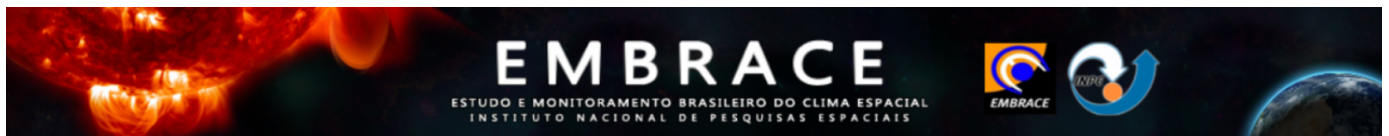


Briefing Space Weather - 2021/10/18



Briefing Space Weather - 2021/10/18

Sun

Responsible: José Roberto Cecatto

OBS: One halo CME toward Earth on Oct 09, assoc flare M1.6 at 06:40 UT from AR 2882.

10/04 – No fast wind stream; 1 CME can have component toward the Earth;

10/05 – No fast wind stream; No CME toward the Earth;

10/06 – No fast wind stream; No CME toward the Earth;

10/07 – No fast wind stream; 2 CME can have component toward the Earth;

10/08 – No fast wind stream; No CME toward the Earth;

10/09 – No fast wind stream; 5 CME can have component toward the Earth;

10/10 – No fast wind stream; 3 CME can have component toward the Earth;

10/11 – No fast wind stream; 3 CME can have component toward the Earth;

SB: On Oct. 12 at 01:46 UT, arrival of CME assoc M1.6 flare – Oct 09 - which generated a G2 geomagnetic storm.

10/12 – Fast (≤ 500 km/s) wind stream; 1 CME can have component toward the Earth;

10/13 – Fast (≤ 450 km/s) wind stream; 3 CME can have component toward the Earth;

10/14 – No fast wind stream; 2 CME can have component toward the Earth;

10/15 – No fast wind stream; 3 CME can have component toward the Earth;

10/16 – Fast (≤ 420 km/s) wind stream; 3 CME can have component toward the Earth; SB: At 00:09 UT arrival of CME from Oct 12 at 03:24 UT.

10/17 – No fast wind stream; 1 CME assoc. eruptive filament can have a componente toward the Earth;

10/18 – No fast wind stream; No CME toward the Earth;

Prev.: Fast wind stream expected from October 19 to October 21; 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; expected arrival of a CIR from October 18 to October 19.

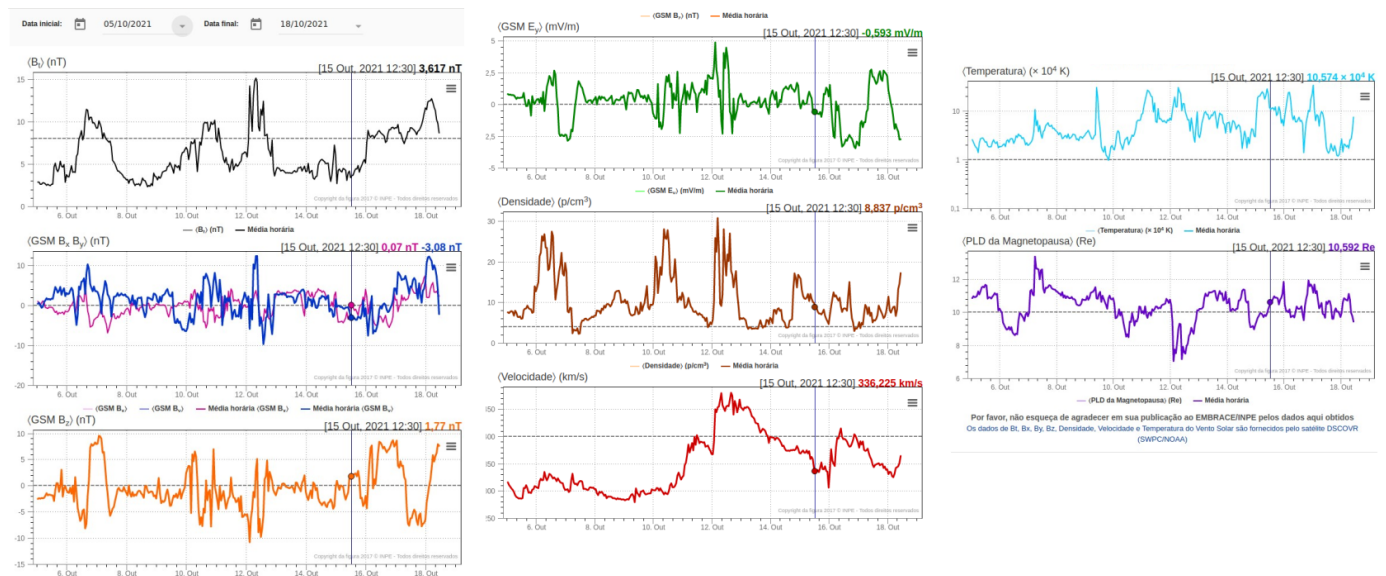
Responsible: Douglas Silva

- WSA-ENLIL (Prediction for CME 2021-10-09T07:09Z)
 - The simulation indicates that the CME arrival forecast will occur on the following date: 2021-10-11T07:50Z (-7h, +7h)
- WSA-ENLIL (Prediction for CME 2021-10-12T03:42Z)

