

# Briefing Space Weather - 2022/03/21

## Sun

### Responsible: José Cecatto

03/14 – Fast ( $\leq 450$  km/s) wind stream; 6 CME can have component toward the Earth;

03/15 – Fast ( $\leq 450$  km/s) wind stream; 1 CME can have component toward the Earth;

03/16 – Fast ( $\leq 450$  km/s) wind stream; 3 CME can have component toward the Earth;

03/17 – No fast wind stream; 4 CME can have component toward the Earth;

03/18 – No fast wind stream; 3 CME can have component toward the Earth;

03/19 – No fast wind stream; 3 CME can have component toward the Earth;

03/20 – No fast wind stream; 2 CME can have component toward the Earth;

03/21 – No fast wind stream with a stable trend; 4 CME can have component toward the Earth;

Prev.: Fast wind expected to March 23-24; for while low (10% M, 1% 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 (Prediction for CME 2022-03-13T12:00Z)

- The simulation result indicates that it will have no or little impact on Earth.

WSA-ENLIL (CMEs 2022-03-16T13:36Z, 2022-03-16T15:16Z)

- The simulation indicates that the combined Coronal Mass Ejections will reach Earth on the

following date: 2022-03-20T11:43Z (+-7 hours).

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.

## Coronal holes (SPOCA):

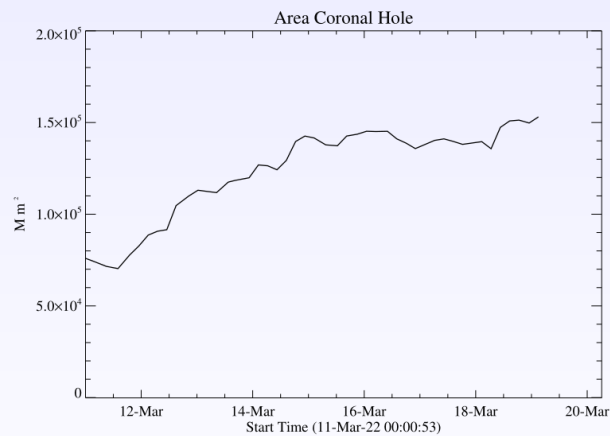
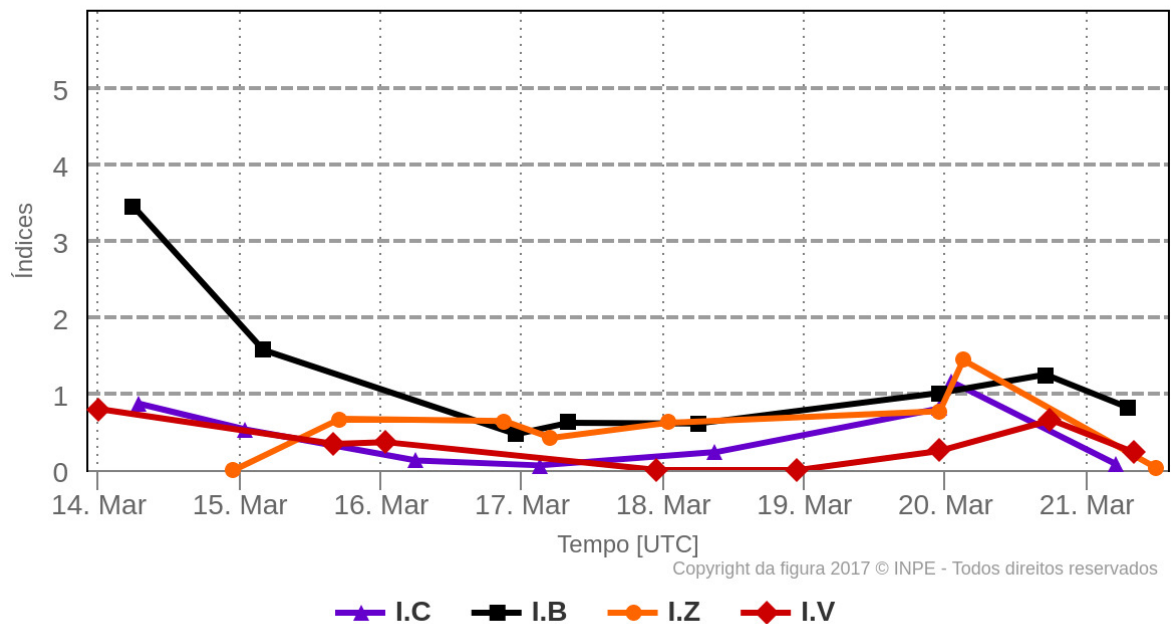


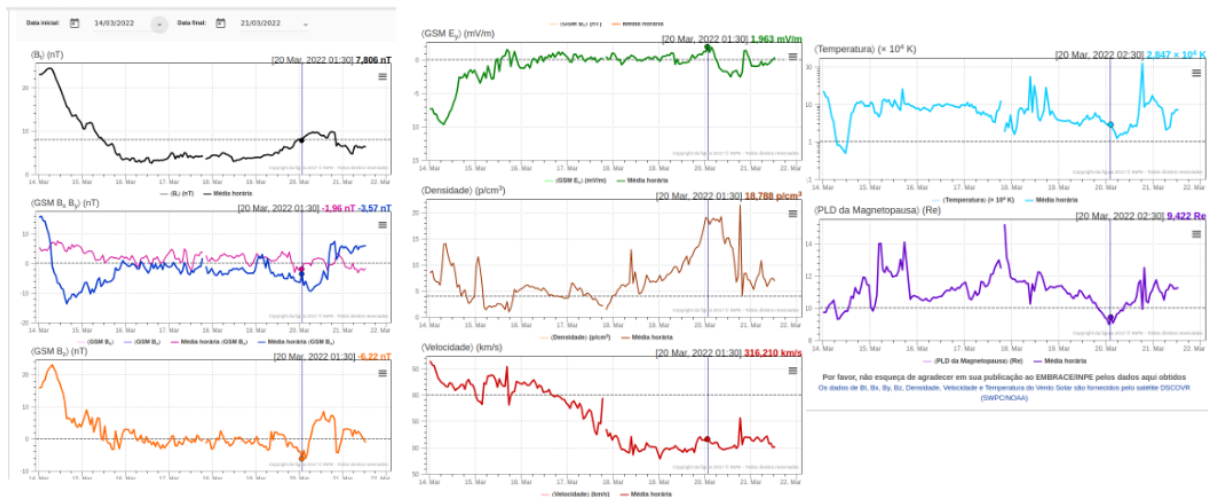
Figura: The line black shows the products of the totality of areas for each detection interval performed by SPOCA between March 11th and 18th, 2022.

