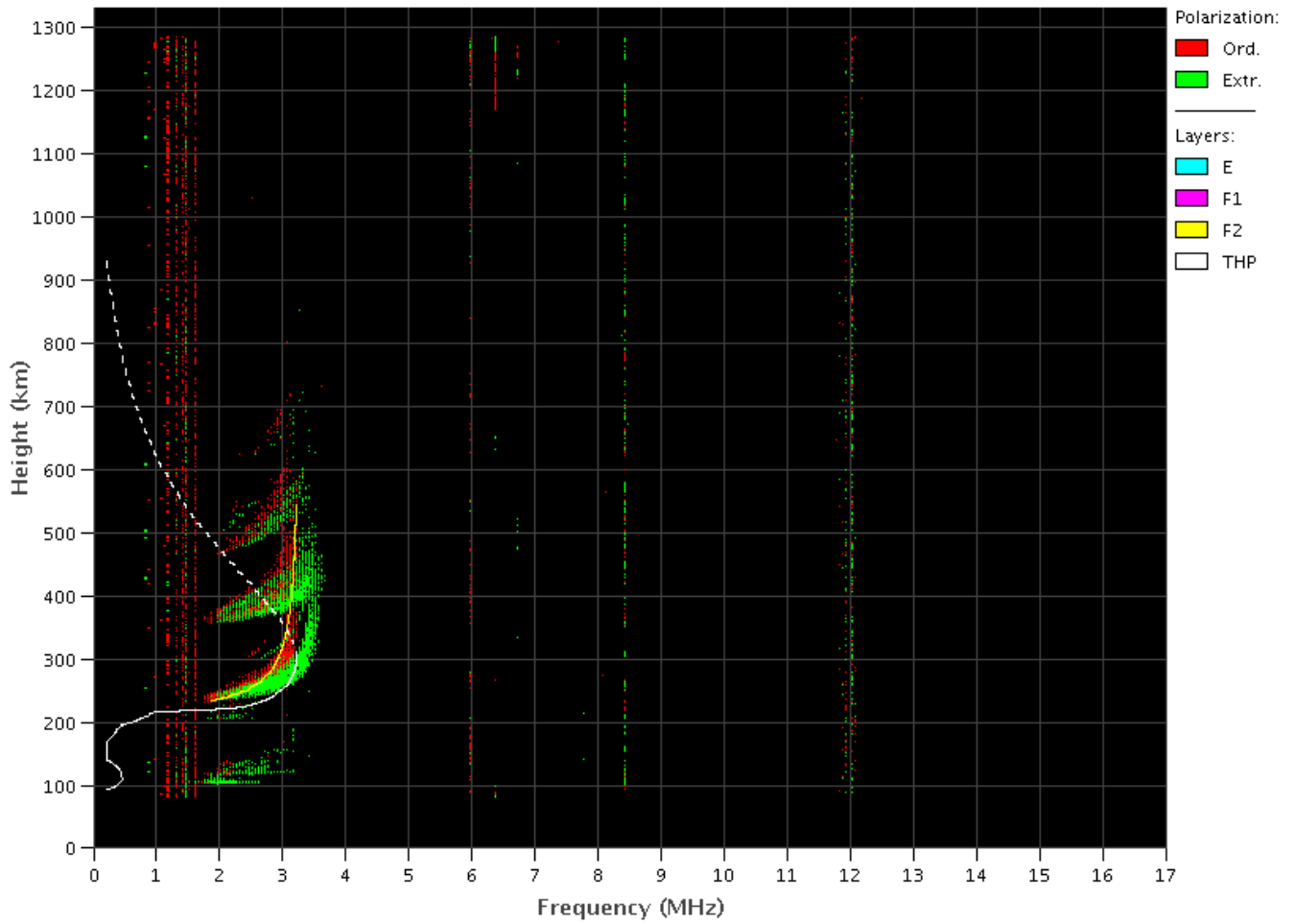
Boa Vista

(NO DATA)