- The simulation indicates that the CME arrival forecast will occur on the following date: 2021-10-15T12:00Z (-7h, +7h)
- WSA-ENLIL (Prediction for CME 2021-10-17T09:36Z)
 - *The simulation indicates that the CME arrival forecast will occur on the following date: 2021-10-20T04:17Z (-7.0h, +7.0h)
 - *Coronal holes:
 - The coronal hole 34582 observed in the northern hemisphere between the 11th and the 17th of October presented an area variation between 4000 to and 12100 Mm²

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 total Bt magnetic field presented oscillations with peaks on days: 06/Oct, 10/Oct, 12/Oct and 18/Oct at 4:30 pm, 10:30 pm, 7:30 am and at 4:30 am UT.
- The IMF Bz component oscillated with peaks on days: 1 peak on Oct 6, 2 peaks on Oct 12 and 2 peaks on Oct 17, at 2:30 pm, 2:30 am, 11:30 am 10:30 and at 21:30 UT of -8.19, -10.84, -9.81, -7.66 and -7.30 nT respectively.
- There was no clear and persistent occurrence of the change of sector in the BxBy components, however signs were observed on Oct 09 and Oct 10 at 13:30 and 09:30 UT. For the remainder of the period, the components fluctuated around zero.
- The density of the Vsw presented fluctuations with a maximum value of 30.75 p/cm³ on October 12th at 04:30UT. It presented peaks of 27.4, 27.9, 16.01, and 14.99 p/cm³ on Oct 6, Oct 10, Oct 14 and Oct 16 at 12:30, 08:30, 20:30 and at 16:30 respectively. In the rest of the period, density oscillated with values lower than 15 p/cm³.

- The solar wind speed V_{sw} , showed peaks on October 11, October 12 and October 16 of 396.7, 479.4 and 414.6 km/s at 12:30, 7:30 and 9:30 respectively. The subsolar M_p showed maximum compression on Oct 6, Oct 10 and two compressions on Oct 12 at 12:30, 12:30, 02:30 and at 09:30 UT respectively of 8.6, 8.4, 7.0 and 7.15 R_e respectively.

Radiation Belts

Responsible: Ligia Alves da Silva

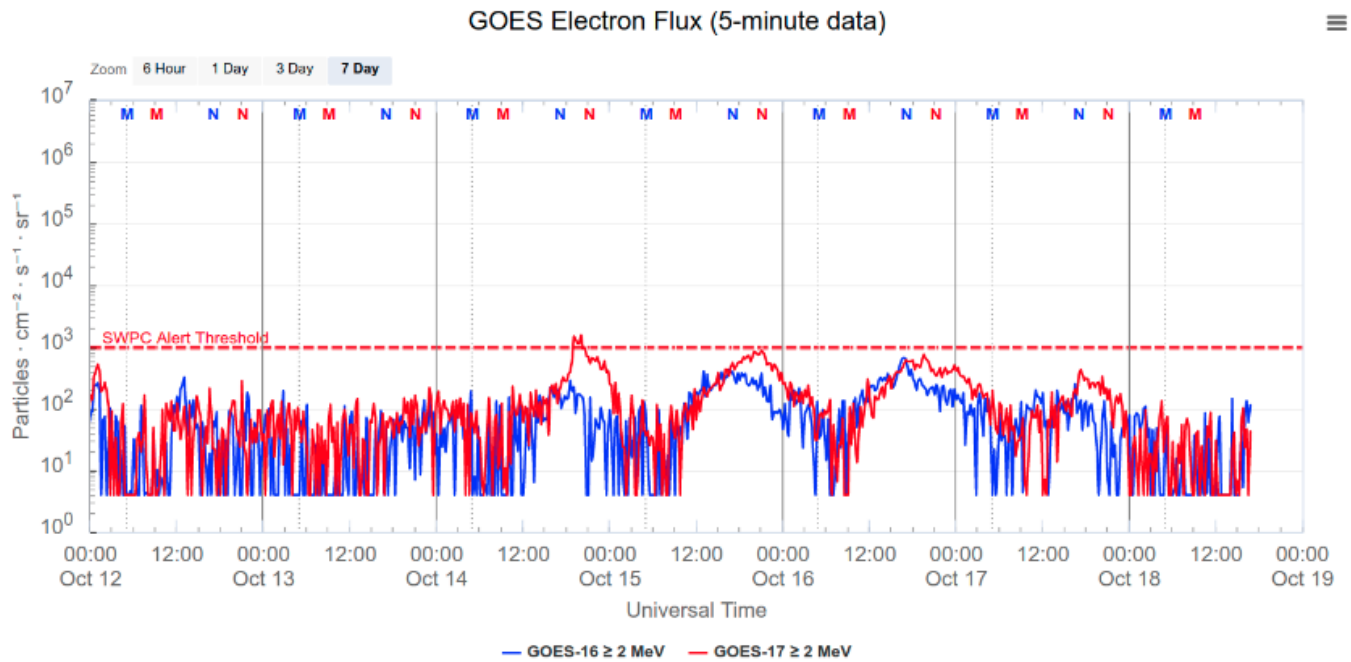


Figure 1: High-energy electron flux (> 2 MeV) obtained from GOES satellite. Source:

