

Briefing Space Weather - 2022/03/07

Sun

Responsible: José Cecatto

02/21 – Fast (≤ 550 km/s) wind stream; 1 CME can have component toward the Earth;

02/22 – Fast (≤ 600 km/s) wind stream; 1 CME can have component toward the Earth;

02/23 – Fast (≤ 550 km/s) wind stream; 4 CME can have component toward the Earth;

02/24 – Fast (≤ 550 km/s) wind stream; 1 CME can have component toward the Earth;

02/25 – Fast (≤ 500 km/s) wind stream; No CME toward the Earth;

02/26 – No fast wind stream; 1 CME can have component toward the Earth;

02/27 – Fast (≤ 550 km/s) wind stream; 1 CME can have component toward the Earth;

02/28 – Fast (≤ 550 km/s) wind stream; 6 CME can have component toward the Earth;

Prev.: Fast wind expected up to February 22; 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.

02/28 – Fast (≤ 550 km/s) wind stream; 6 CME can have component toward the Earth;

03/01 – Fast (≤ 550 km/s) wind stream; 1 CME can have component toward the Earth;

03/02 – Fast (≤ 500 km/s) wind stream; 6 CME can have component toward the Earth; 15:04 - SB pred arrival:

22:00Z, Mar. 05 – 22:00Z, Mar. 06; 18:24 - SB pred arrival: 04:00Z-17:00Z, Mar. 06;

03/03 – No fast wind stream; No CME toward the Earth;

03/04 – Fast (≤ 500 km/s) wind stream; 2 CME can have component toward the Earth;

03/05 – Fast (≤ 500 km/s) wind stream; 7 CME can have component toward the Earth; ; 00:01 – SB pred arrival:

15:46Z, Mar. 07 – 08:32Z, Mar. 10;

03/06 – Fast (≤ 550 km/s) wind stream; 5 CME can have component toward the Earth;

03/07 – Fast (≤ 500 km/s) wind stream; No CME toward the Earth;

Prev.: Fast wind expected up to March 07-08; for while low (25% M, 5% X) probability of M / X flares next 2 days; also, occasionally some other CMEs can present a component toward the Earth.

Responsible: Douglas Silva

CME:

- Type II halo CME was observed (2022-02-28T08:36Z) on the LASCO coronal images.

WSA-ENLIL (CME 2022-02-28T08:48Z)

- No or little impact to Earth.

WSA-ENLIL (CME 2022-03-02T15:48Z)

- The simulation indicates that the flank of the Coronal Mass Ejection will reach Earth at about

2022-03-05T22:00Z (+- 7 hours).

WSA-ENLIL (CME 2022-03-02T12:24Z)

- The simulation indicates that the flank of the Coronal Mass Ejection will reach Earth at about

2022-03-05T22:00Z (+- 7 hours).

WSA-ENLIL (CME 2022-03-02T18:24Z)

- The simulation indicates that the flank of the Coronal Mass Ejection will reach Earth at about