**Responsible: Paulo Ricardo Jauer**

## Resumo dos índices do meio interplanetário

Máximos diários - mais recentes entre 14 Mar, 2022 e 21 Mar, 2022





- 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: 14/Mar at 06:30 of ~ 24nT.
- The BxBz components presented a sector switch on March 20 at 15:30 UT. The IMF Bz component peaked on March 14 at 15:30 of -13.6 nT.
- The south IMF bz field component showed a peak on March 14 at 07:30 from +23 nT, and a significant change in orientation on March 20 at 03:30 from -6.16 nT.
- The density of the solar wind presented a peak set, however the most significant was on March 20 at 18:30 of 21.3 p/cm<sup>3</sup>.
- The solar wind speed was oscillating mostly above 400km/s until mid-March 16th. After that, its speed remained low with a minimum value of 278 km/s on March 19 at 00:30 UT.
- The magnetopause position was on average above the typical position. The maximum compression was observed on March 20 at 01:30 from 8.9 Re. And an expansion of 14 Re was observed on March 15 at 17:30.

## Radiation Belts

Responsible: Ligia Alves Da Silva

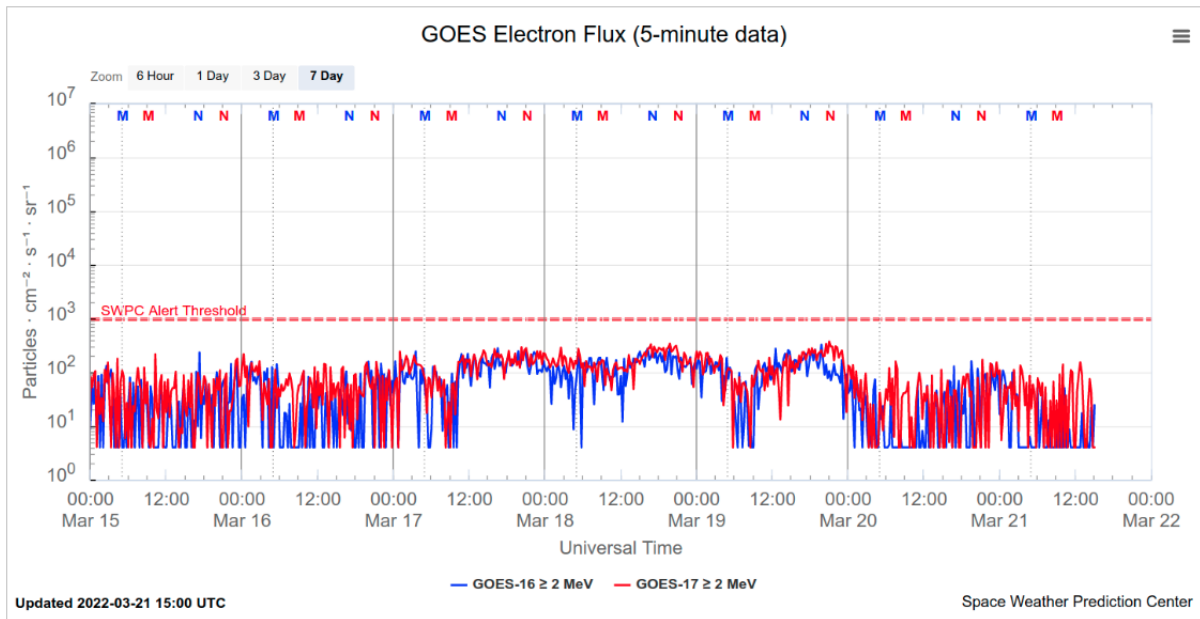


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-17 satellite.  
 Source: <https://www.swpc.noaa.gov/products/goes-electron-flux>