<https://www.swpc.noaa.gov/products/goes-electron-flux>

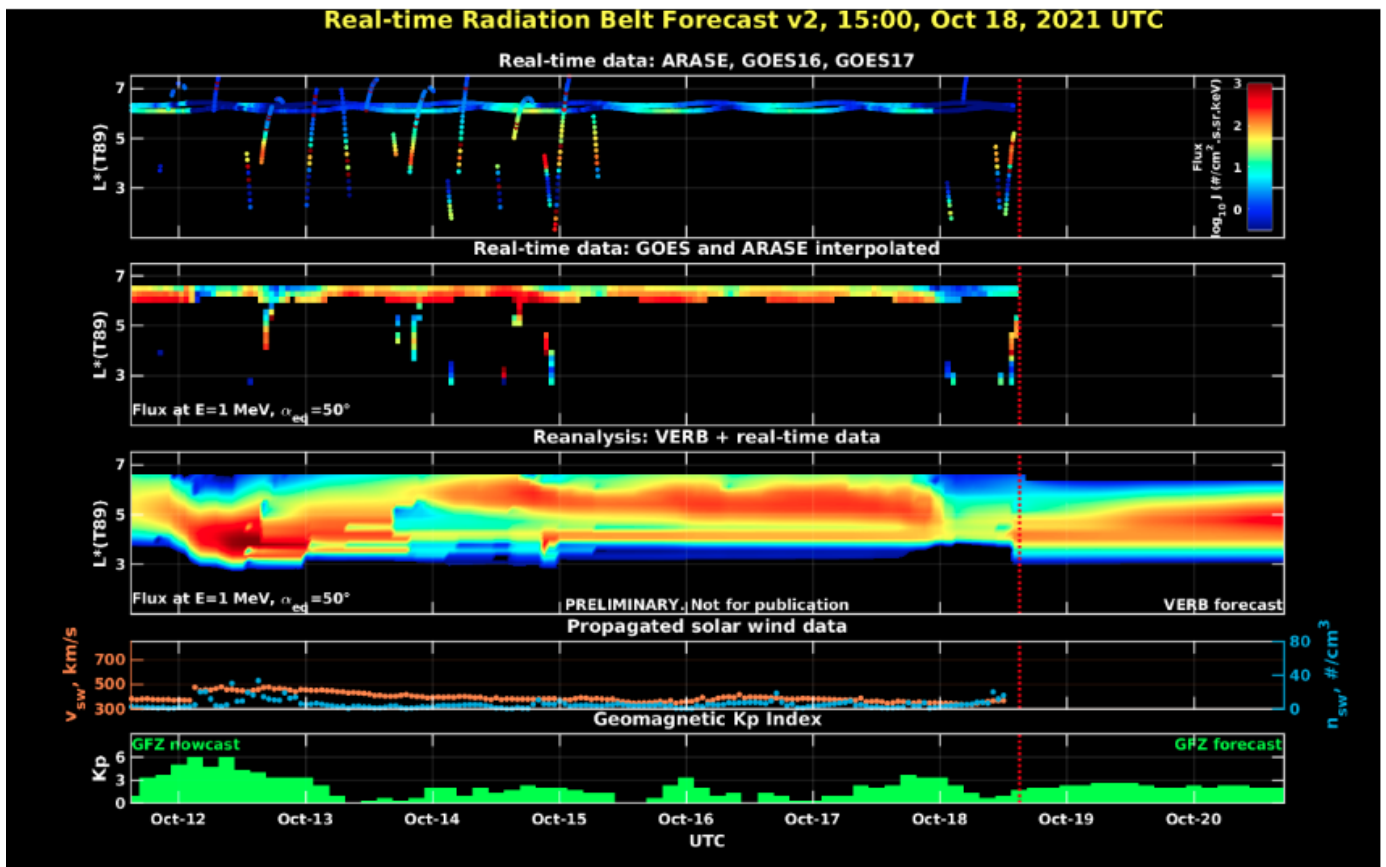


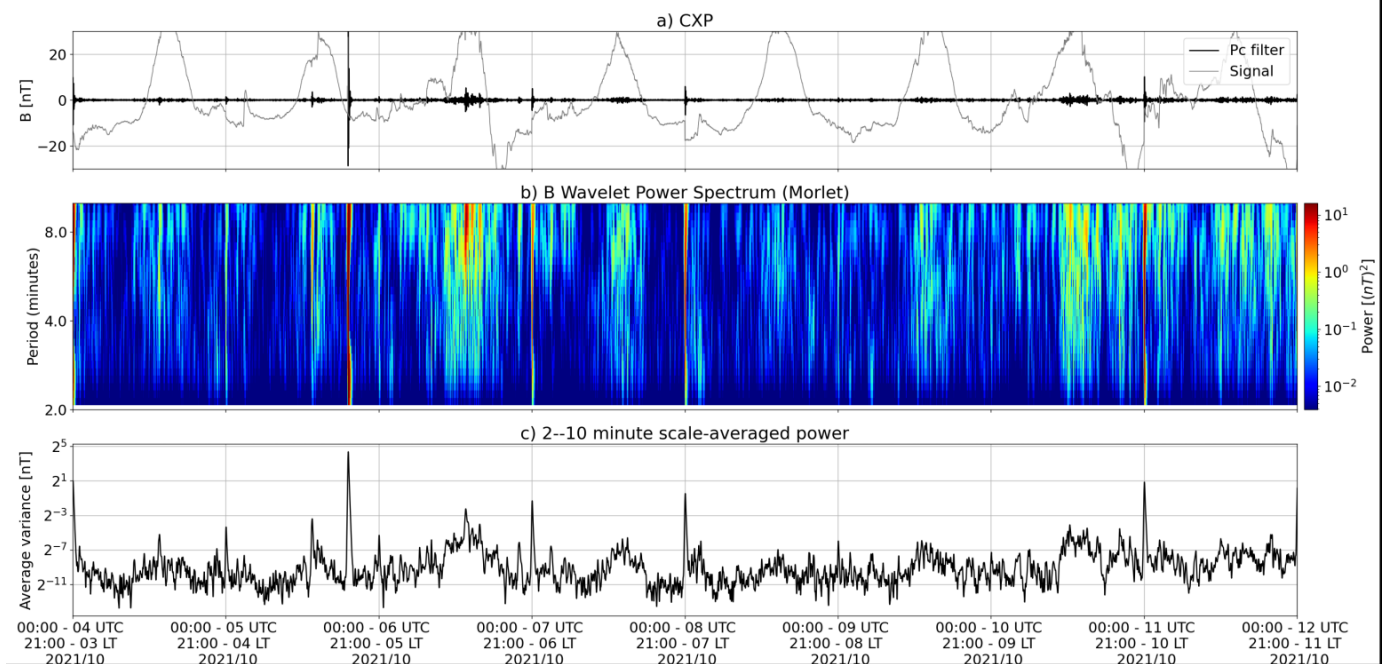
Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES 16 and 17, POES satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: Fonte: <https://rbm.epss.ucla.edu/realtime-forecast/>