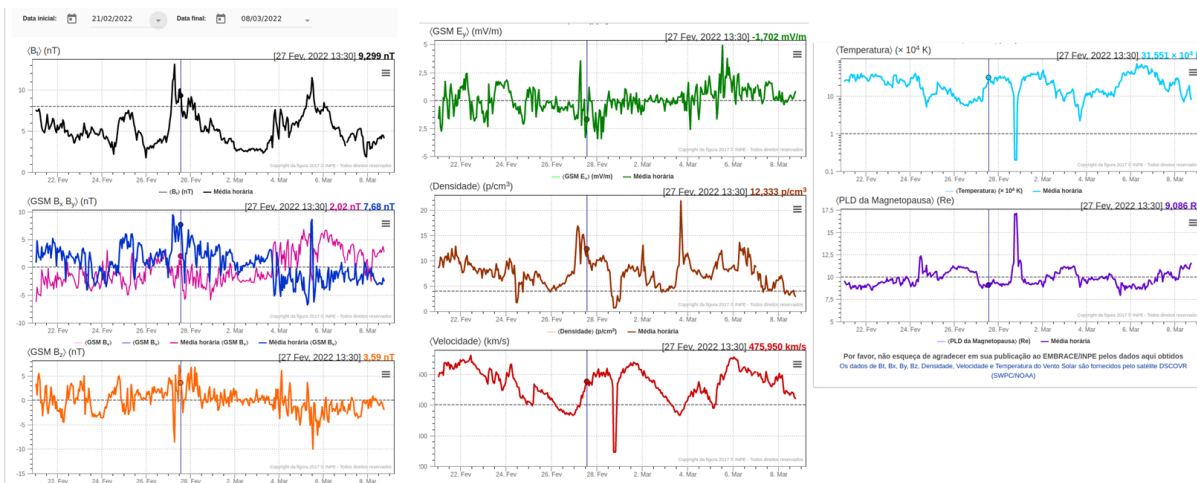
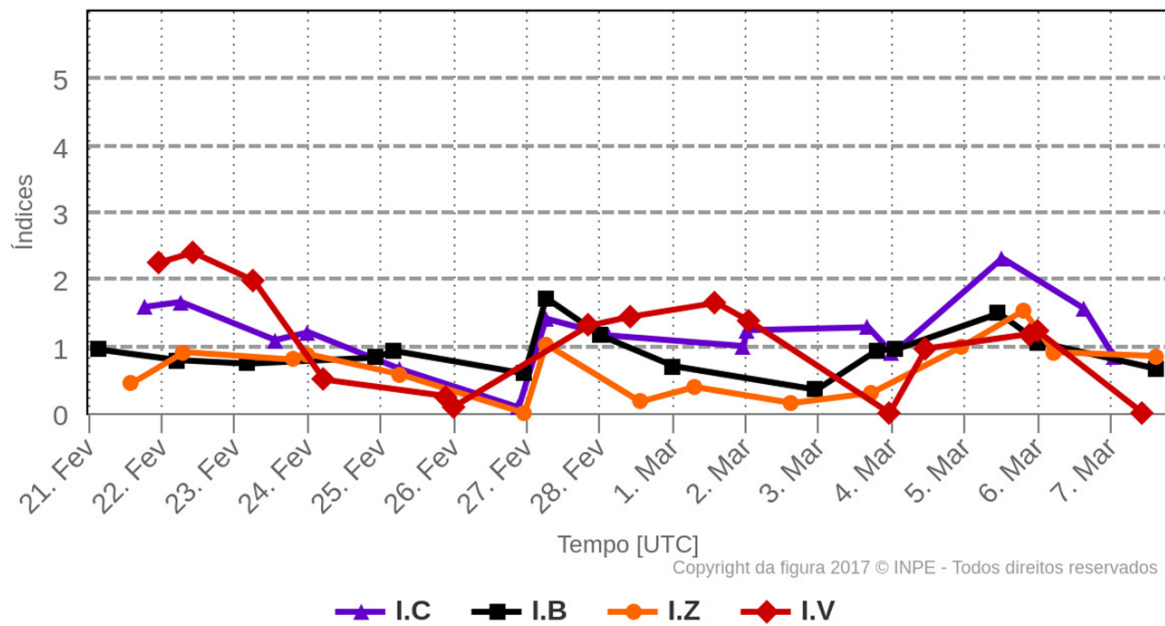
2022-03-06T04:00Z (+- 7 hours).

Interplanetary Medium

Responsible: Paulo Ricardo Jauer

Resumo dos índices do meio interplanetário

Máximos diários - mais recentes entre 21 Fev, 2022 e 7 Mar, 2022



- 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 and CIRs.
- The modulus of the component of the interplanetary magnetic field had 3 peaks: Feb 5 at 11:30 from ~ 11.4 nT, Feb 25 at 4:30 ~ 7.4 nT and Feb 27 at 6:30 from 13 nT.

- The bxy components show a sector switch on March 03 at 17:30, being within the range of $\sim[+10, -10]$ nT.
- The component of the south bz field showed two significant peaks on February 27th at 06:30 ~ -8.5 nT, and another on March 05th at 12:30 at -10.02 nT.
- The solar wind density remained below 22 p/cm³ during the analyzed period. The density also showed two significant peaks on February 27 at 04:30 UT of 16 p/cm³ and another on March 03 at 16:30 of 21 p/cm³.
- The solar wind speed was mostly oscillating above 400 km/s during the analyzed period, with a peak around ~ 560 km/s on 22/Feb at 10:30 UT.
- The position of the magnetopause was on average oscillating around the typical position. The maximum compression was observed on March 5th at 12:30 at 7.9 Re.