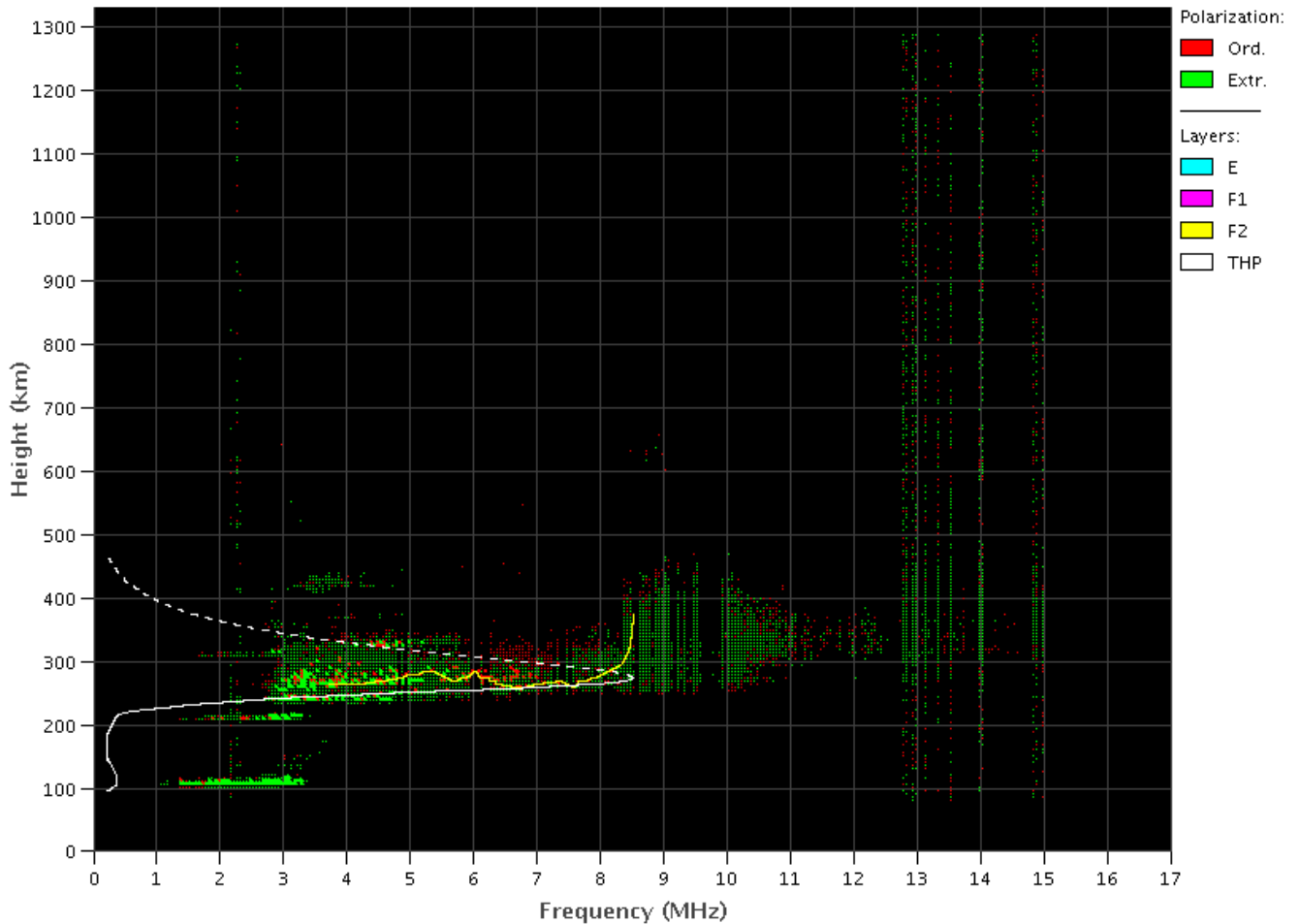
Cachoeira Paulista

- There was spread F on September 20 and 24.
- 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 2 during all day in the week.



Scintillation 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 ~ 360 m.

The STSN and SLMA stations showed moderate scintillations on different days during the analyzed period beginning on September 20th.