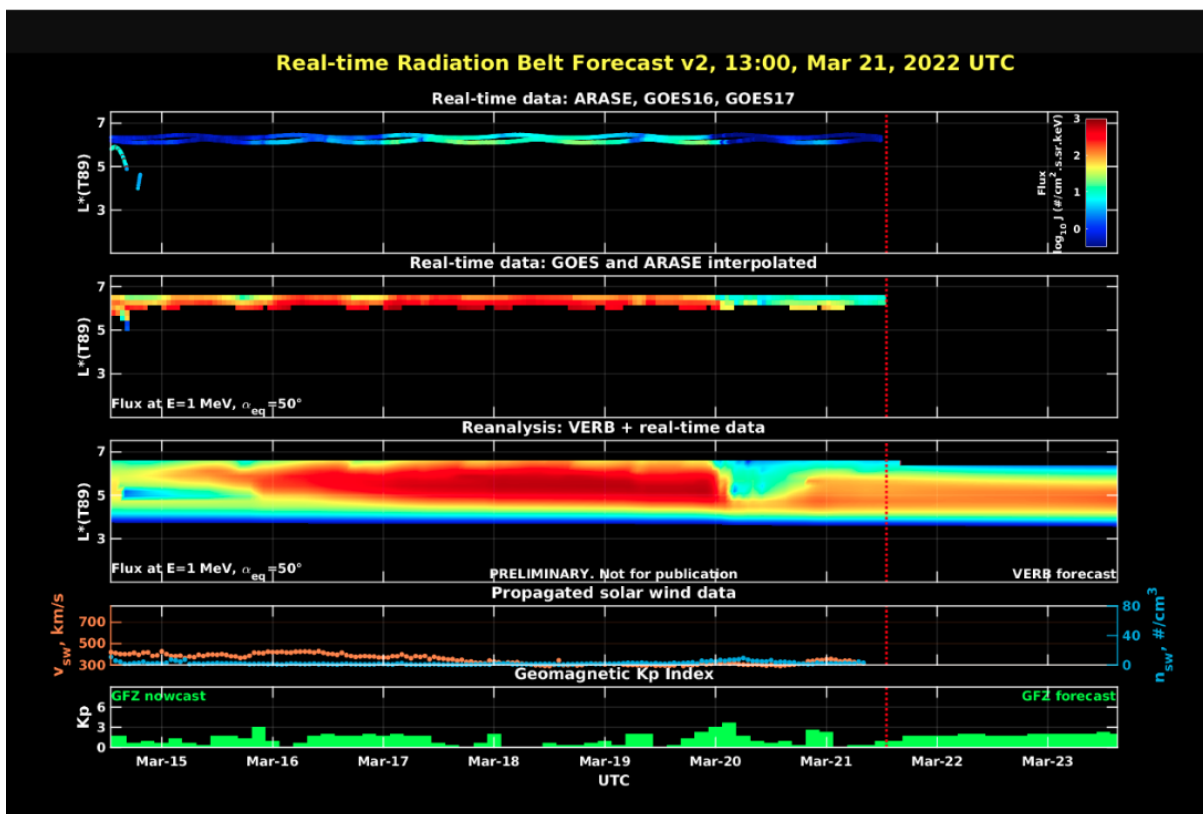


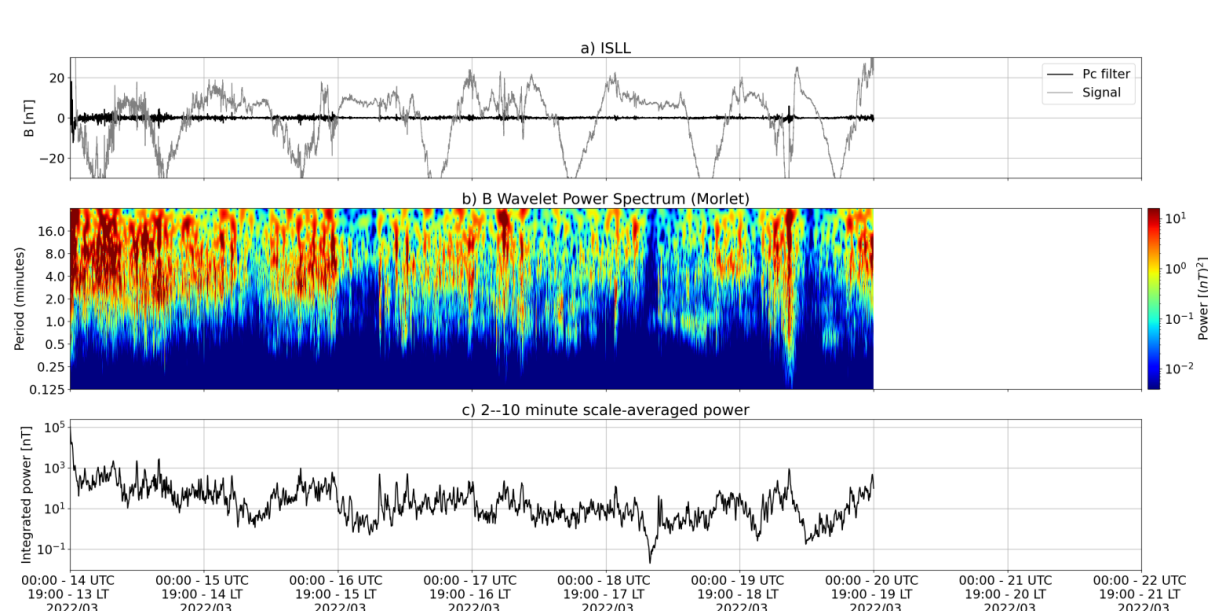
Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES-16, GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: <https://rbm.epss.ucla.edu/realtime-forecast/>

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/(cm<sup>2</sup> s sr) between March, 15th-16th, presenting a slight electron flux increase at the beginning of the March 17th, which persists close to 102 particles/(cm<sup>2</sup> s sr) until the last of the March 19th. On March 20th, the electron flux returns to being below 102 particles/(cm<sup>2</sup> s sr) until today.

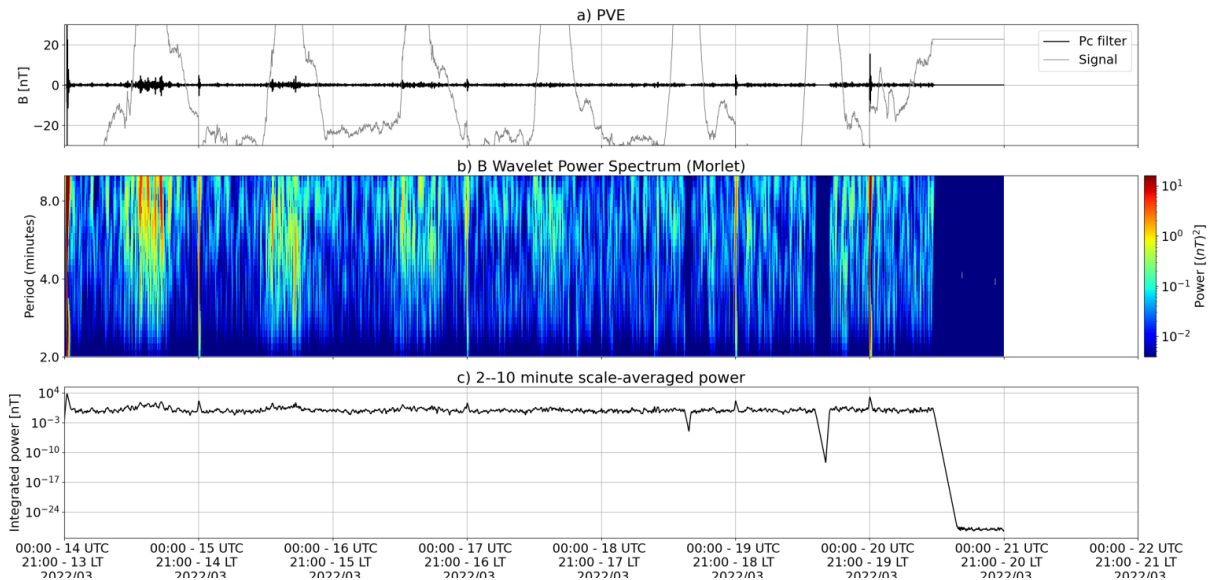
The GOES-16, GOES-17, and Arase satellite data are analyzed and interpolated to observe the high-energy electron flux variability (1 MeV) in the outer radiation belt (Figure 2). Additionally, the VERB code rebuilds this electron considering the Ultra Low Frequency (ULF) waves' radial diffusion. The simulation (VERB code) shows that the electron flux decrease observed at the beginning of March 17th 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