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 to be close to 102 particles/(cm² s sr) on October 12-13th and beginning of October 14th, with electron flux increase from 12:00 UT on October 14th. This electron flux increase remains close to 103 particles/(cm² s sr) until October 16th. A slight electron flux decrease is observed on October 17th, which becomes more significant from 00:00 UT on October 18th.

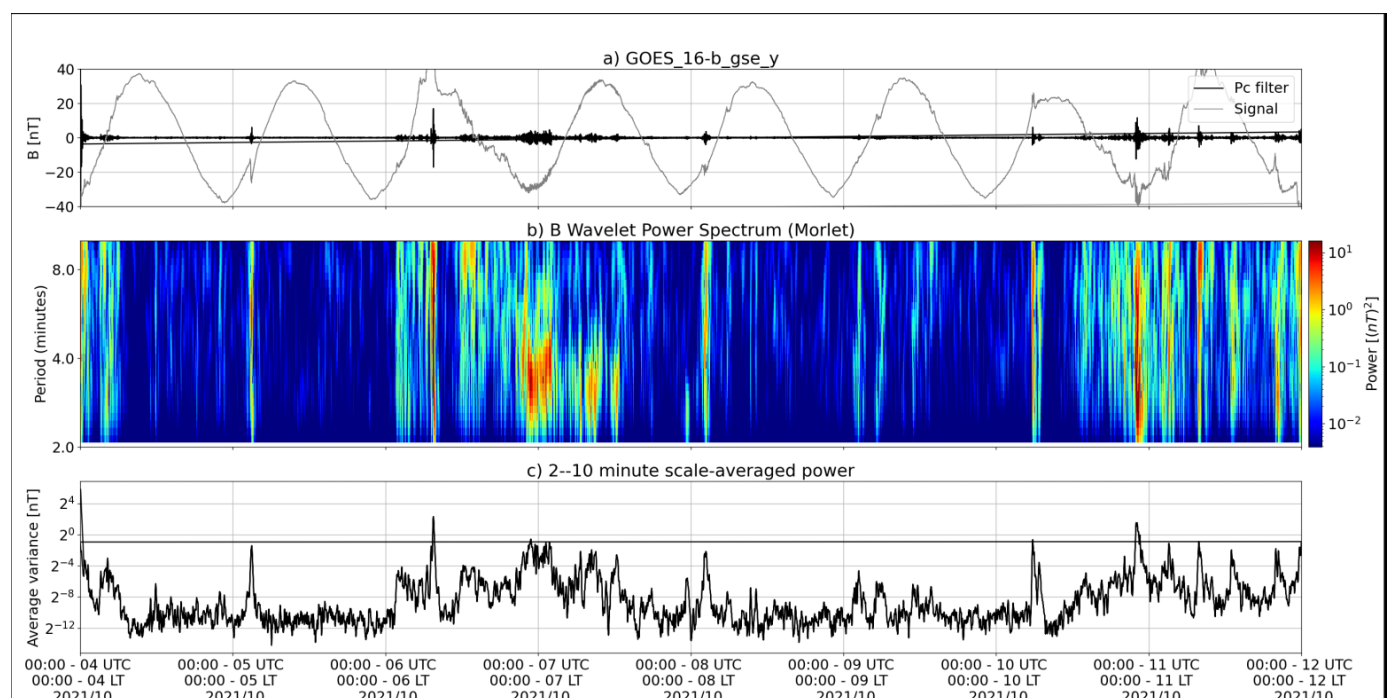
The GOES-16, GOES-17, and Arase satellite data are analyzed and interpolated to observe the high-energy electron flux variability (1 MeV) in the outer radiation belt (Figure 2). Additionally, the VERB code rebuilds this electron considering the Ultra Low Frequency (ULF) waves' radial diffusion. The electron flux increase observed on October 14th reaches L-shell > 5.0 and 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 pulsations were more pronounced on the 6th, 10th, 11th and 12th of October.
 - In these periods, the Bz component of the IMF showed negative fluctuations.
 - They are also associated with dynamic solar wind pressure pulses.
 - On 10/12 there is a complex structure of the solar wind interacting with the magnetosphere. There is an increase in pressure and velocity that remains high on the following days.