In the case of the SLMA station, S4 values in the range 0.3--0.6 (moderate scintillation) were observed in the time after sunset on September 22 --26 (Figure 1). For the STSN station, S4 values above 0.3 were recorded in the early hours of 09/22, (Figure 2). Finally, the UFBA station only reported moderate scintillation values for the early morning of September 16th (Figure 2).

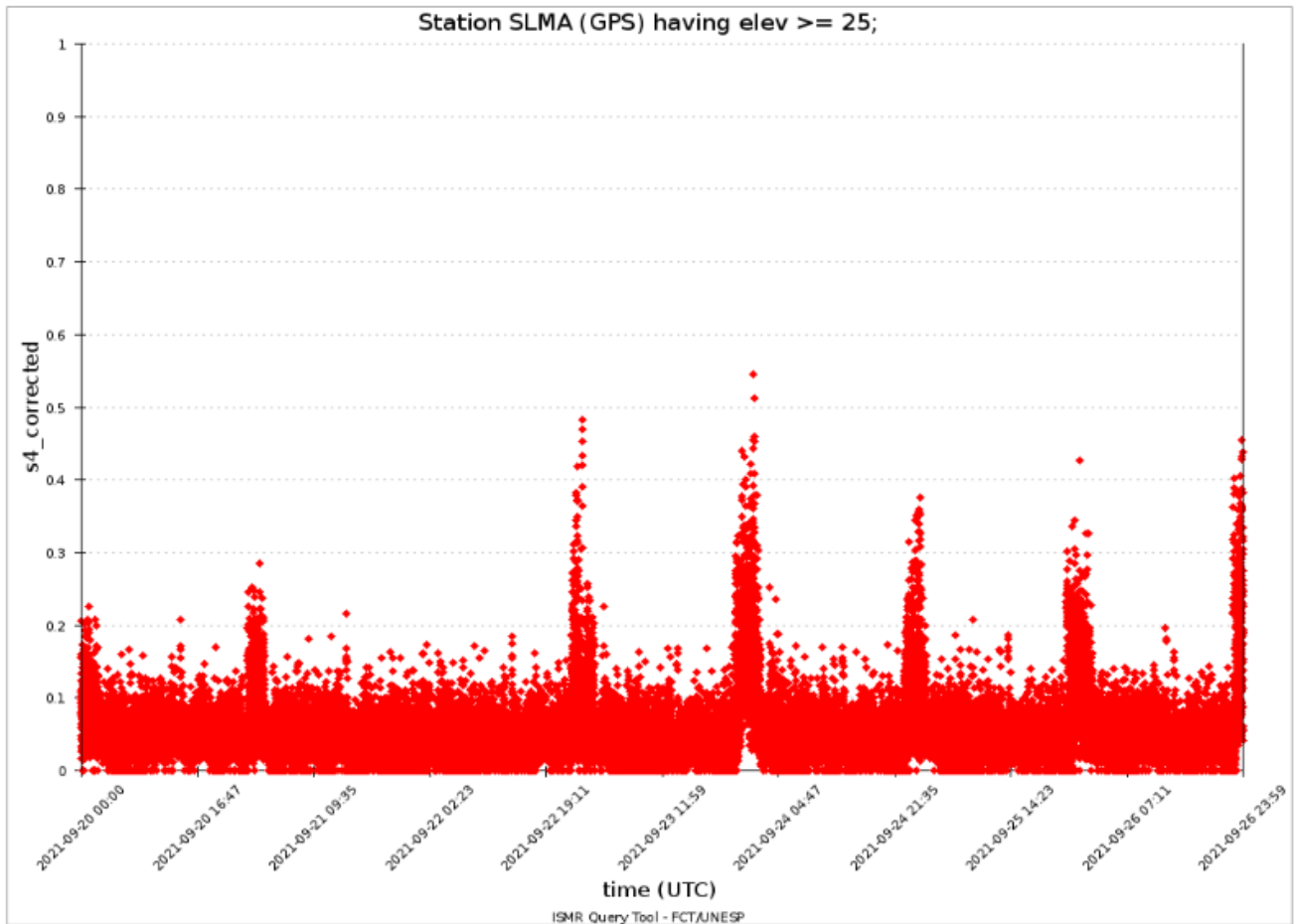


Figure 1: Values of the S4 index for the GPS constellation between September 20th and September 26th for the SLMA station in São Luís\MN.