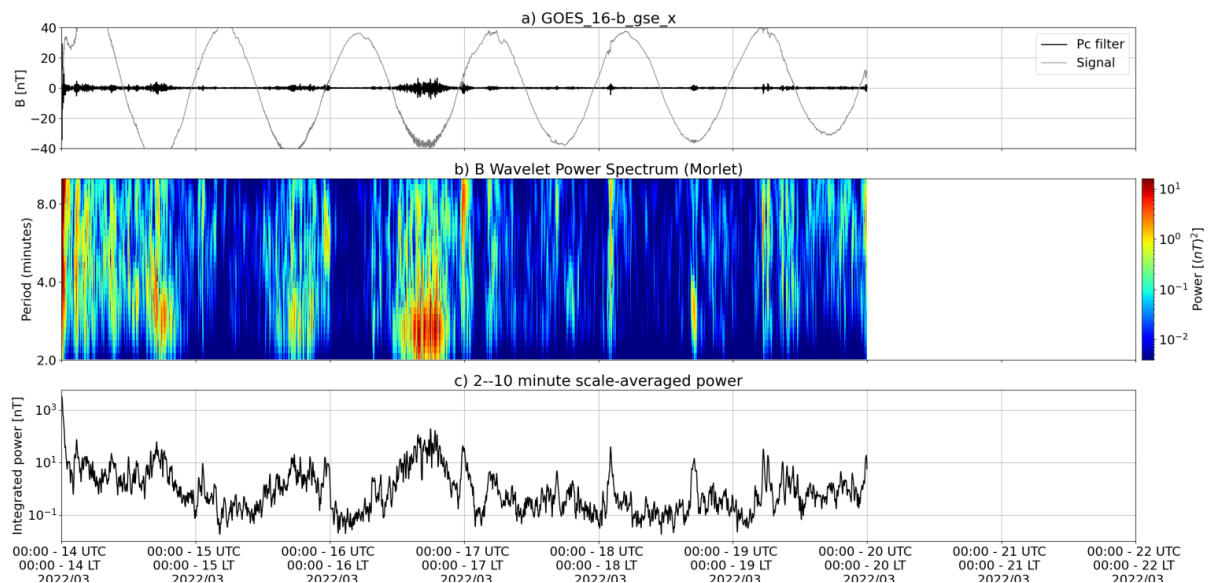
Responsible: José Paulo Marchezi



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 14th of March, where there are small shocks, which are visible mainly at high latitudes and by the GOES satellite, as impulsive pulsations with short duration. On the 16th there are new impulse pulsations for a short period of time, they are more pronounced in the Bx component measured by the GOES satellite. Around the 20th of March there is a

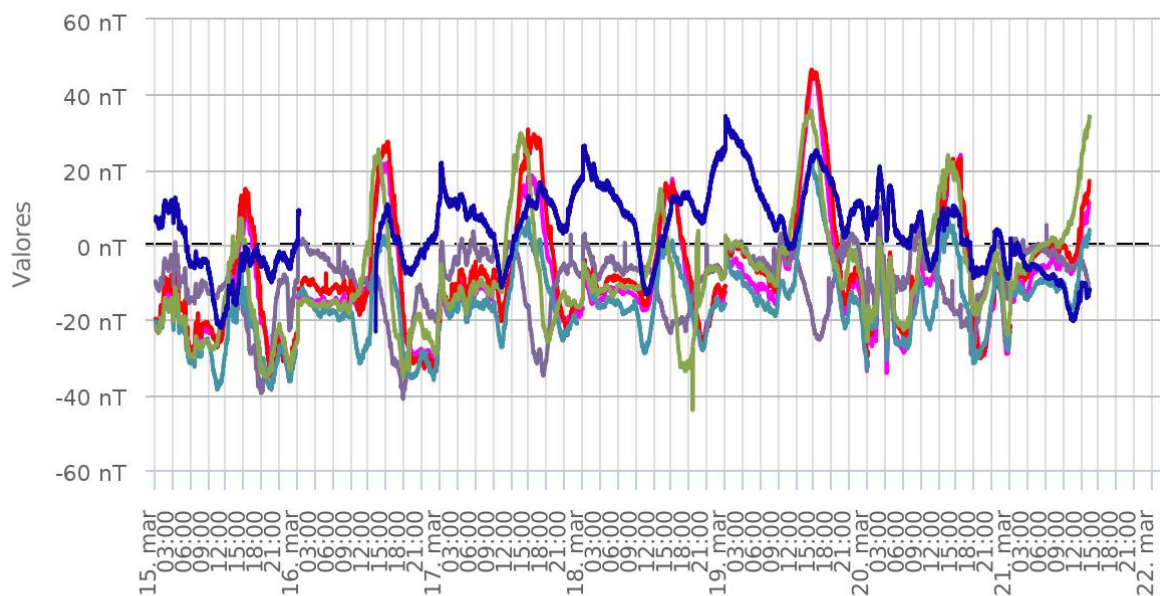
new disturbance, possibly related to a shock in the magnetosphere that generated localized waves for a short period of time.

# Geomagnetism

Responsible: Livia Ribeiro Alves

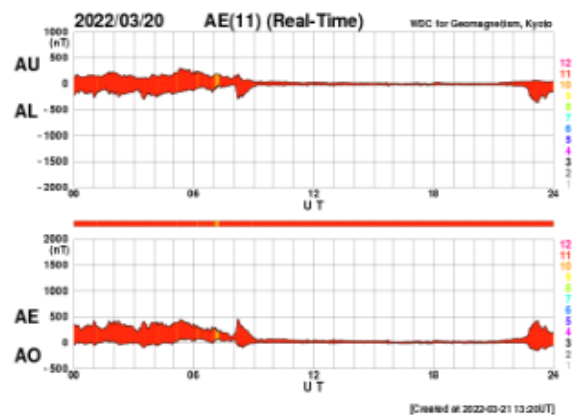
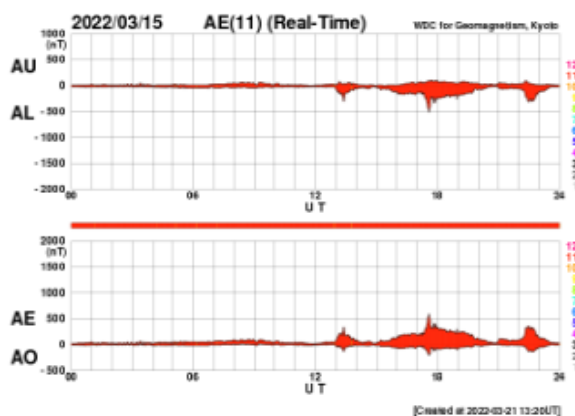
## Rede EMBRACE de Magnetômetros