Radiation Belts

Responsible: Ligia Alves Da Silva

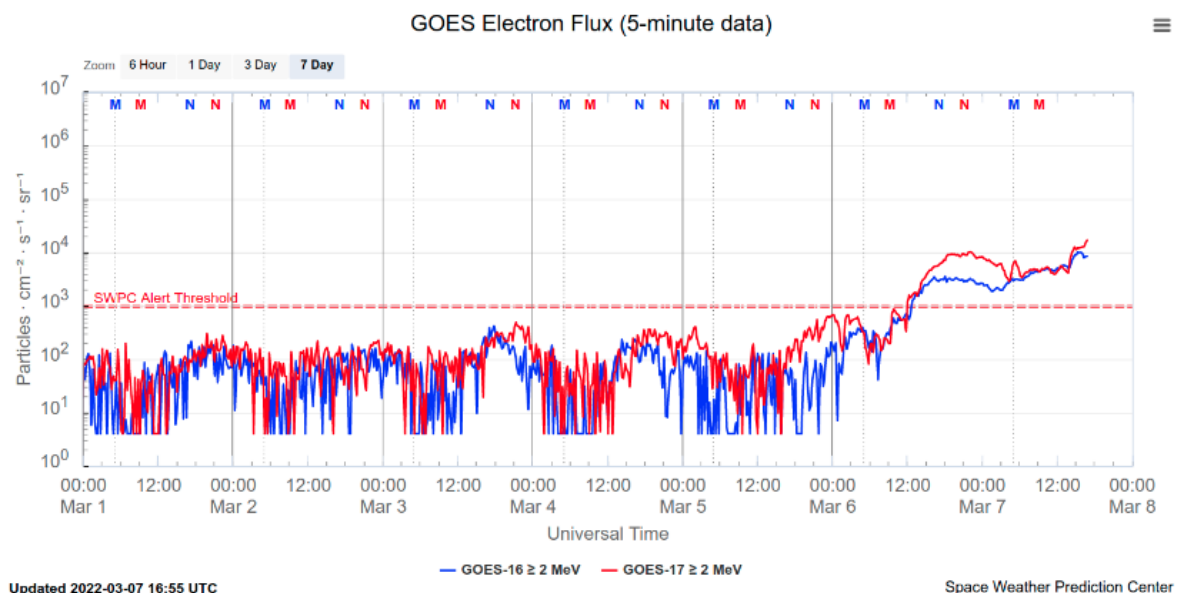


Figure 1: High-energy electron flux (> 2 MeV) obtained from GOES-16 and GOES-17 satellite.

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

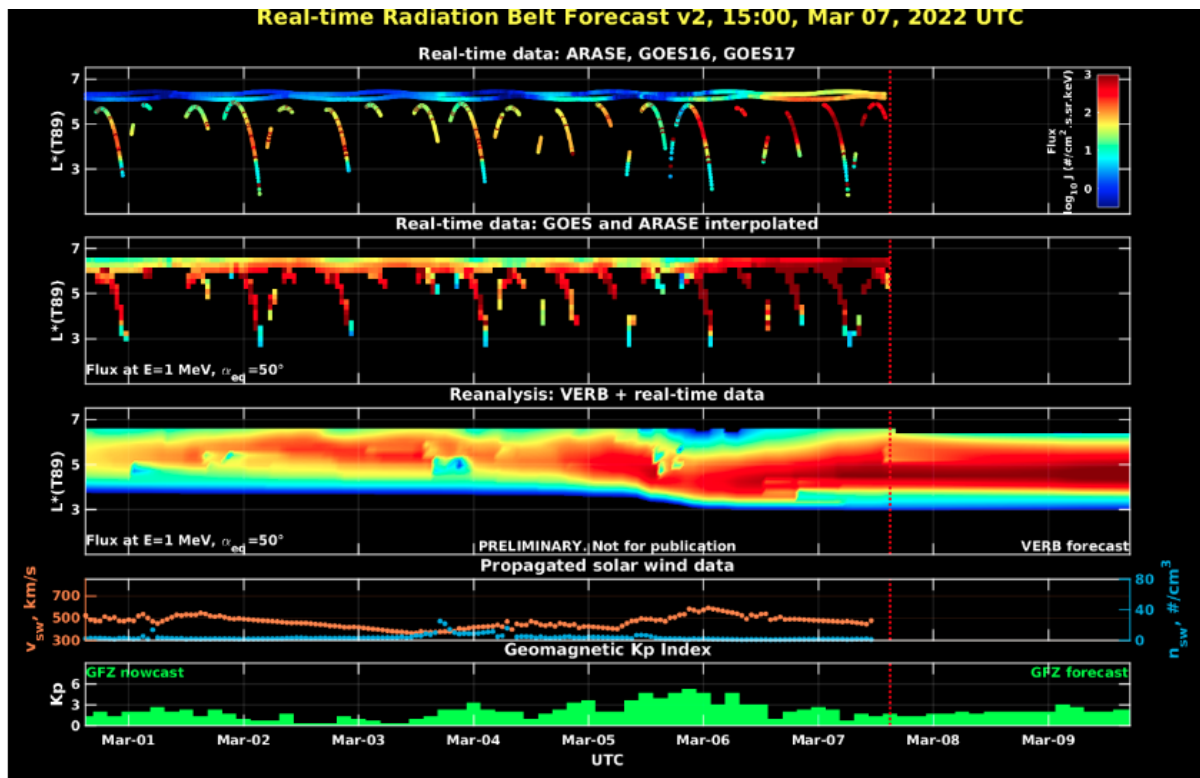


Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES-16, GOES-17 satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite.

