Briefing Space Weather - 2022/03/28

Sun

Responsible: José Cecatto

03/21 – No fast wind stream; 5 CME can have component toward the Earth;
03/22 – Fast (=< 450 km/s) wind stream; 2 CME can have component toward the Earth;
03/23 – Fast (=< 450 km/s) wind stream; 4 CME can have component toward the Earth;
03/24 – Fast (=< 550 km/s) wind stream; 1 CME can have component toward the Earth;
03/25 – Fast (=< 500 km/s) wind stream; 3 CME can have component toward the Earth; M1.4 flare assoc. halo CME
03/26 – Fast (=< 450 km/s) wind stream; 1 CME can have component toward the Earth;
03/27 – Fast (=< 550 km/s) wind stream; 5 CME can have component toward the Earth;
03/28 – Fast (=< 600 km/s) wind stream with a fall trend; 2 CME can have component toward the Earth; M4.0 flare assoc type-II, type-IV, solar tsunami, short wave radio blackout & halo CME?
Prev.: Fast wind expected up to March 29; for while low (30% M, 10% X) probability of M / X flares next 2 days; also, occasionally some other CMEs can present a component toward the Earth.

Responsible: Douglas Silva

WSA-ENLIL (CME 2022-03-20T11:24Z)
● The simulation results indicate that the flank of CME will reach the DSCOVR mission between
15:30Z and 22:30Z on 23rd March 2022.
WSA-ENLIL (Prediction for CME 2022-03-25T06:12Z)
● The simulation indicates that the CME on Earth arrival forecast will occur on the following
date:2022-03-27T16:52Z (+- 7 hours) .

Coronal holes (SPOCA):

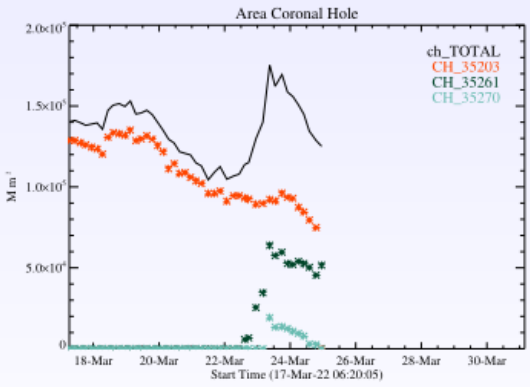


Figura: The solid line in black shows the products of the totality of areas for each detection interval performed by SPOCA between March 17th and 25th, 2022.

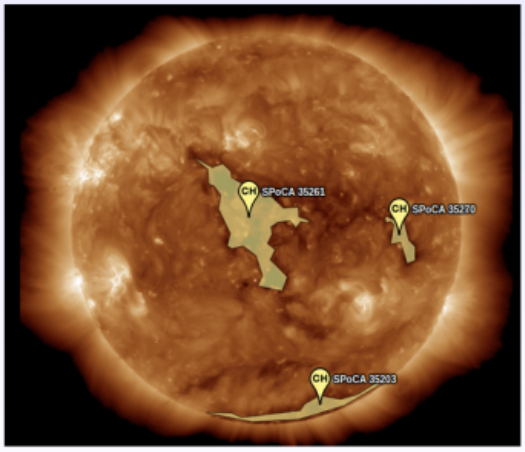
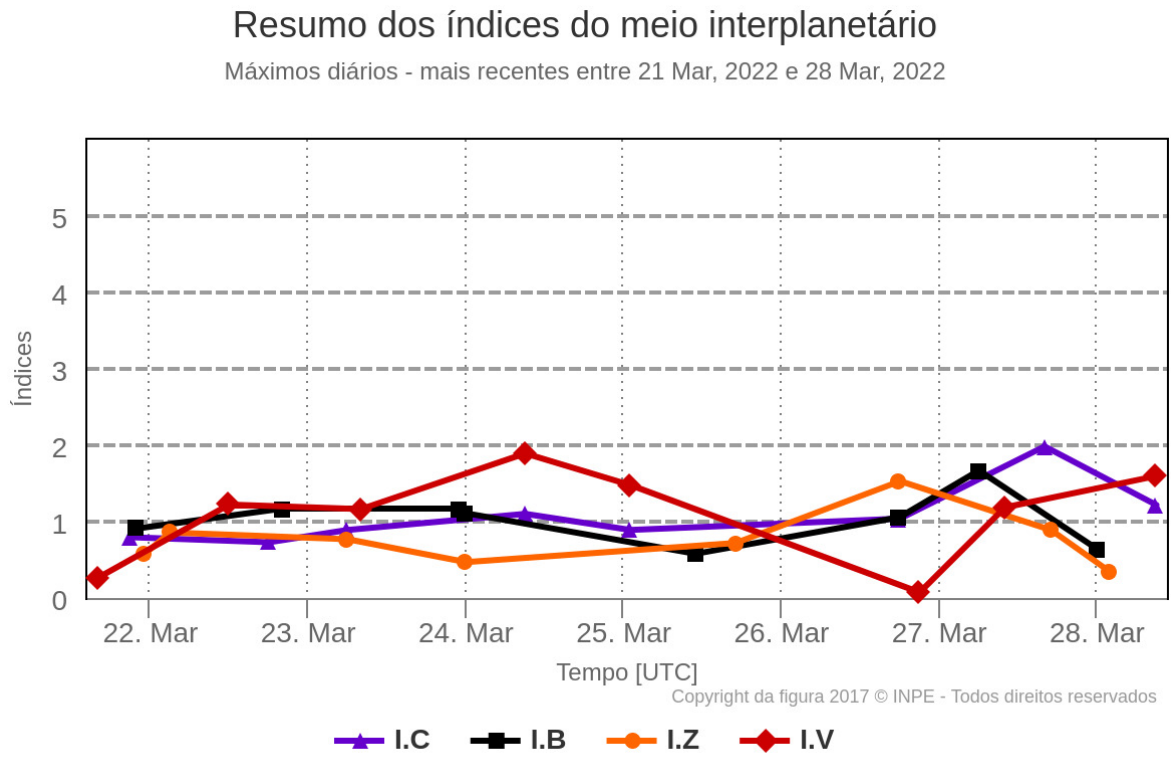
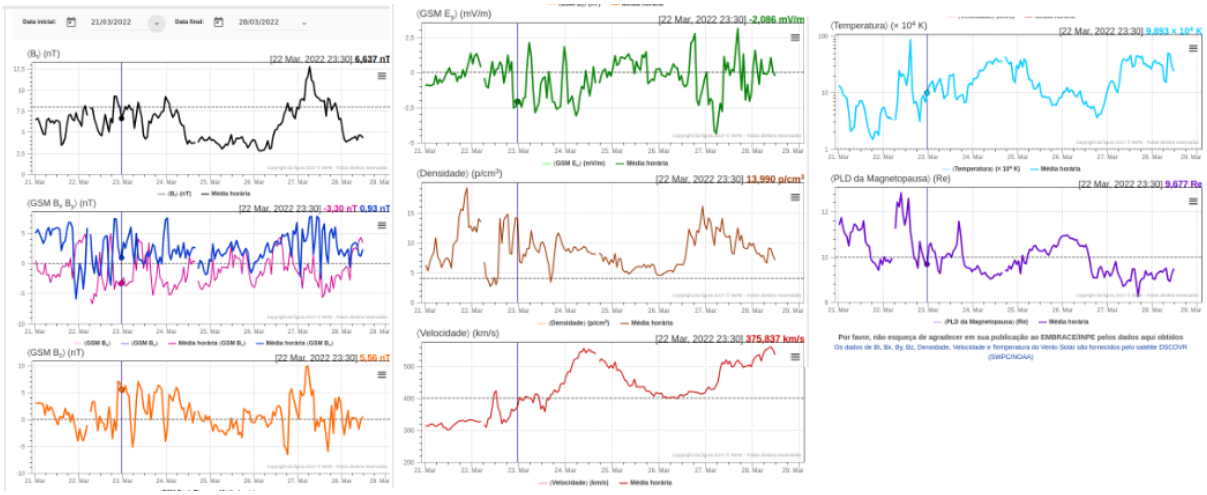


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 23:00 UT on March 23, 2022.