$\Delta H$  - (15/03/2022 - 21/03/2022)

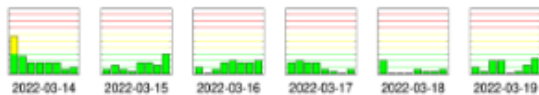
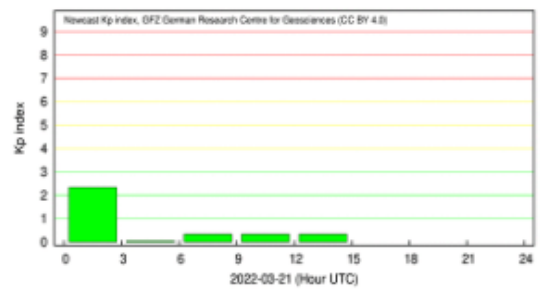
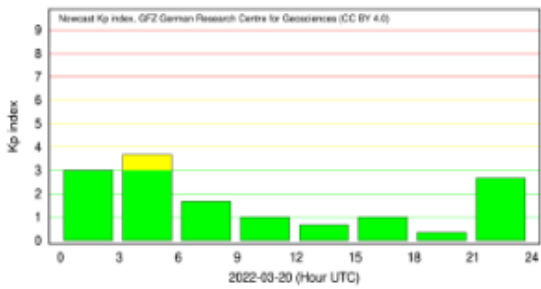
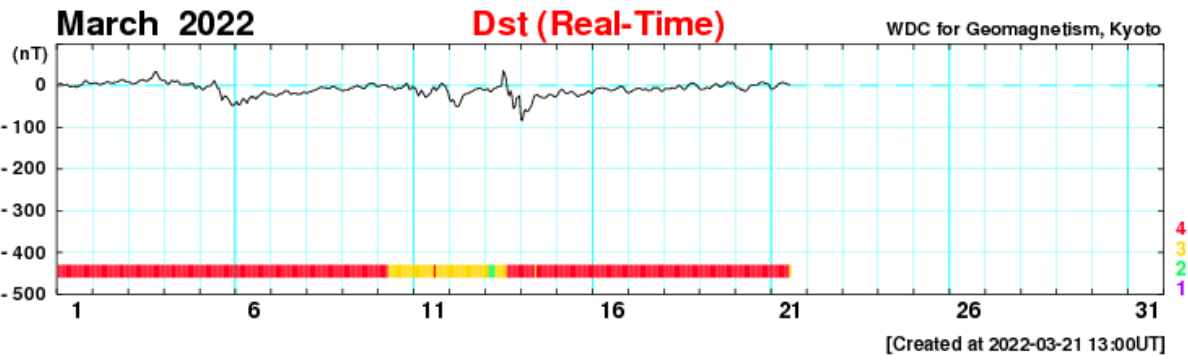
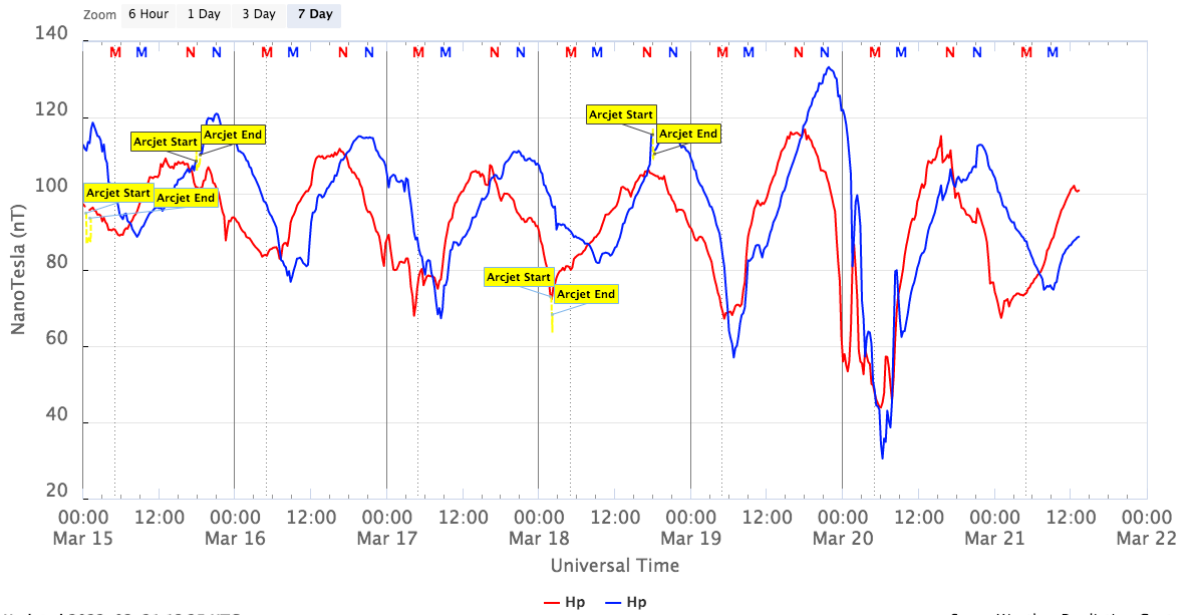


— CBA — JAT — RGA — SJC — SLZ — VSS

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### GOES Magnetometers (1-minute data)