- Day 10 there is a polarization shift in the Bx and By components, which can generate waves, mainly observed in the east-west components of the geomagnetic field.
- These periods (06, 10, 11 and 12/10) may be associated with geomagnetic substorms

Geomagnetism

Responsible: Livia Ribeiro Alves

- Data from the Embrace magnetometer network showed instabilities throughout the period, with some highlighted events:
 - 06, 07, 10, 12, and 17 drop in the H component at all stations, down to -100 nT
 - 06, 07, 11, and 12 SI observed in the H component in all stations
- Geomagnetic activity ranged from calm to active during the week, with the Dst index reaching its minimum value of -53 nT on 12/10. The highest Kp of the week was 6o recorded on 10/12
- The auroral activity remained active throughout the period, increasing on days 06, 07,10, 11, 12, and 17/10.
- Magnetic field measured in the GOES satellite's orbit showed several disturbances in the period.

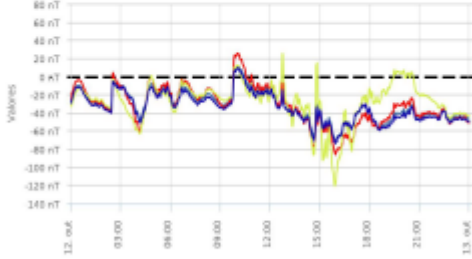
Rede EMBRACE de Magnetômetros
ΔH - (04/10/2021 - 10/10/2021)



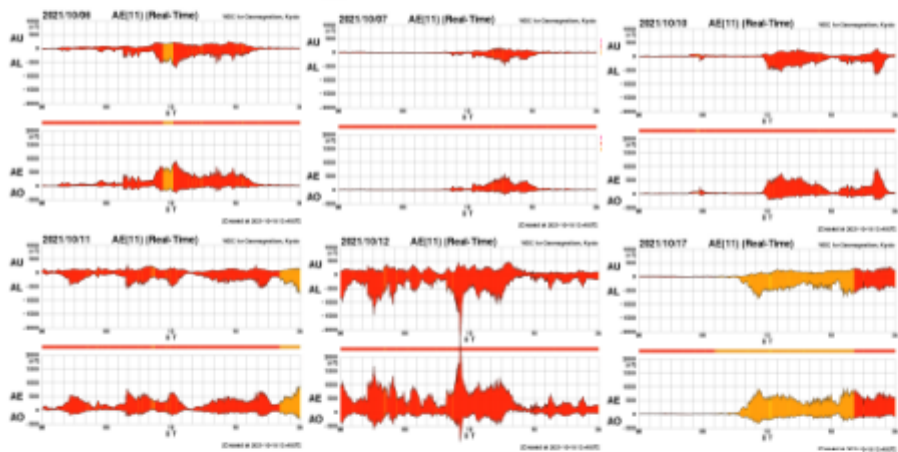
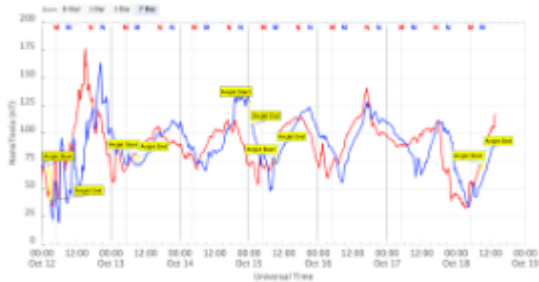
Rede EMBRACE de Magnetômetros
ΔH - (11/10/2021 - 17/10/2021)



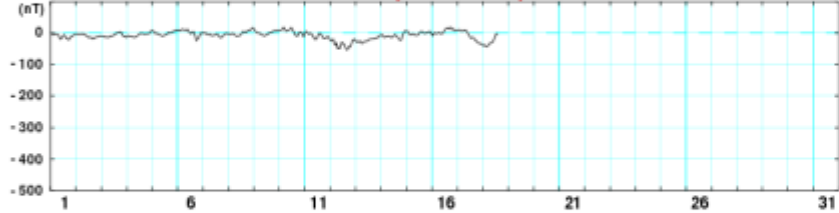
Rede EMBRACE de Magnetômetros
ΔH - (12/10/2021 - 12/10/2021)



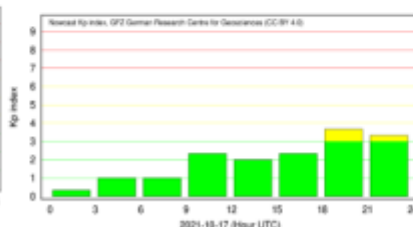
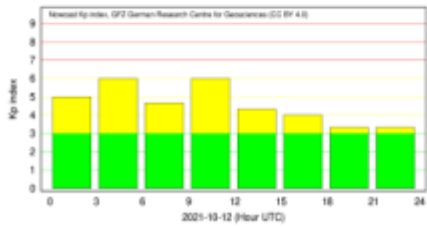
GOES Magnetometers (1-minute data)



October 2021 **Dst (Real-Time)**



[Created at 2021-10-18 13:00UT]