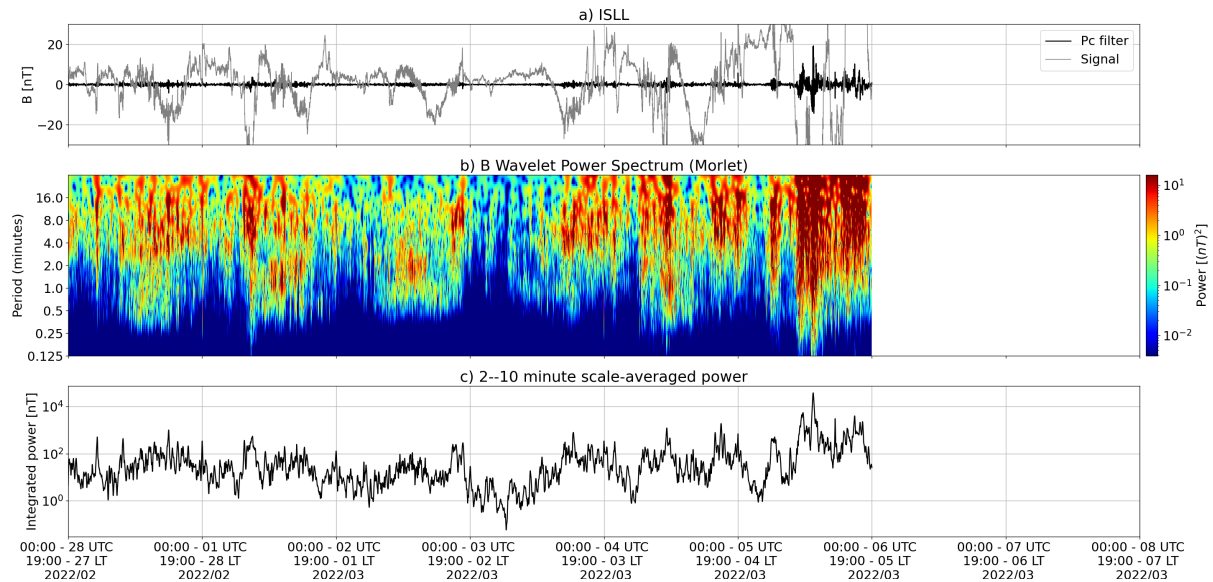
Source: <https://rbm.epss.ucla.edu/realtime-forecast/>

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 close to 102 particles/(cm² s sr) between March, 1st-2nd, with a slight electron flux increase on March 3rd and 4th. A significant electron flux increase was observed from March 6th, reaching values above 104 particles/(cm² s sr) at 18:00 Z on March 7th at the outer boundary of the outer radiation belt.

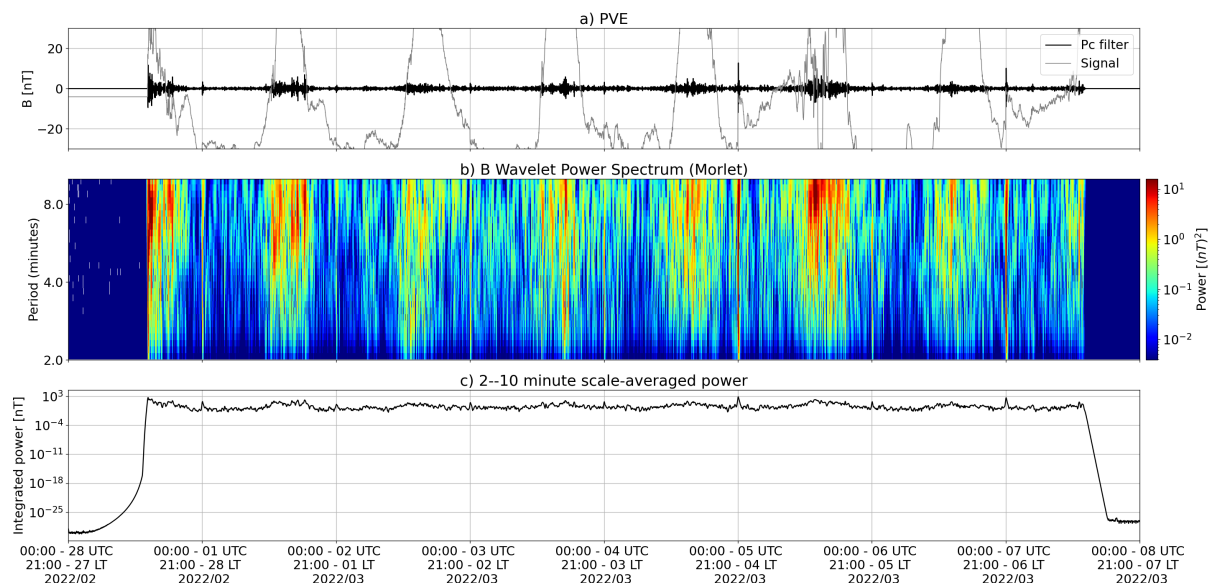
The GOES-16, GOES-17, and Arase satellite data are analyzed and interpolated to observe the high-energy electron flux variability (1 MeV) in the outer radiation belt (Figure 2). Additionally, the VERB code rebuilds this electron considering the Ultra Low Frequency (ULF) waves' radial diffusion. An electron flux decrease was observed on March 5th reaching L-shell > 3.5. This was followed by the significant electron flux increase observed at the outer boundary of the outer radiation belt and also in deeper L-shells. The observed variabilities between March 5th and 7th occurred concomitantly with ULF wave activity and the arrival of two coronal mass ejections.