### Geomagnetic Report - March 15-21



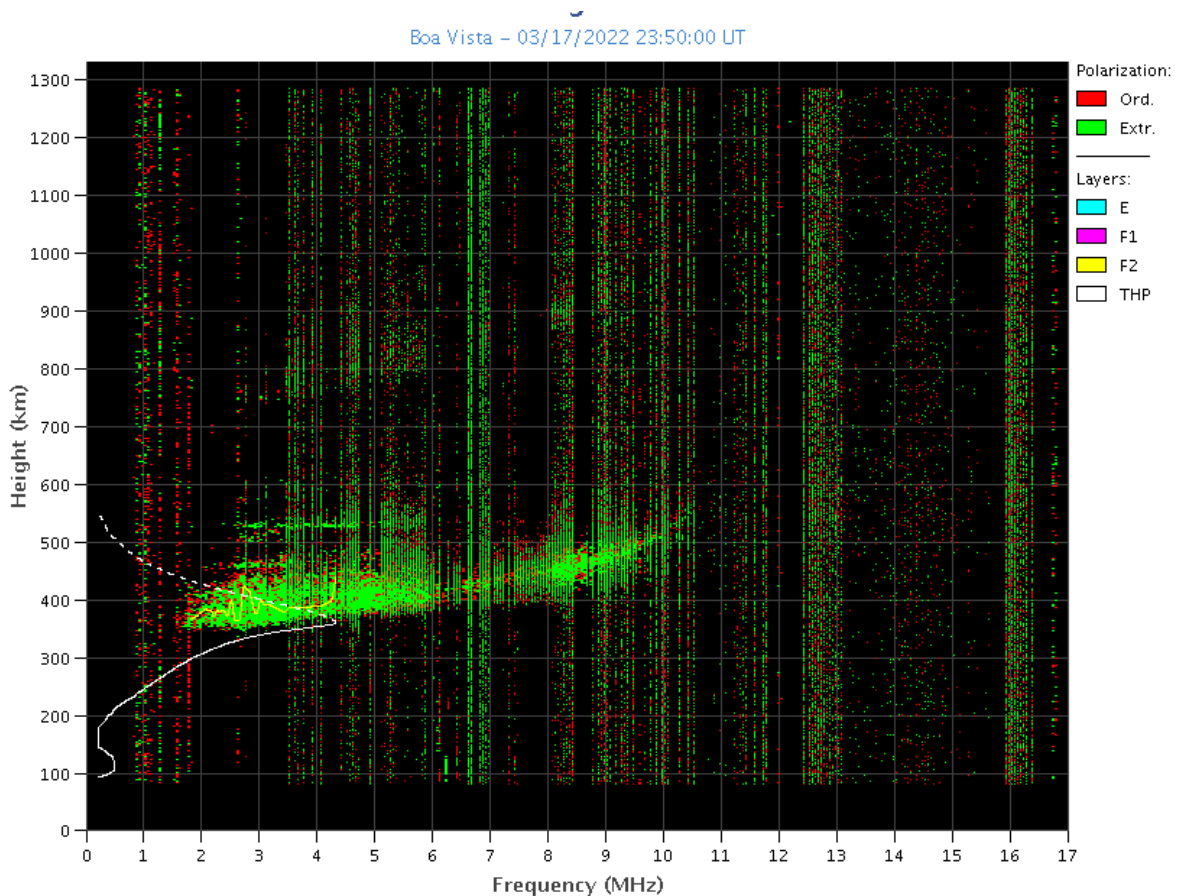
- Data from the MagNet network showed instabilities throughout the period, maintaining the characteristic behavior of a quiet period
- The Dst index reached its minimum value of -26 nT on 03/15. The highest Kp of the week was 4- recorded on 03/20
- Auroral activity was slightly intensified on days 15, 16, and 20.
- Magnetic field measured in the orbit of the GOES satellite showed minor disturbances on 03/20.

# Ionosphere

## Responsible: Laysa Resende

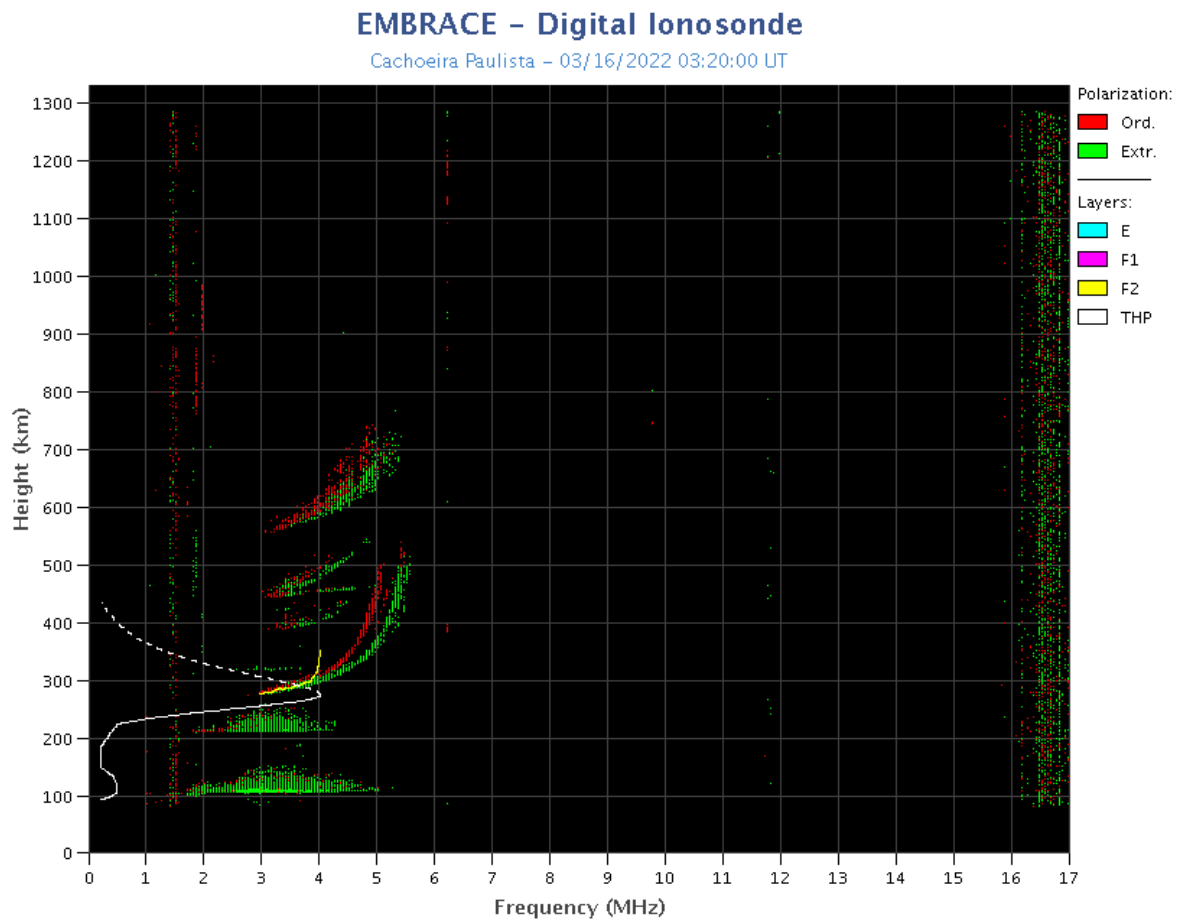
### Boa Vista:

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



## Cachoeira Paulista:

- There were spread F on days 14, and 18.
- The Es layers reached scales 2 and 3 during the week.

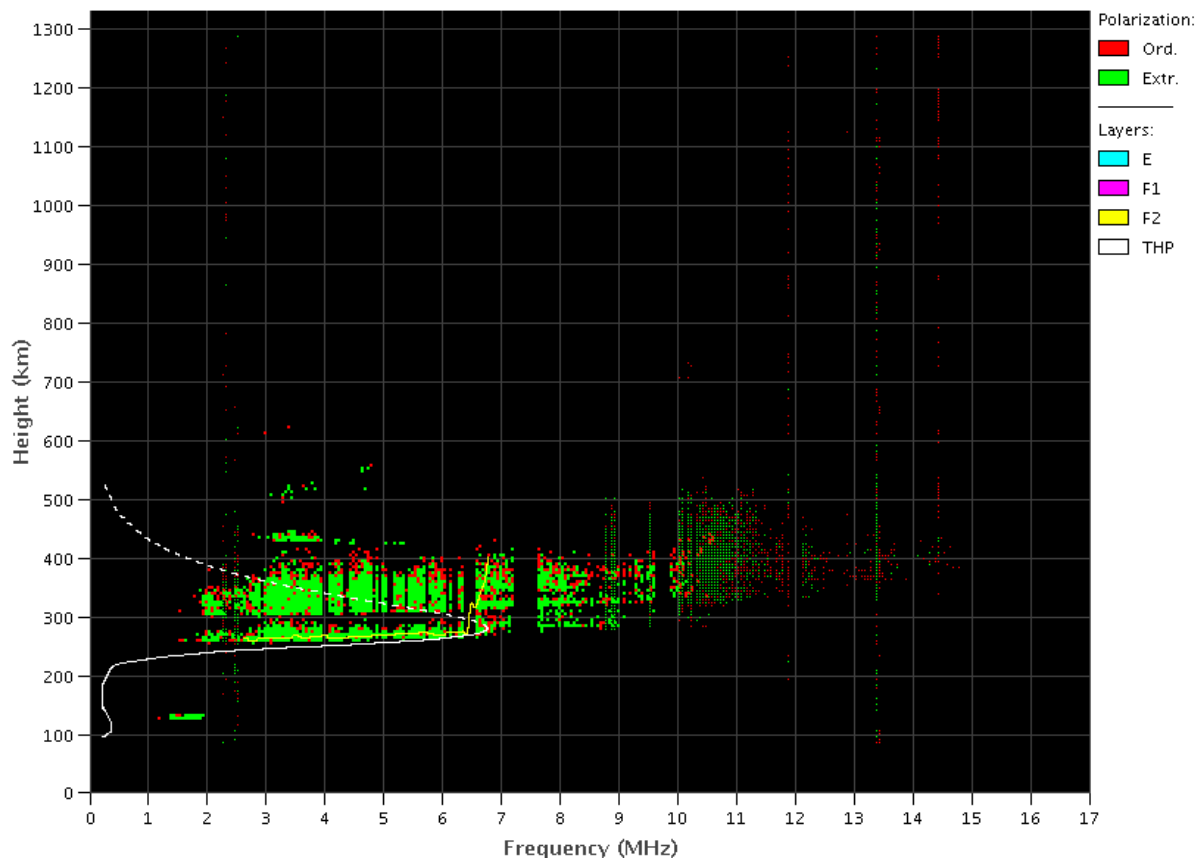


## São Luís:

- There were spread F during all days in this week.
- The Es layers reached scale 3 on days 14, and 18.

## EMBRACE – Digital Ionosonde

São Luís – 03/14/2022 23:50:00 UT



## Scintillation S4

### Responsible: Siomel Savio Odriozola

In this report on the S4 scintillation index, data from SLMA in São Luís/MA, STSN in Sinop/MT, UFBA, in Bahia/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  $\sim 360$  m.

Strong S4 index values ( $> 0.6$ ) were measured throughout the week at the SLMA and STSN stations. At UFBA station at least one satellite was affected by scintillation events throughout the week. SJCE station detected strong S4 values after sunset on 03/14 and 03/17. This situation begins to indicate that the 2021-2022 bubble season, in Brazilian territory, is ending (Figure 1).