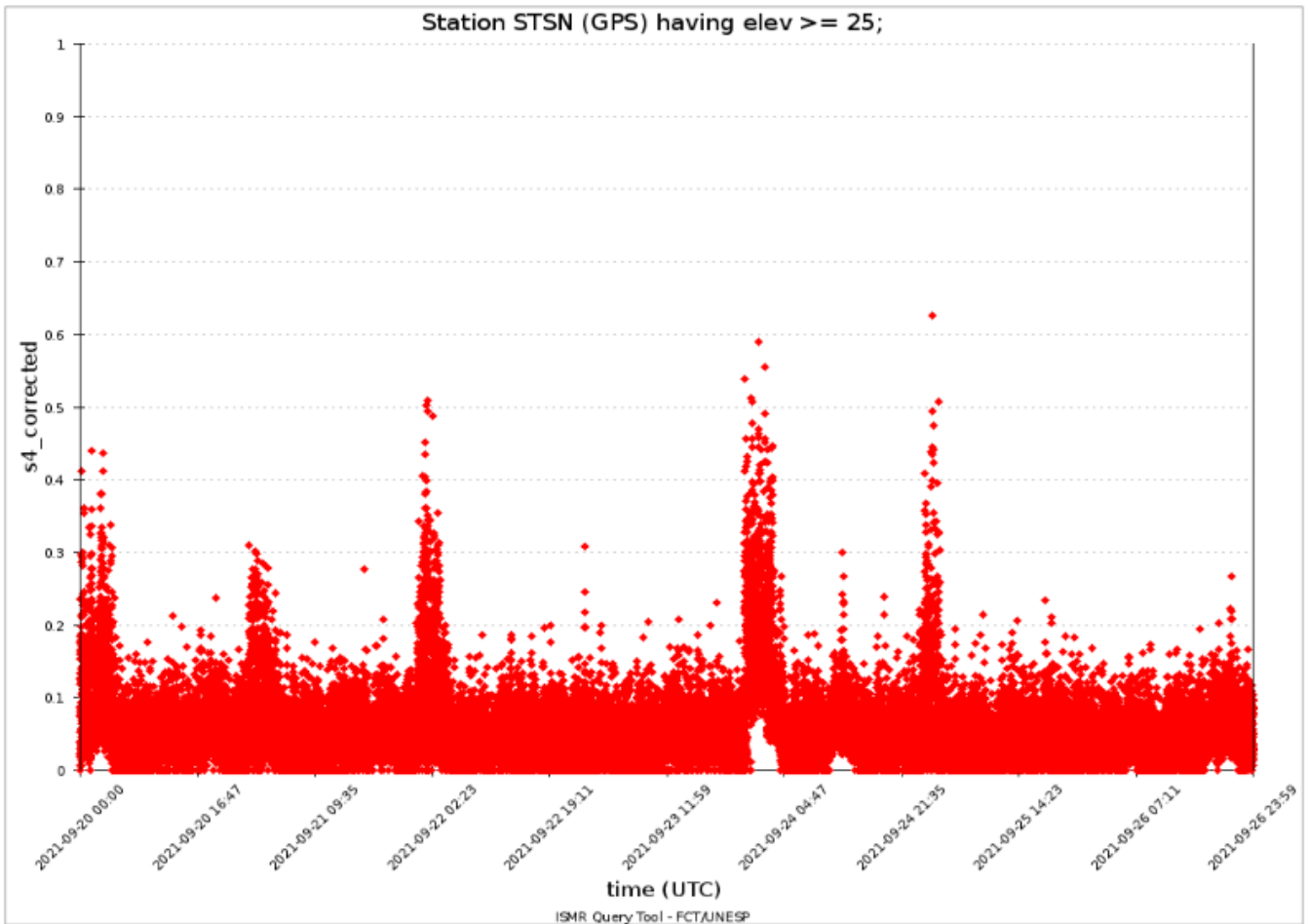


Figure 2: Values of the S4 index for the GPS constellation between September 20th and September 26th for the SNTP station in Sinop\MT