Ionosphere

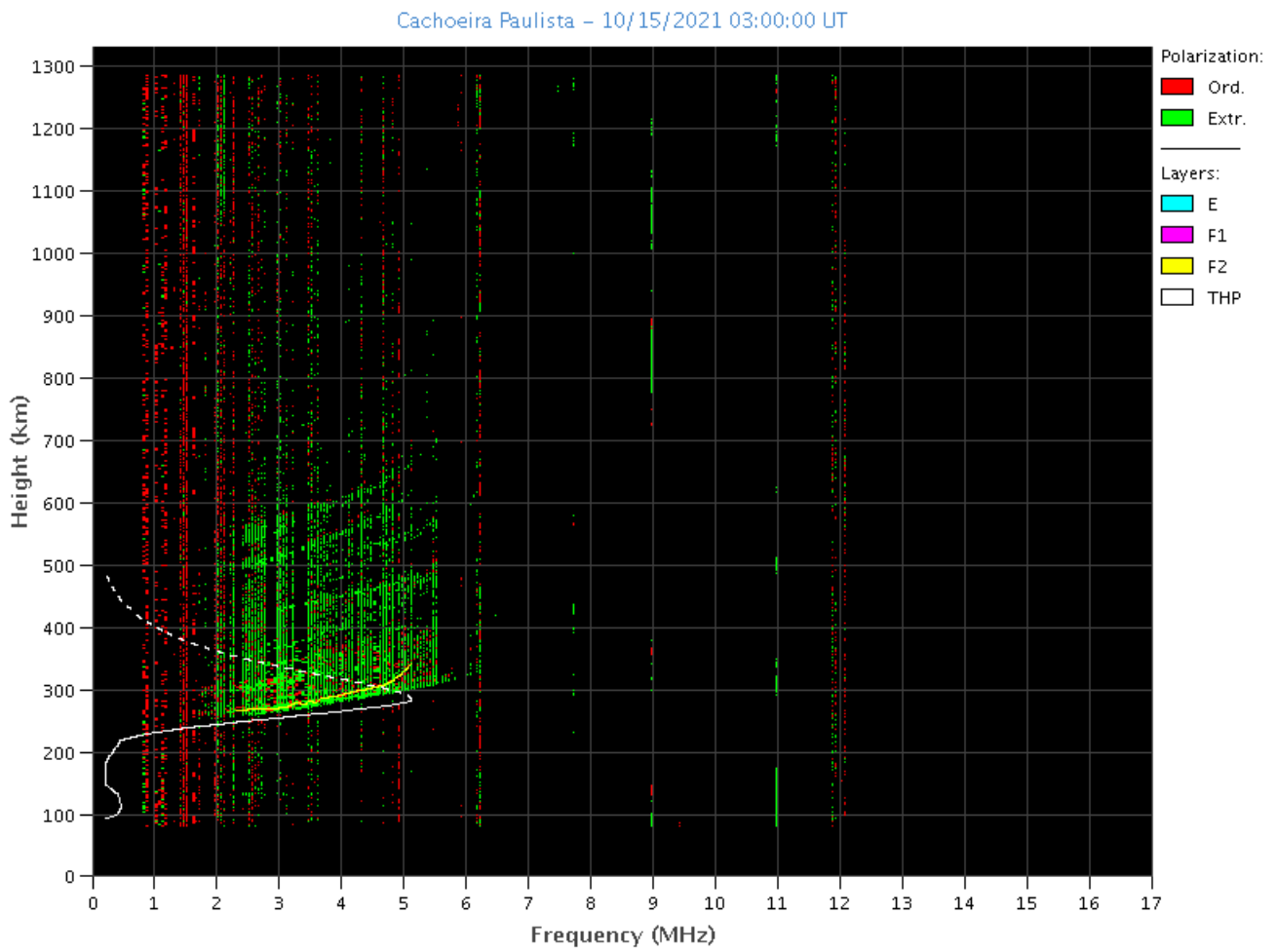
Responsible: Laysa Resende

Boa Vista

(NO DATA)