ULF waves in the Magnetosphere

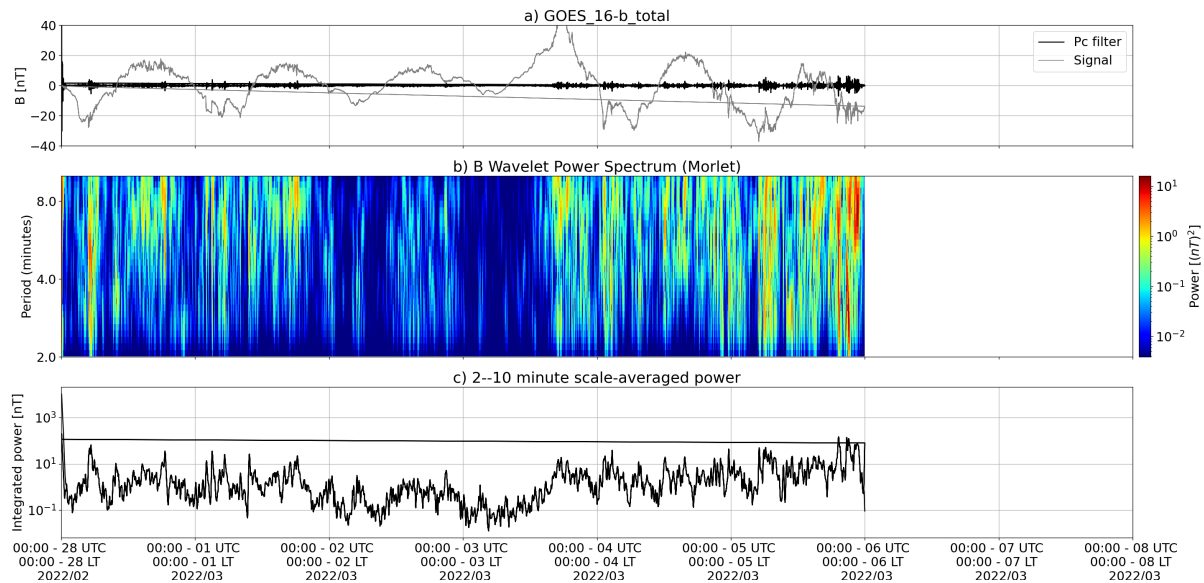
Responsible: José Paulo Marchezi



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).