Responsible: Paulo Ricardo Jauer





- The interplanetary region in the last week showed a moderate of plasma perturbations due to the passage of the CME structure identified by the DSCOVR satellite in the interplanetary region.
- The modulus of the interplanetary magnetic field component showed 1 maximum peak : 27/Mar at 06:30 of ~ 12.7nT.
- The BxBy components showed a probable sector change, on March 21 and 22nd at 21:30 and 17:30 UT.
- The component of the south bz field presented 4 peaks. Two on March 23 at 05:30 and 23:30 of -5.19, -4.08 nT respectively. One peak recorded on March 26 at 18:30 -6.56 nT and another on March 27 at 16:30 from -6.0 nT.
- The density of the solar wind showed two peaks. One registered on March 21 at 9:30 pm at 19 p/cm³ and another on March 26 at 10:30 pm at 16 p/cm³.
- The solar wind speed had a gradual increase during the analyzed period with peaks on March 24 and 28 at 09:30 at ~555 and 561 km/s respectively.
- The position of the magnetopause was found on average above the typical position. Maximum compression was observed on March 27 at 16:30 at 8.23 Re. And an expansion of 12.8 Re was observed on March 22 at 09:30.

Radiation Belts

Responsible: Ligia Alves Da Silva

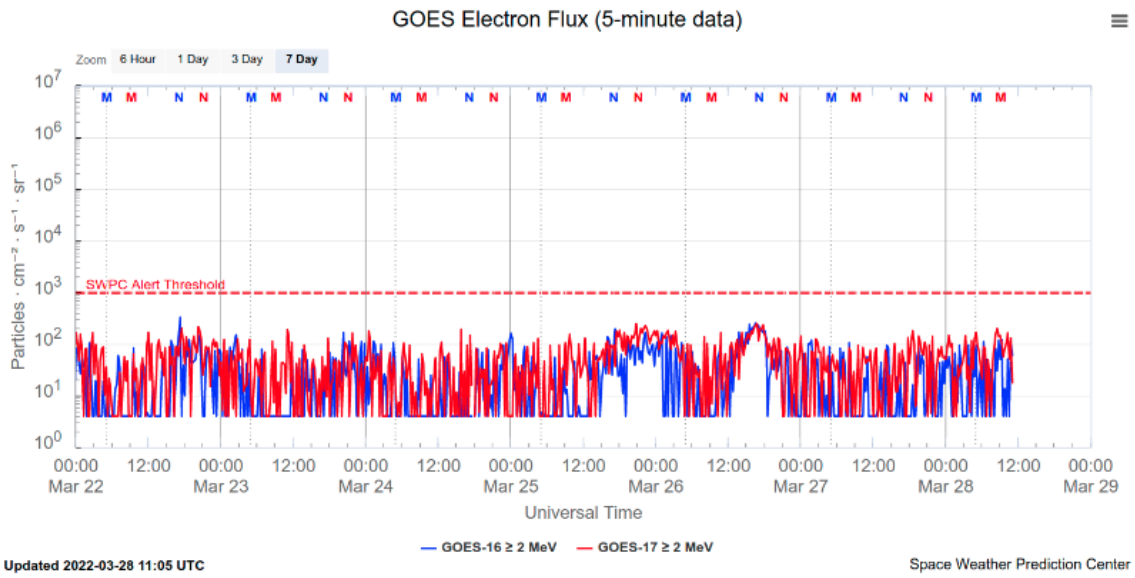


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-17 satellite.
Source: https://www.swpc.noaa.gov/products/goes-electron-flux