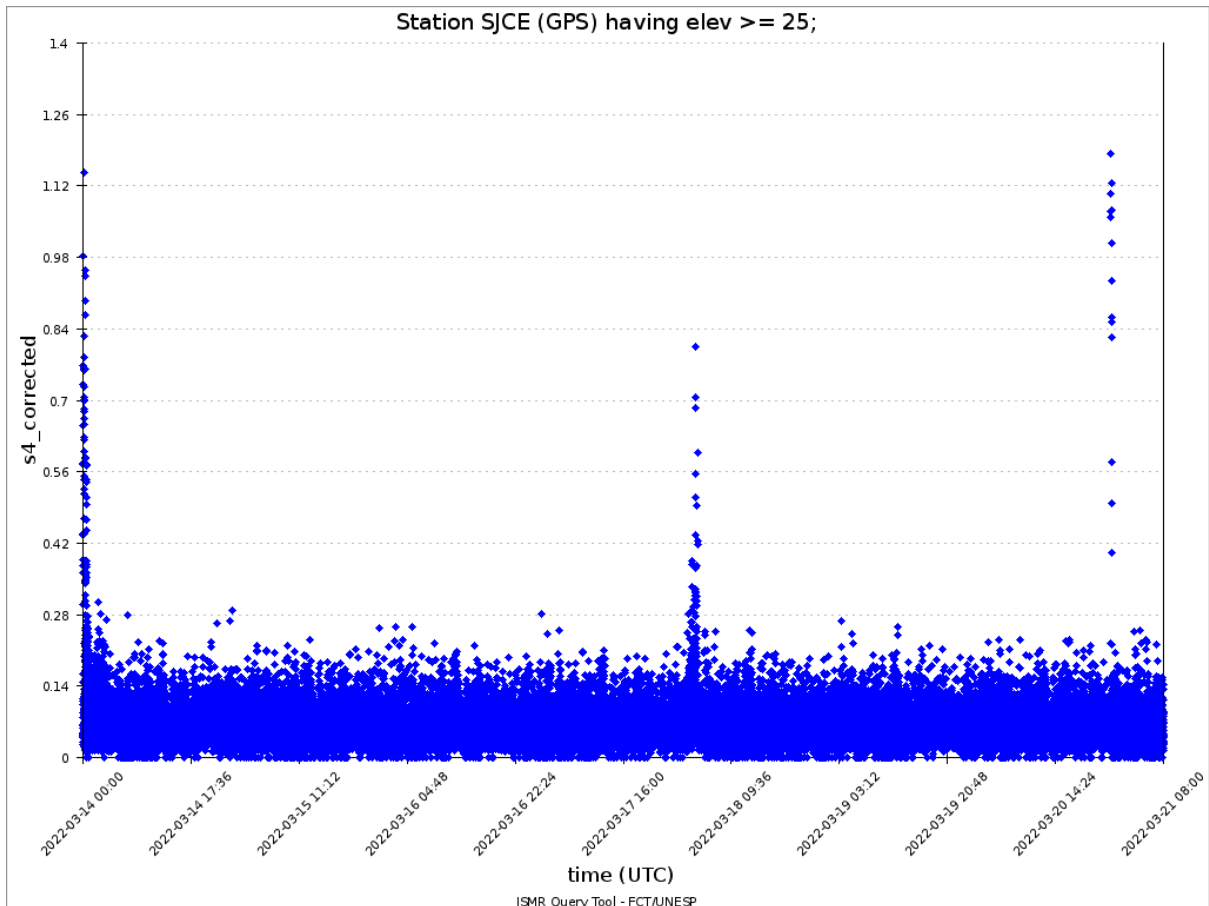
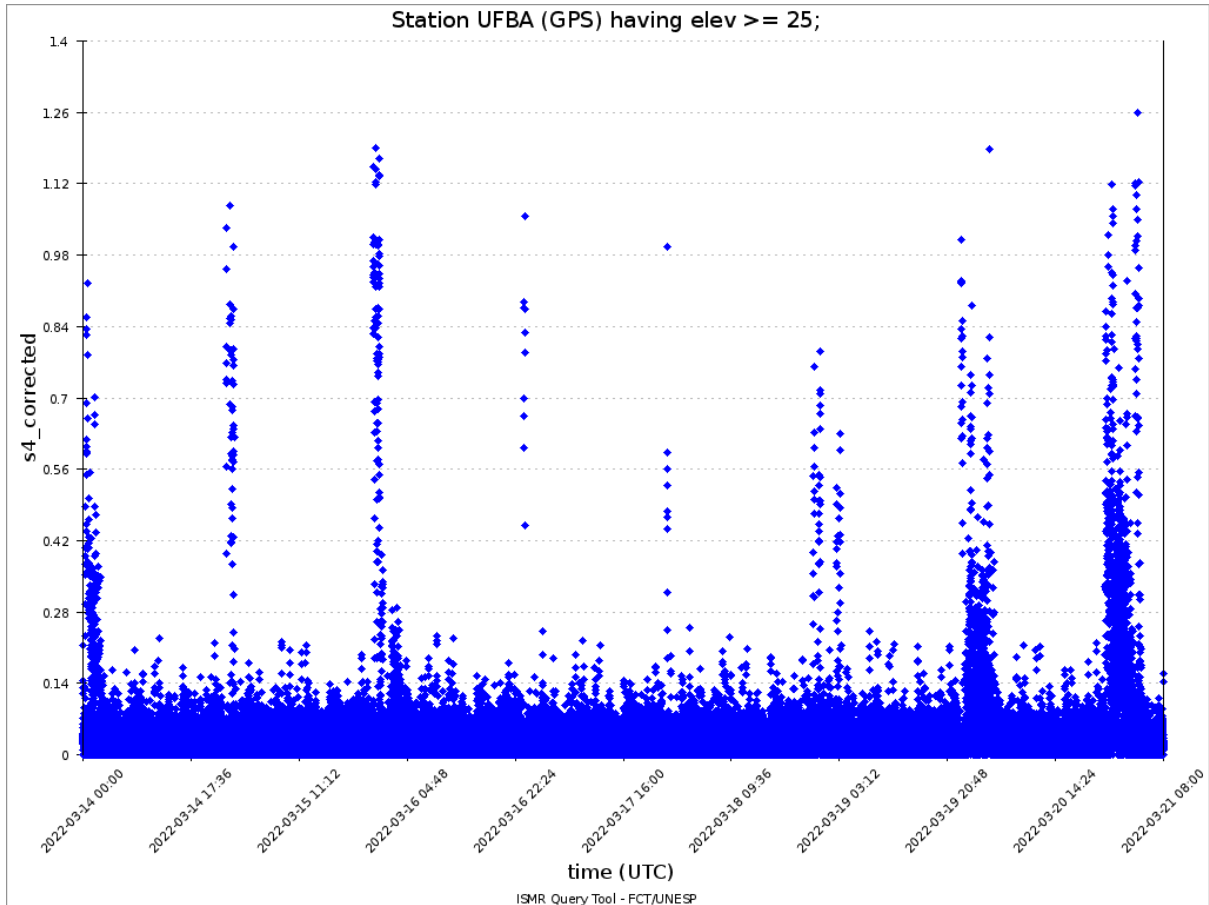


Figure 1: S4 index values for the GPS constellation for the stations UFBA (upper panel) and SJCE (lower panel) during the week 03/14—03/21/2022.