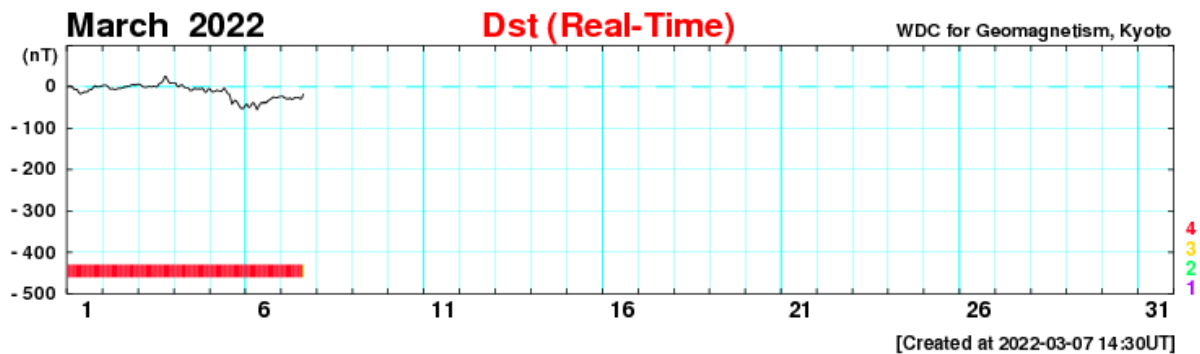
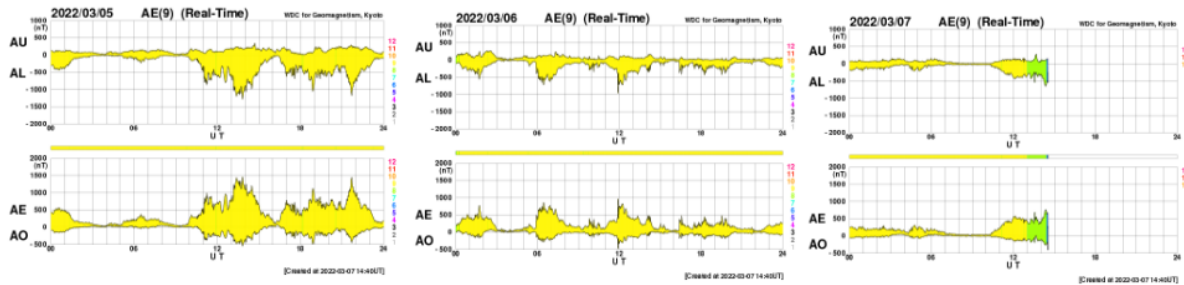
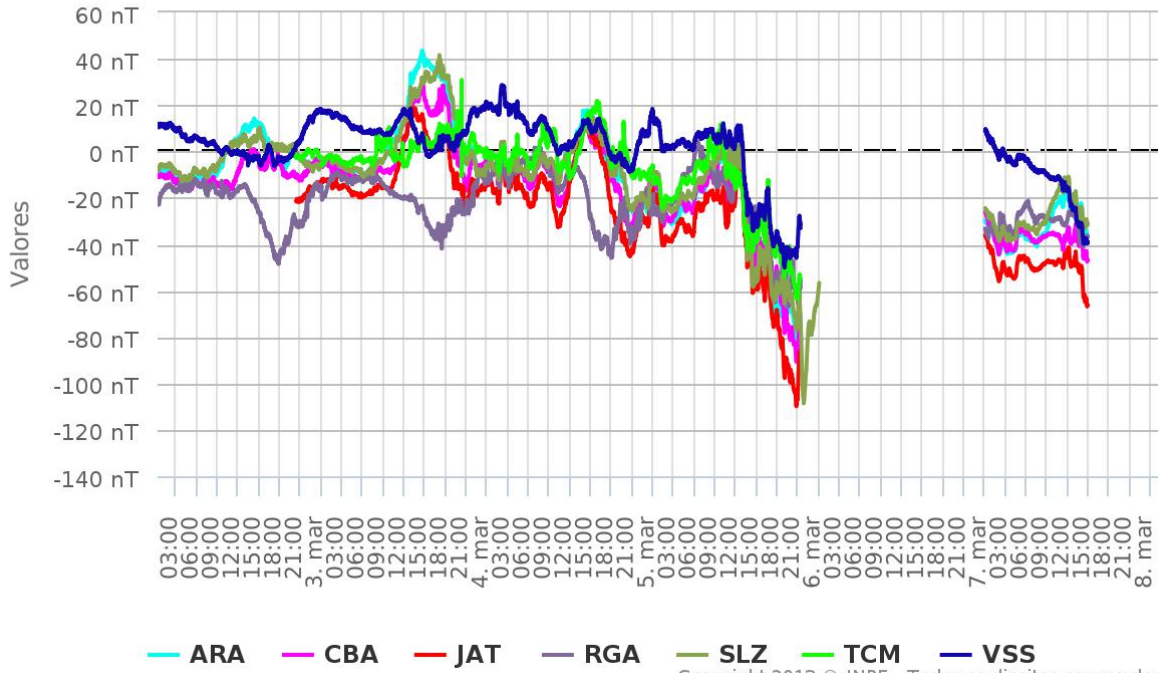
The ULF waves activity shows an increase in power from the March 1st, where there are small shocks, which are mainly visible at high latitudes and by the GOES satellite, as impulsive pulsations with short duration. On the 4th, there is a greater power of waves in the Pc5 band that last for a long period, which may be associated with the interaction of a possible two CME followed by a fast beam of the solar wind with the earth's magnetosphere. These waves are the result of a disturbance in the equatorial currents, seen by the GOES satellite and in low-latitude magnetometers in the EMBRACE network, and also a result of the intensification of the auroral currents, detected by magnetometers at high latitudes (ISLL-CHARISMA).