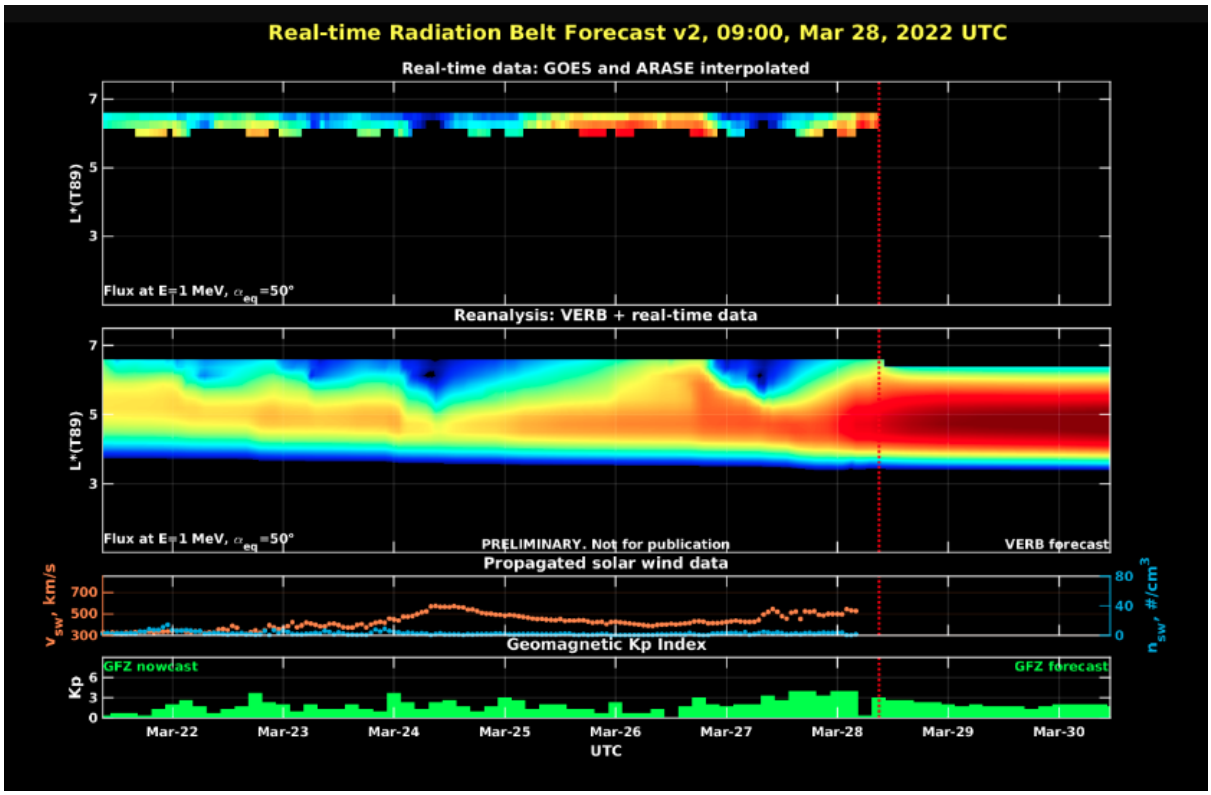


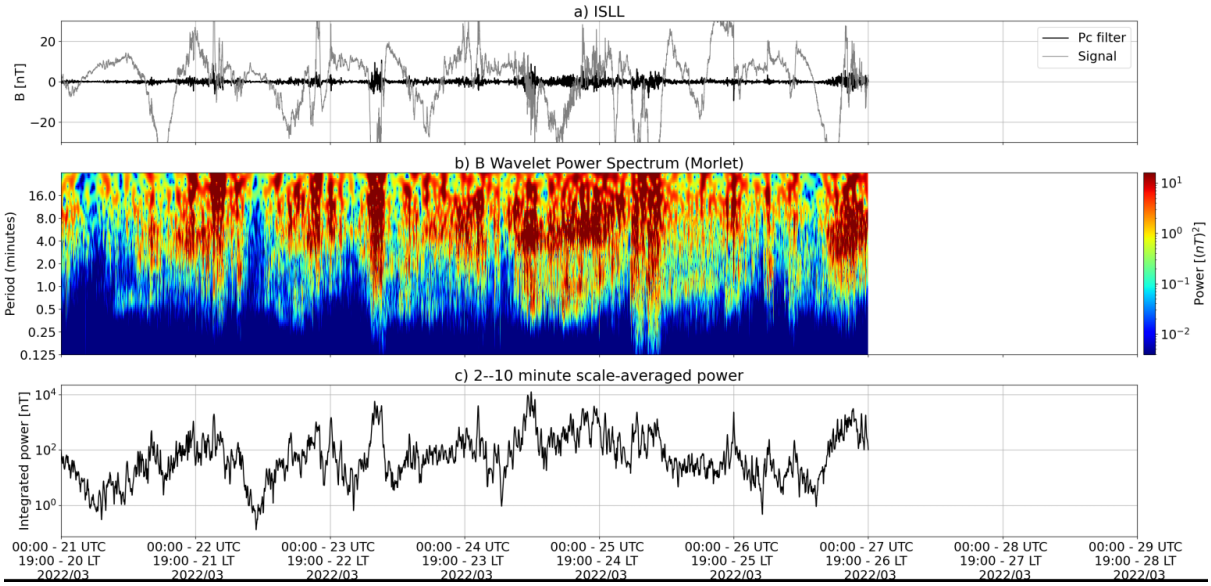
Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES-16, GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite.
Source: https://rbm.epss.ucla.edu/realtime-forecast/

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 102 particles/(cm2 s sr) between March, 22nd-25h, presenting a slight electron flux increase at the beginning of the March 25th, which persists close to 102 particles/(cm2 s sr) until the end of March 26th. On March 27th, the electron flux returns to being below 102 particles/(cm2 s sr) until today.

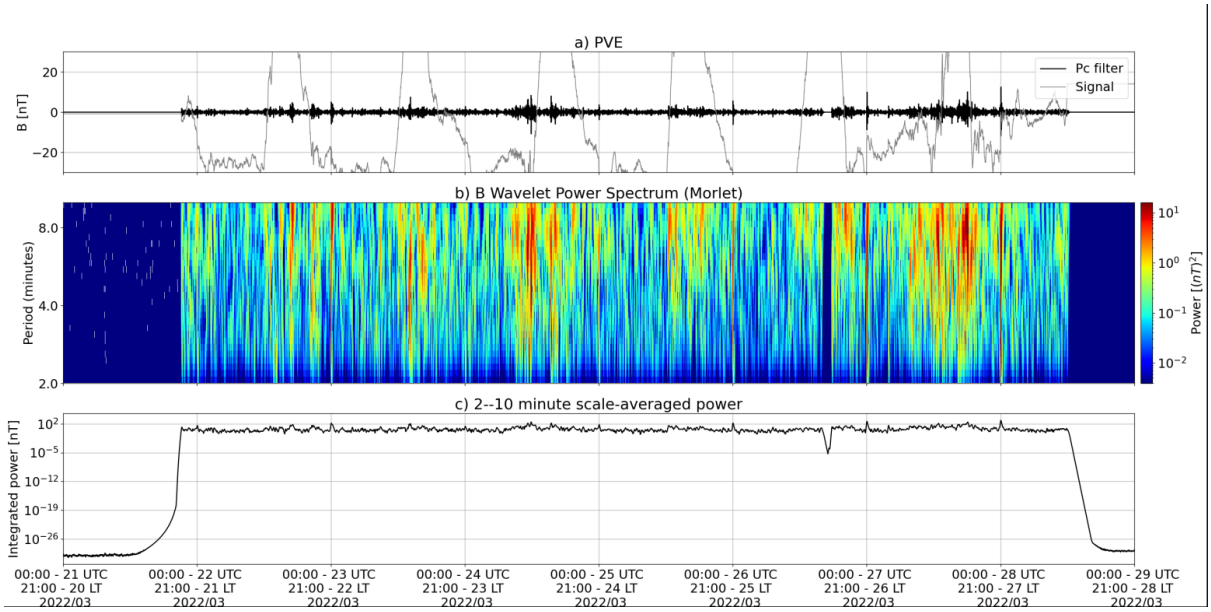
The GOES-16, GOES-17, and Arase satellite data are analyzed and interpolated to observe the high-energy electron flux variability (1 MeV) in the outer radiation belt (Figure 2). Additionally, the VERB code rebuilds this electron considering the Ultra Low Frequency (ULF) waves' radial diffusion. The simulation (VERB code) shows that the electron flux decrease observed at the beginning of March 27th reached L-shell > 4.8. However, it is important to point out that the data from the ARASE satellite are not available for the week under analysis, to confirm the L-shell level of this referred electron flux decrease.

ULF waves in the Magnetosphere

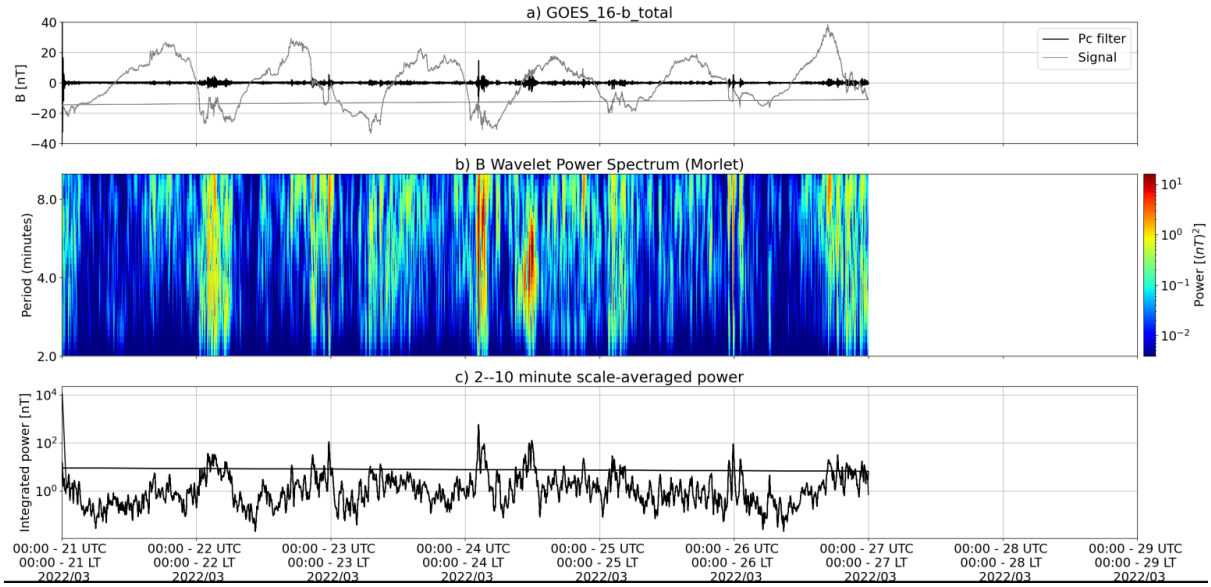
Responsible: José Paulo Marchezi



a) signal of the total magnetic field measured in the ISLL Station of the CARISMA 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 in the PVE 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).