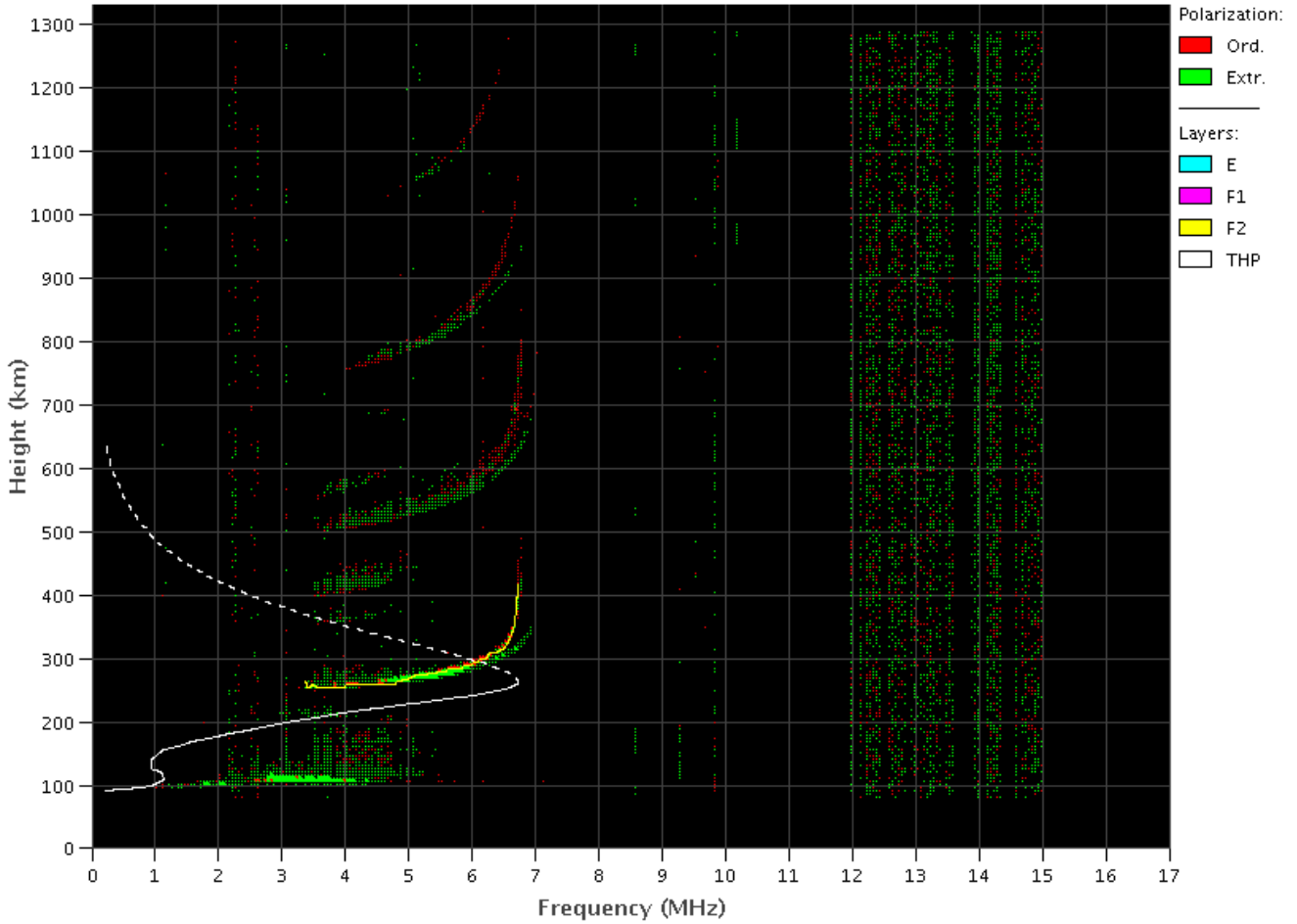
Cachoeira Paulista

- There were spread F on days: 05, 06, 07, 08, 12, and 15.
- The Es layers reached scale 3 on days: 04, 06 e 16.



São Luis

- There were spread F during all days in this week.
- The Es layers reached scale 3 during all day in the week.