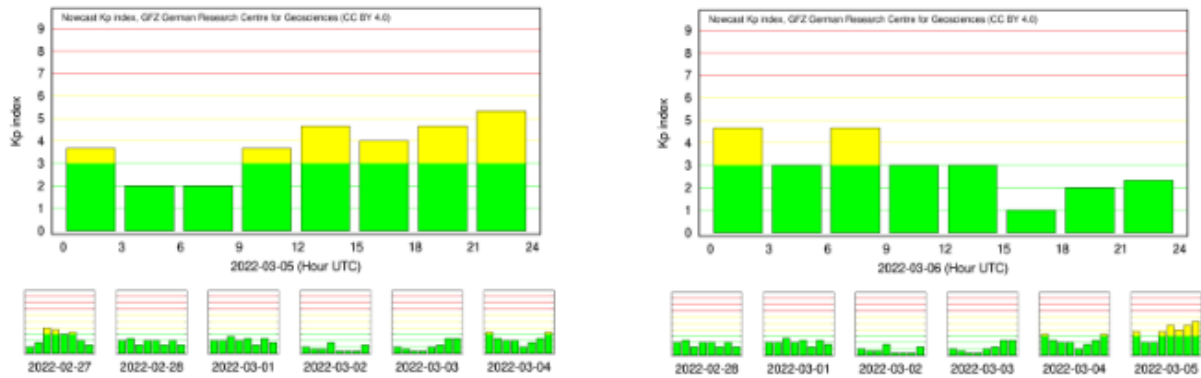
Geomagnetism

Responsible: Livia Ribeiro Alves

Rede EMBRACE de Magnetômetros

ΔH - (02/03/2022 - 07/03/2022)





In the week of March 01 to 07, the following events related to geomagnetic activity stand out:

- Data from the Embrace magnetometer network showed instabilities throughout the period, with some events highlighted: day 05, drop in the H component in all magnetometers, up to -110 nT
- Geomagnetic activity recorded storm level G1 on 05/03 and 06/03, with the Dst index reaching -50 nT on 05/03. The highest Kp of the week was 5+ recorded on 05/03
- Auroral activity was intensified on the 5th, 06th and 07th.
- Magnetic field measured in the orbit of the GOES satellite showed disturbances on 03, 05 and 06/03.