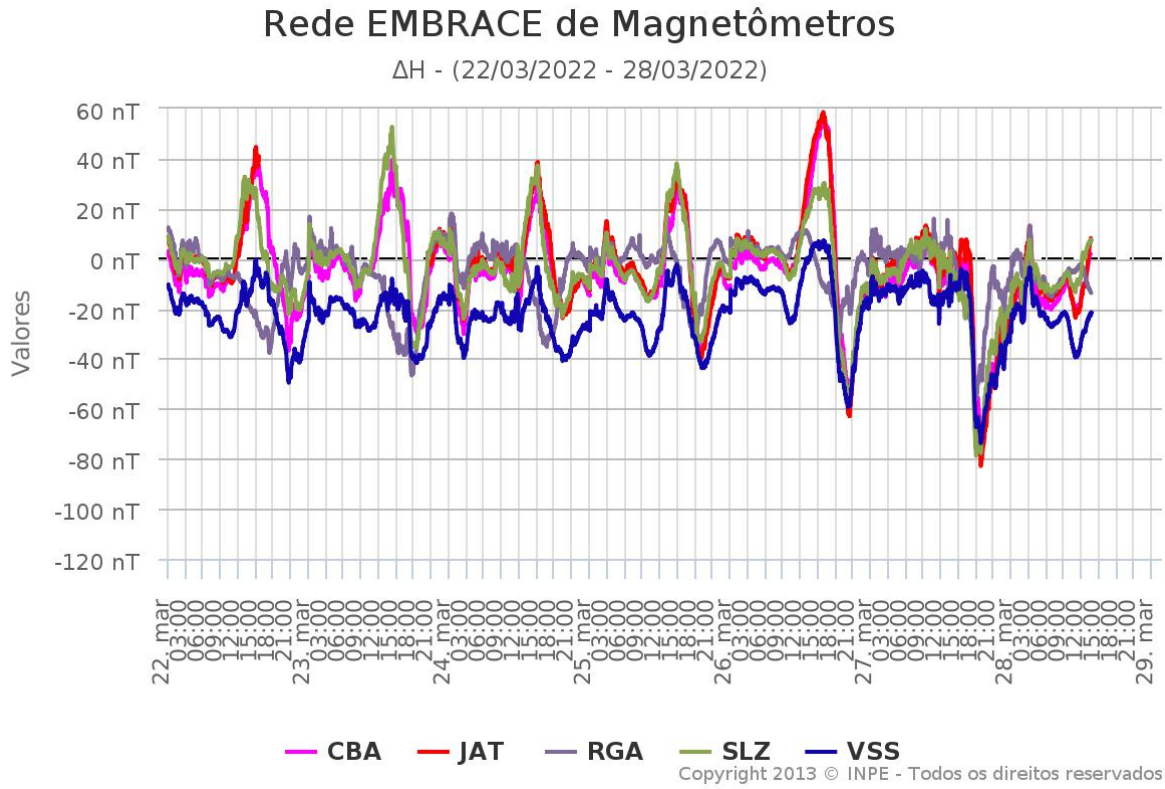
a) signal of the total magnetic field measured by the GOES 16 satellite, together with the fluctuation in the range of Pc5 in black. b) Wavelet power spectrum of the filtered signal. c) Average spectral power in the ranges from 2 to 10 minutes (ULF waves).

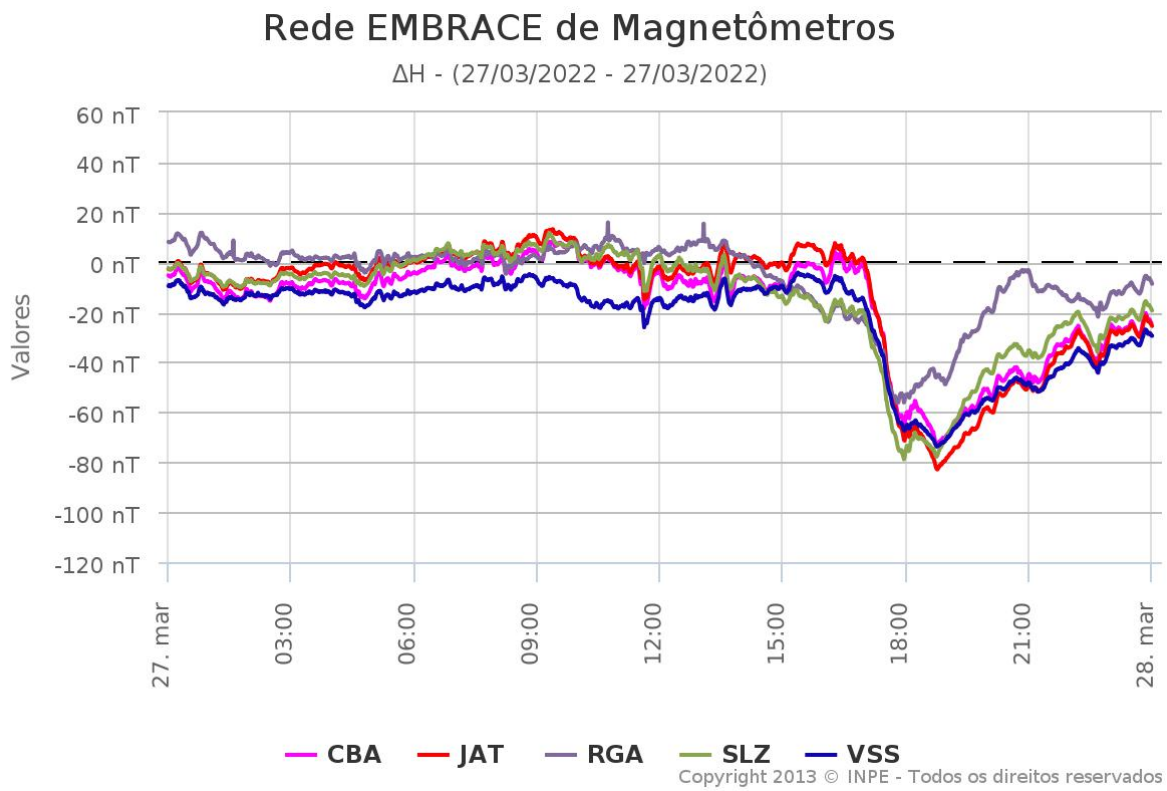
The ULF wave activity shows an increase in power from the 24th of March, where there are small shocks, which are detected from high latitudes to the magnetomerts at low latitudes of the EMBRACE network. On the 26th there is a new incidence of abrupt waves detected by the RGA, PVE and SMS pagnetometers of the EMBRACE network, this activity continues during the 27th and beginning of the 20th of March

continuously. Possibly related to an increase in speed and alfvenic fluctuations of the solar wind.