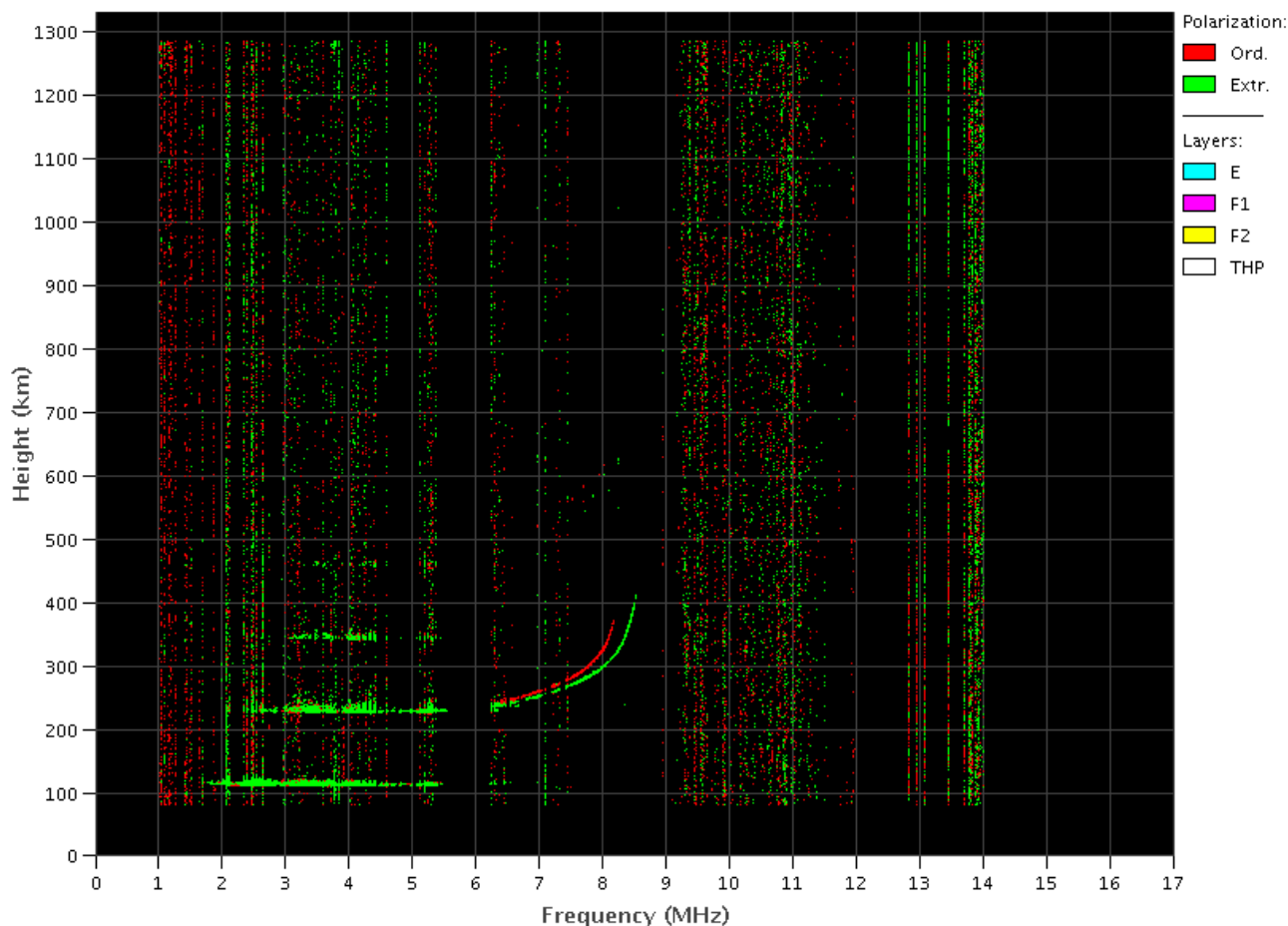


Santa Maria

- There were not spread F during all days in this week.
- The Es layers reached scale 4 during one day 15.
- The auroral type, indicating particle precipitation, occurred on days 11 and 15.

EMBRACE – Digital Ionosonde

Santa Maria – 10/15/2021 22:15:00 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 ~ 360 m.

All the stations have data only available between the 11th and 14th of October.

The STSN station showed moderate and strong S4 index values in the evening of October 11th and moderate scintillation values after midnight of October 14th. In the case of the UFBA and SJCE stations, at the end of the 12th, S4 index values above 1 and values close to 1 were recorded for the UFBA station and SJCE station respectively (Figure 1). The scintillation event after midnight of October 14th was also registered in UFBA and SJCE.

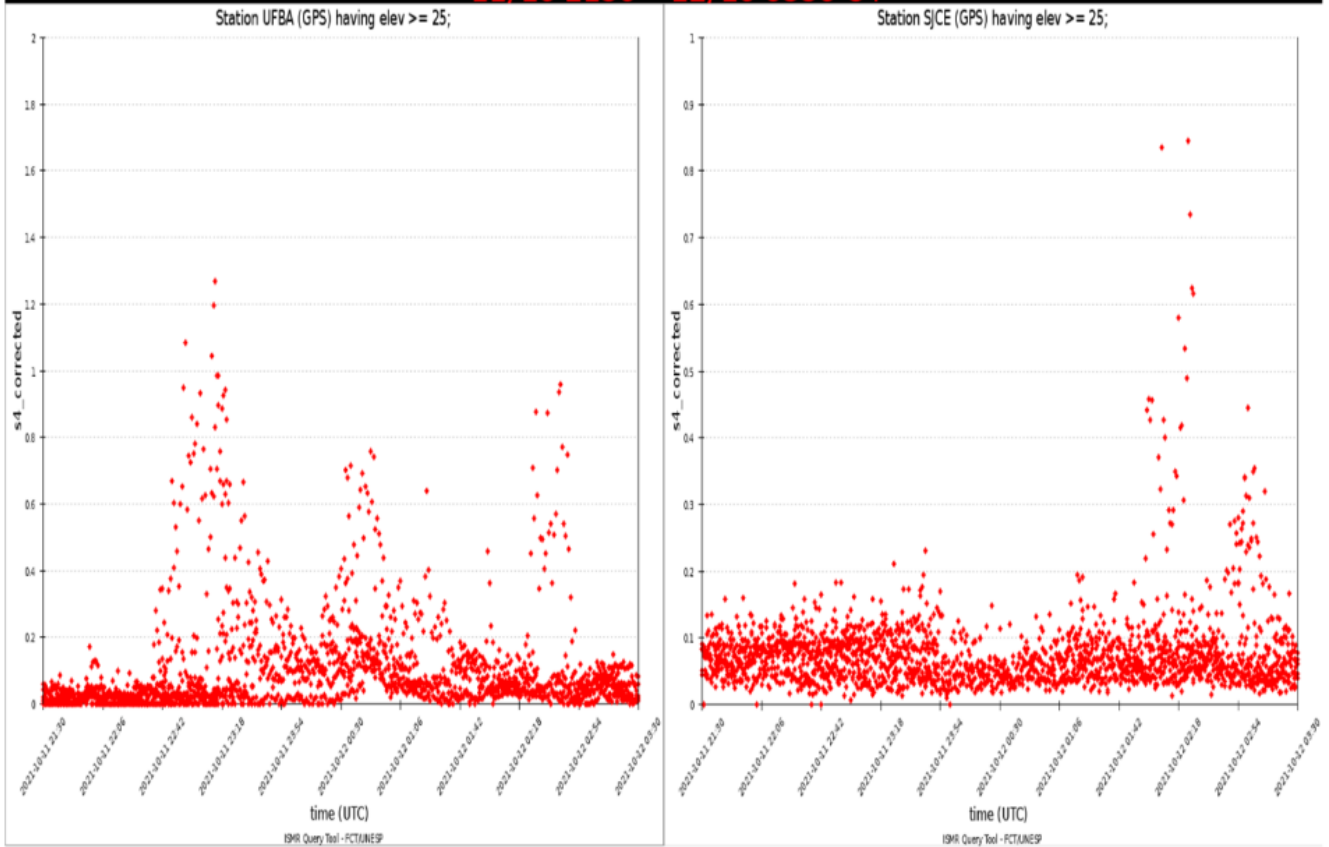


Figure 1: Values of the S4 index for the GPS constellation at the end of the day 10/11 for UFBA station (left panel) and SJCE station (right panel)