Geomagnetism

Responsible: Livia Ribeiro Alves




Rede EMBRACE de Magnetômetros
ΔH - (27/03/2022 - 27/03/2022)
60 nT
40 nT
20 nT
0 nT
-20 nT
-40 nT
-60 nT
-80 nT
-100 nT
-120 nT
Valores
27. mar
03:00
06:00
09:00
12:00
15:00
18:00
21:00
28. mar
CBA
JAT
RGA
SLZ
VSS
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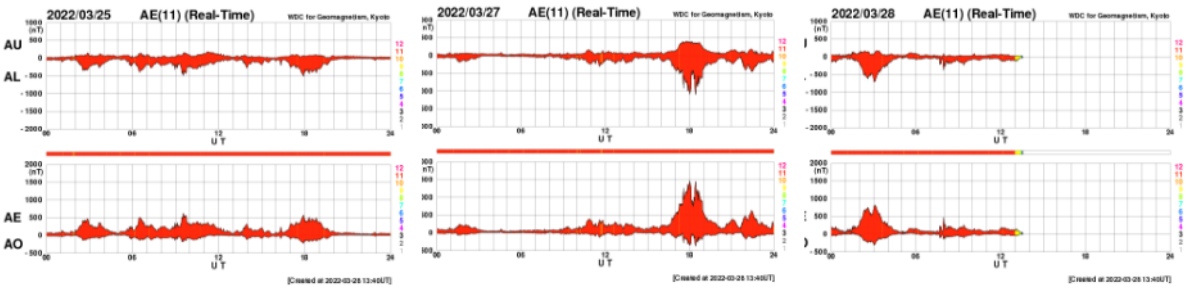
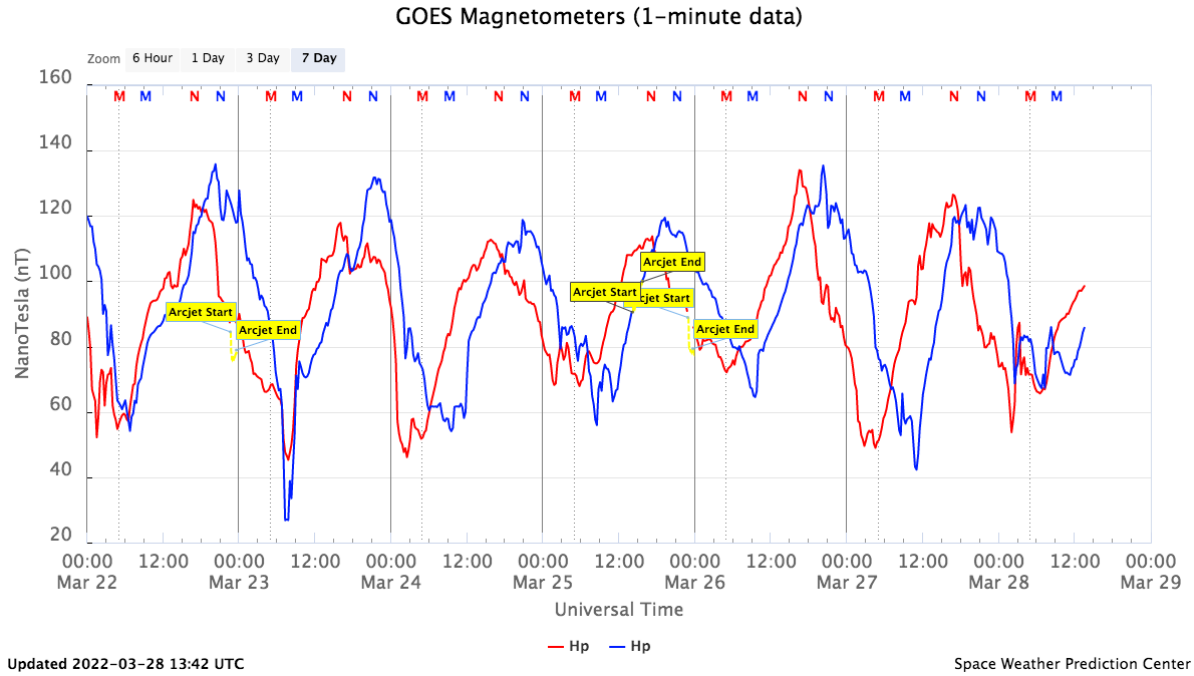
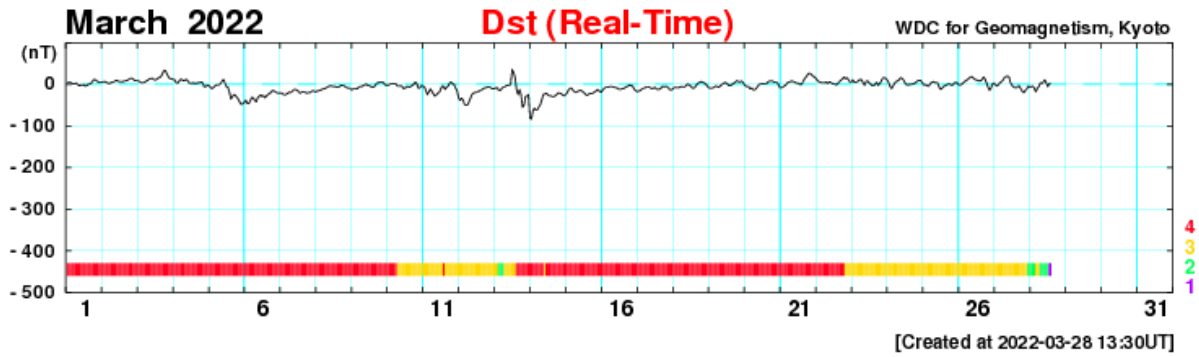
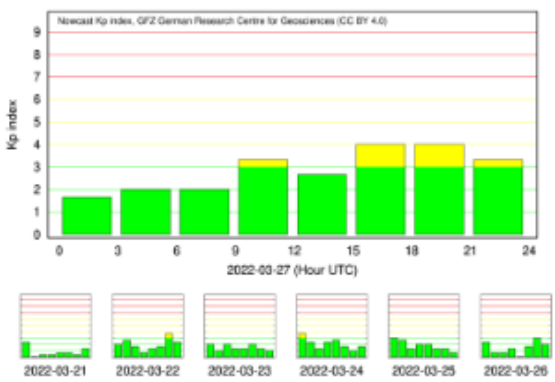
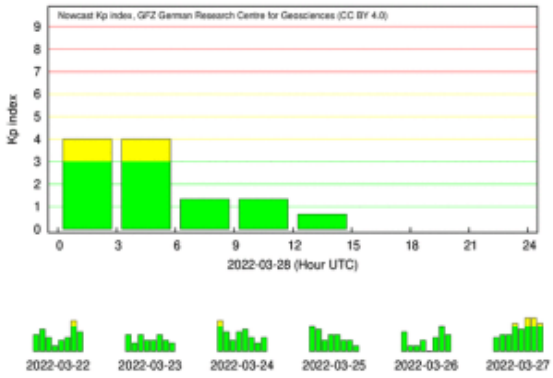

2022/03/25 AE(11) (Real-Time)
2022/03/27 AE(11) (Real-Time)
2022/03/28 AE(11) (Real-Time)
AU
AL
AE
AO
UT


GOES Magnetometers (1-minute data)
Zoom 6 Hour 1 Day 3 Day 7 Day
NanoTesla (nT)
160
140
120
100
80
60
40
20
Arcjet Start
Arcjet End
00:00 Mar 22
12:00
00:00 Mar 23
12:00
00:00 Mar 24
12:00
00:00 Mar 25
12:00
00:00 Mar 26
12:00
00:00 Mar 27
12:00
00:00 Mar 28
12:00
00:00 Mar 29
Universal Time
Hp
Hp
Updated 2022-03-28 13:42 UTC
Space Weather Prediction Center







Geomagnetic Report - March 22-28

- Data from the MagNet network showed instabilities throughout the period, maintaining the characteristic behavior of a quiet to unsettled period. Important events

03/28 - H component reached -80nT in several stations from MagNet

- The Dst index reached its minimum value of -20 nT on 03/20. The highest Kp of the week was 4o recorded on 03/28
- Auroral activity was slightly intensified on days 25, 27, and 28.
- Magnetic field measured in the orbit of the GOES satellite showed minor disturbances on 03/23, 27, and 28.

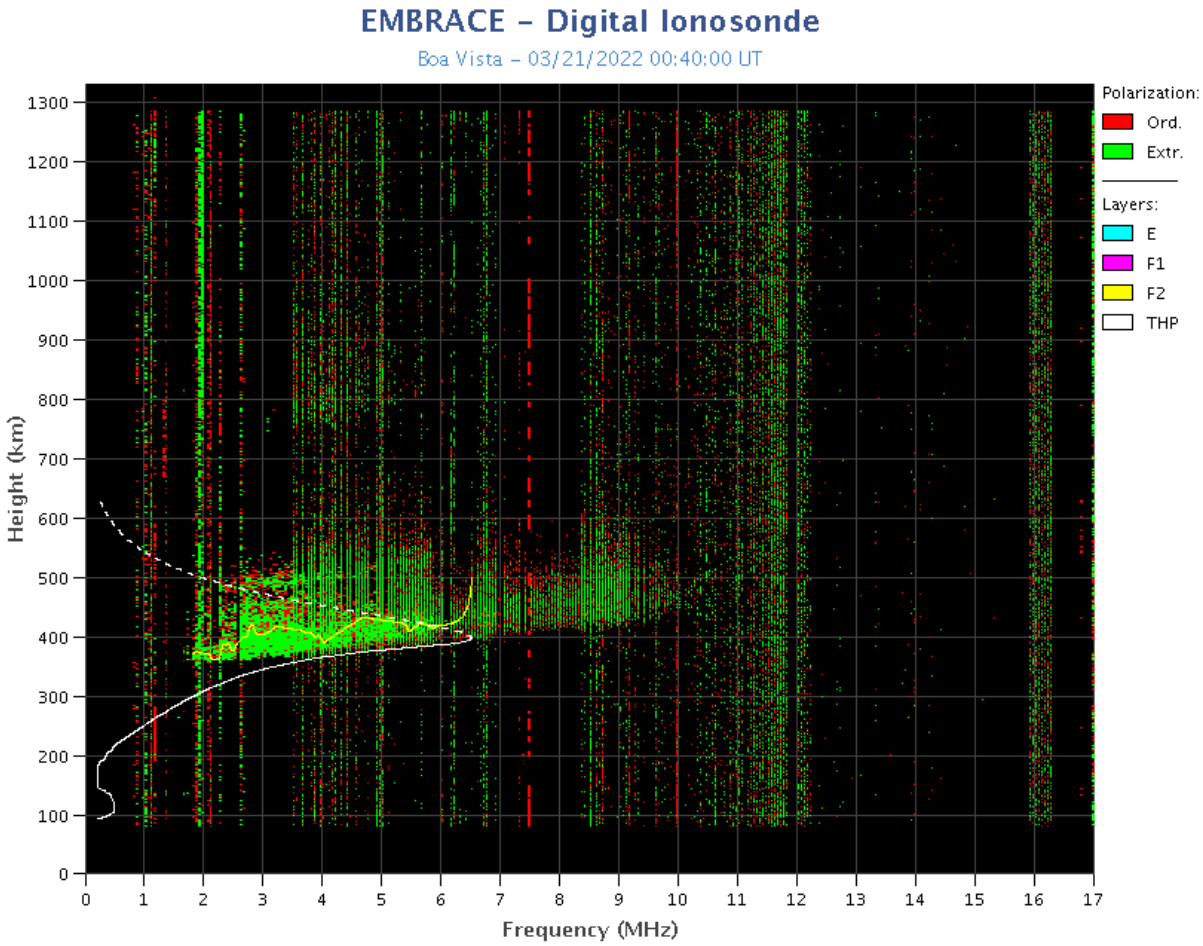
Ionosphere

Responsible: Laysa Resende

Boa Vista:

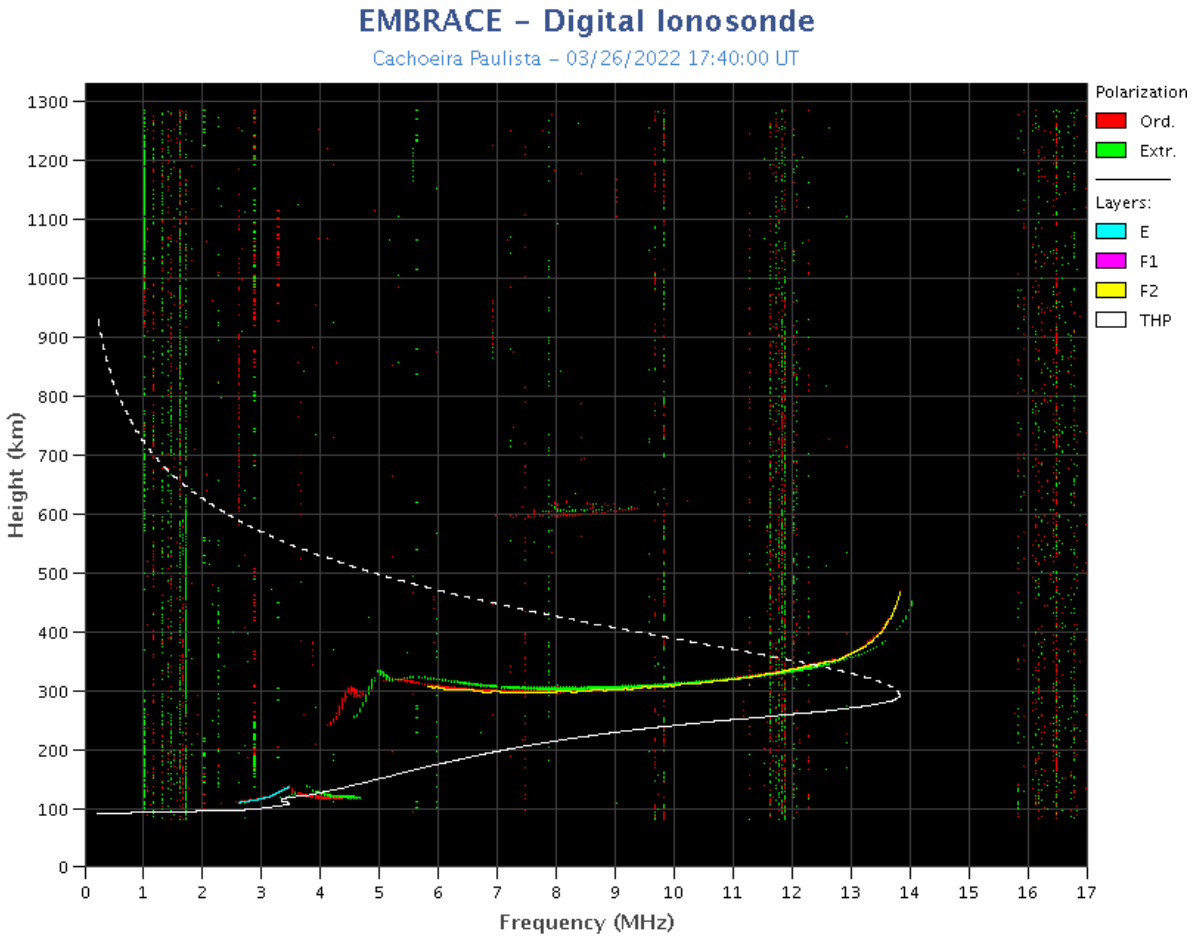
- There were spread F during all days in this week.

- The Es layers reached scale 2 during all days in this week



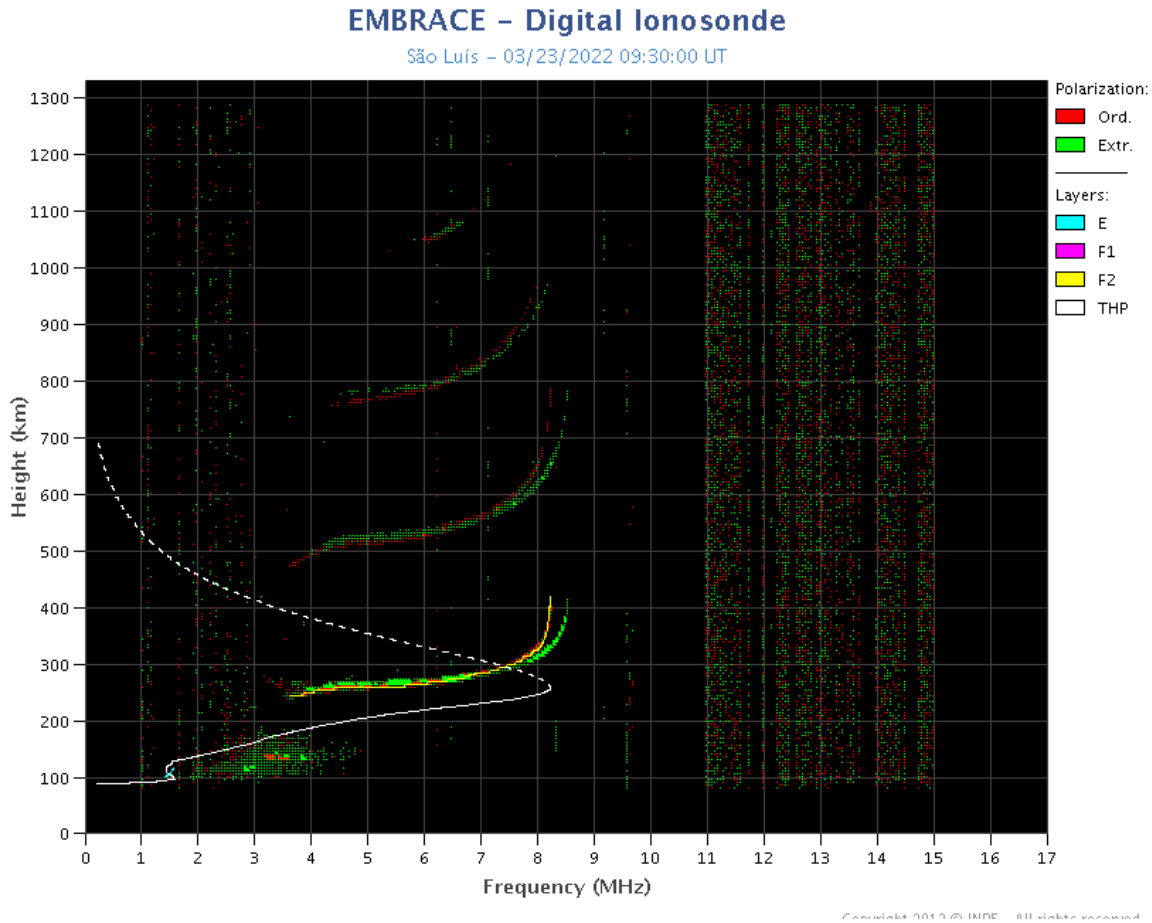
Cachoeira Paulista:

- Do not occurr spread F during the week.
- The Es layers reached scales 2 during the week.



São Luís:

- There were spread F during all days in this week.
- The Es layers reached scales 2 during the week.

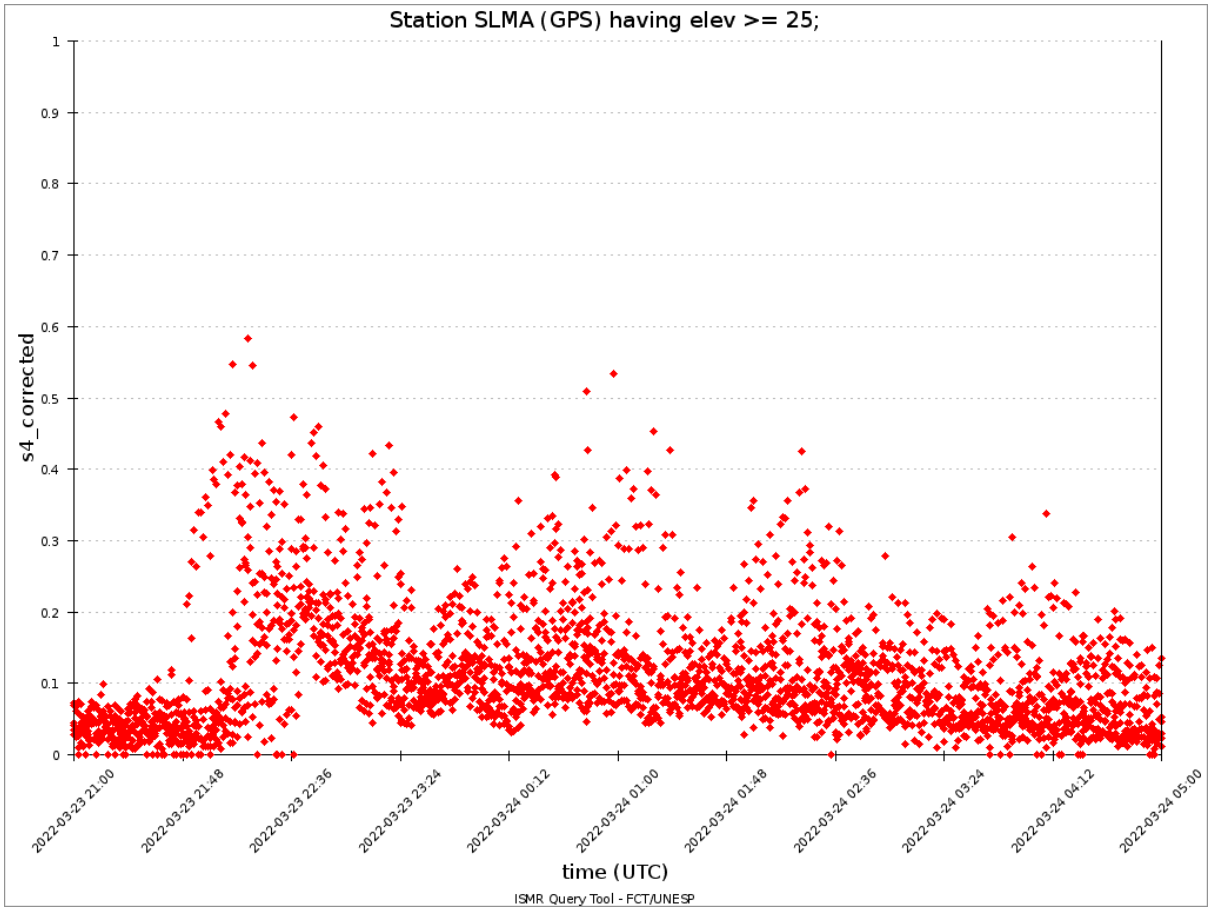


Scintillation S4

Responsible: Siomel Savio Odriozola

In this report on the S4 scintillation index, data from SLMA in São Luíz/MA, STSN in Sinop/MT, UFBA, in Bahía/BA e SJCE in São José dos Campos/SP are presented. The S4 index tracks the presence of irregularities in the ionosphere having a spatial scale ~ 360 m.

Strong values of the S4 index (> 0.6) were measured throughout the week at the STSN station and, except for 03/26-27 at the SLMA station. At the UFBA station, scintillation events appeared until the 26th. The SJCE station had strong S4 values after sunset only on the 03/26-27. Figure 1 shows the most significant day (23-24/03) at SLMA (upper panel) and STSN (lower panel) stations. For the same time interval as in Figure 1, Figure 2 shows the map of S4 values > 0.2 for GPS satellites with elevation > 25o in the field of view of the SLMA and STNT stations receivers.


Station SLMA (GPS) having elev >= 25;
s4_corrected
time (UTC)
ISMR Query Tool - FCT/UNESP

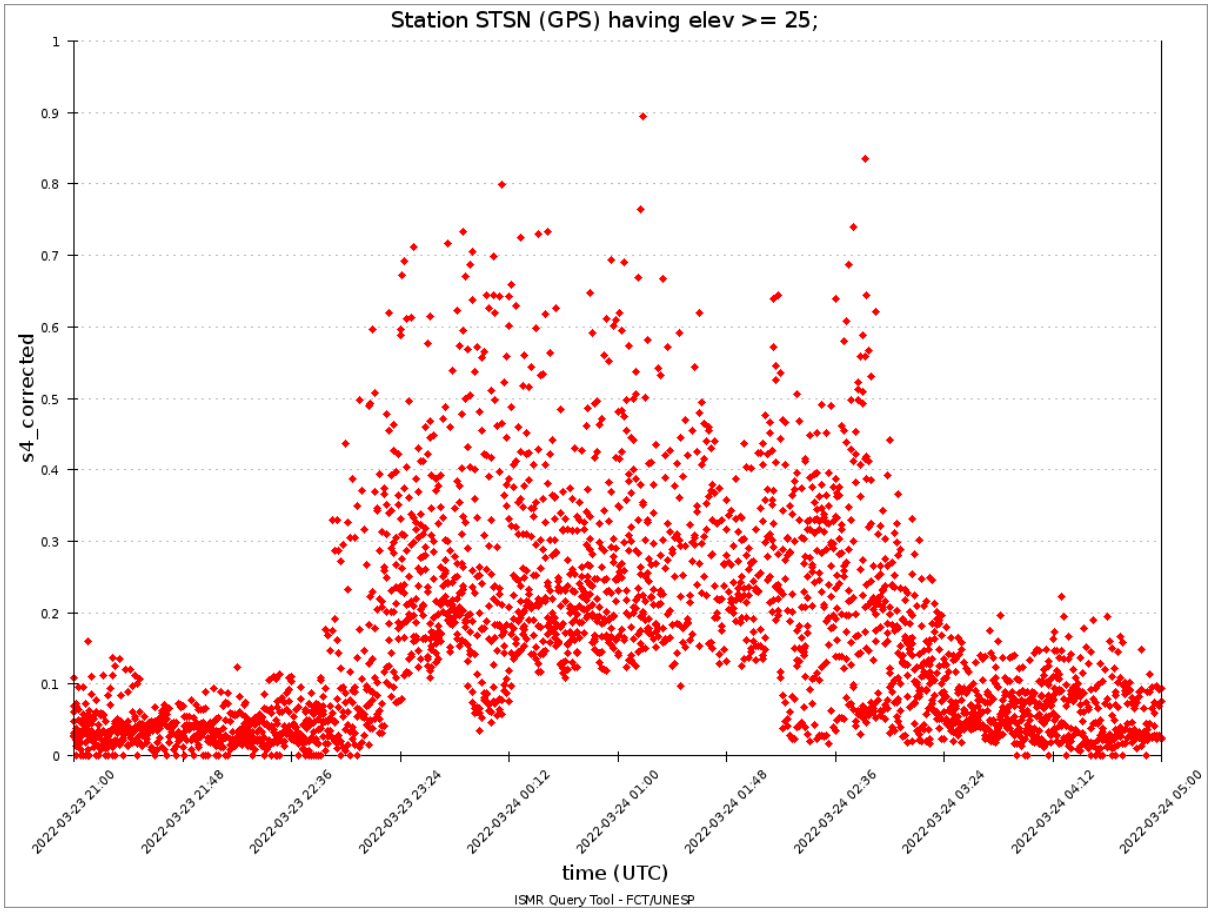

Station STSN (GPS) having elev >= 25;
s4_corrected
time (UTC)
ISMR Query Tool - FCT/UNESP

Figure 1: S4 index values for the GPS constellation for the stations SLMA (upper panel) and STSN
(lower panel) between 2100h on 03/23 until 0500h on 03/24/2022.

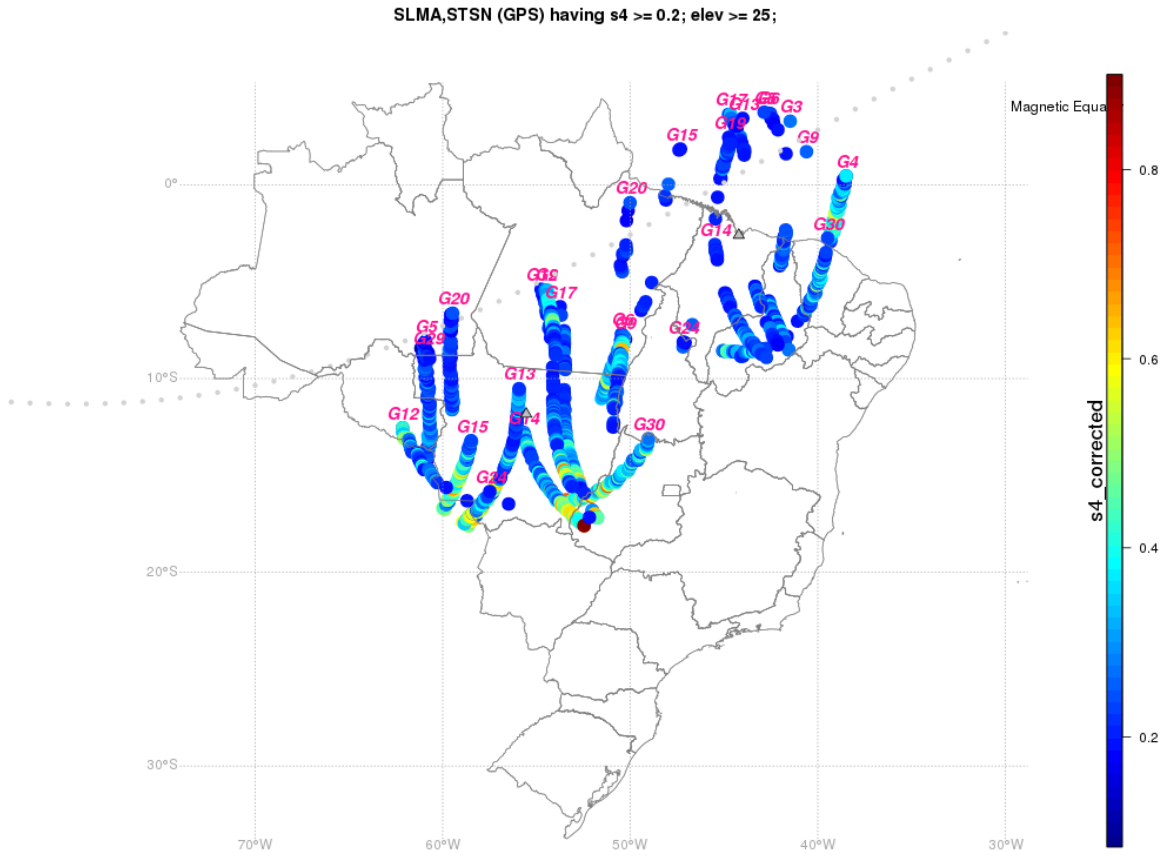


Figure 2: The map of S4 values > 0.2 for GPS satellites with elevation > 25o from the field of view
of SLMA and STNT station receivers for the same time interval used in Figure 1.