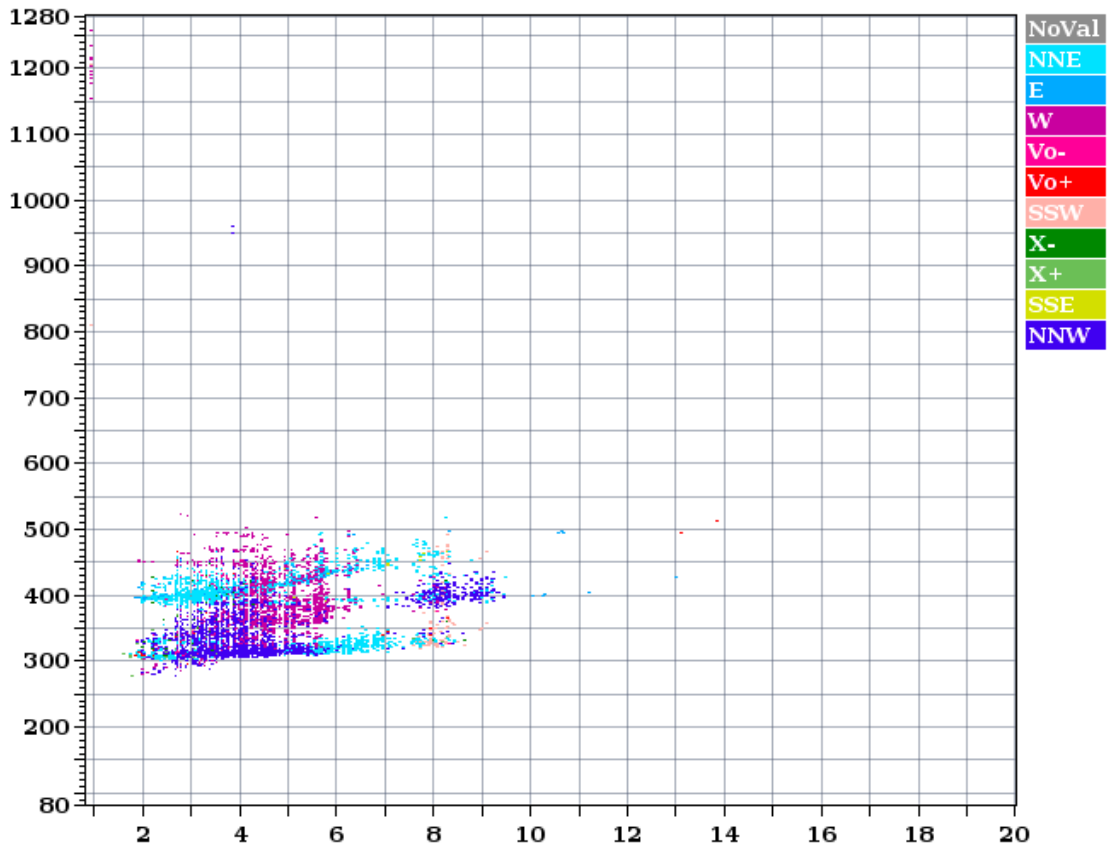
Ionosphere

Responsible: Laysa Resende

Boa Vista:

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

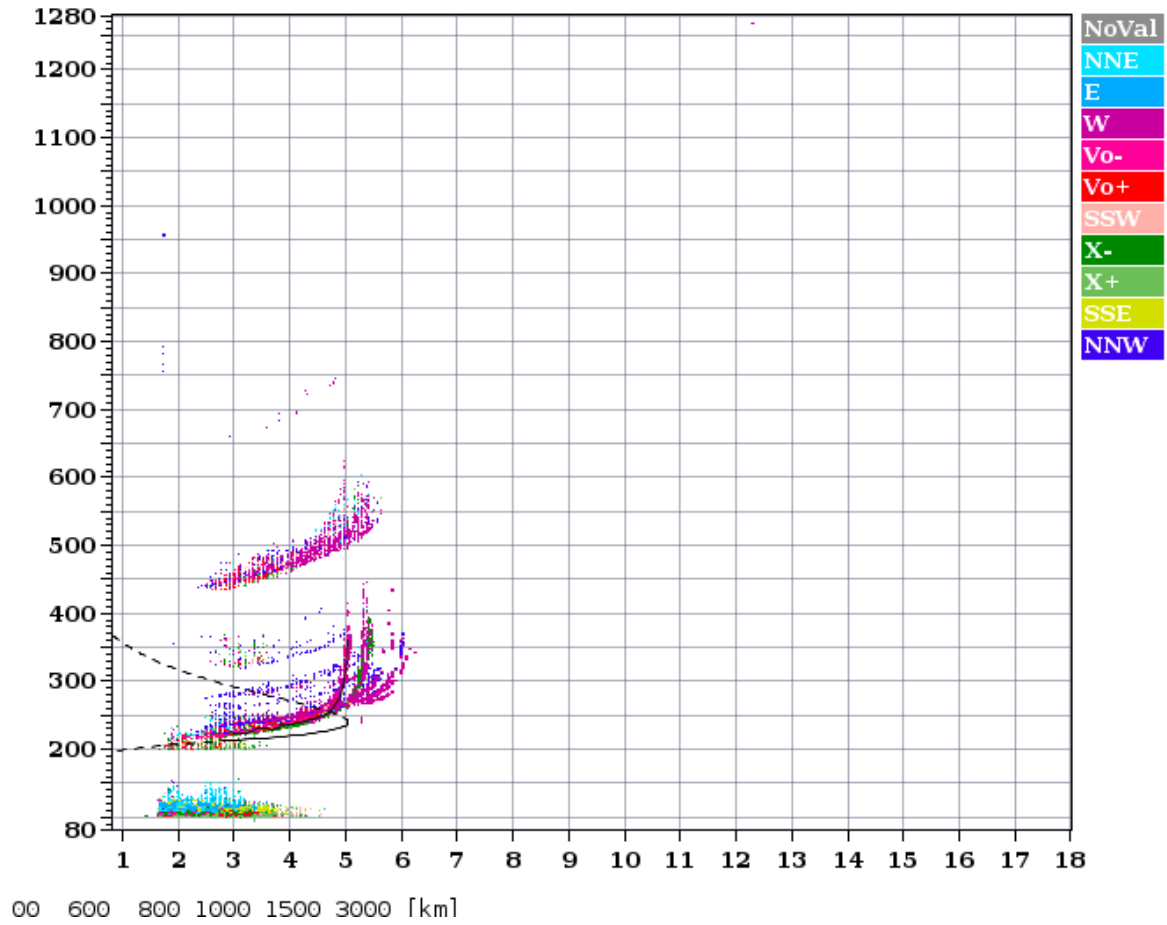
Station YYYY DAY DDD HHMMSS P1 FFS S AXN PPS IGA PS
Boa Vista 2022 Mar05 064 003000 RSF 005 2 713 100 03+ 30



Cachoeira Paulista:

- There were spread F during all days in this week.
- The Es layers reached scale 4 on day 02.

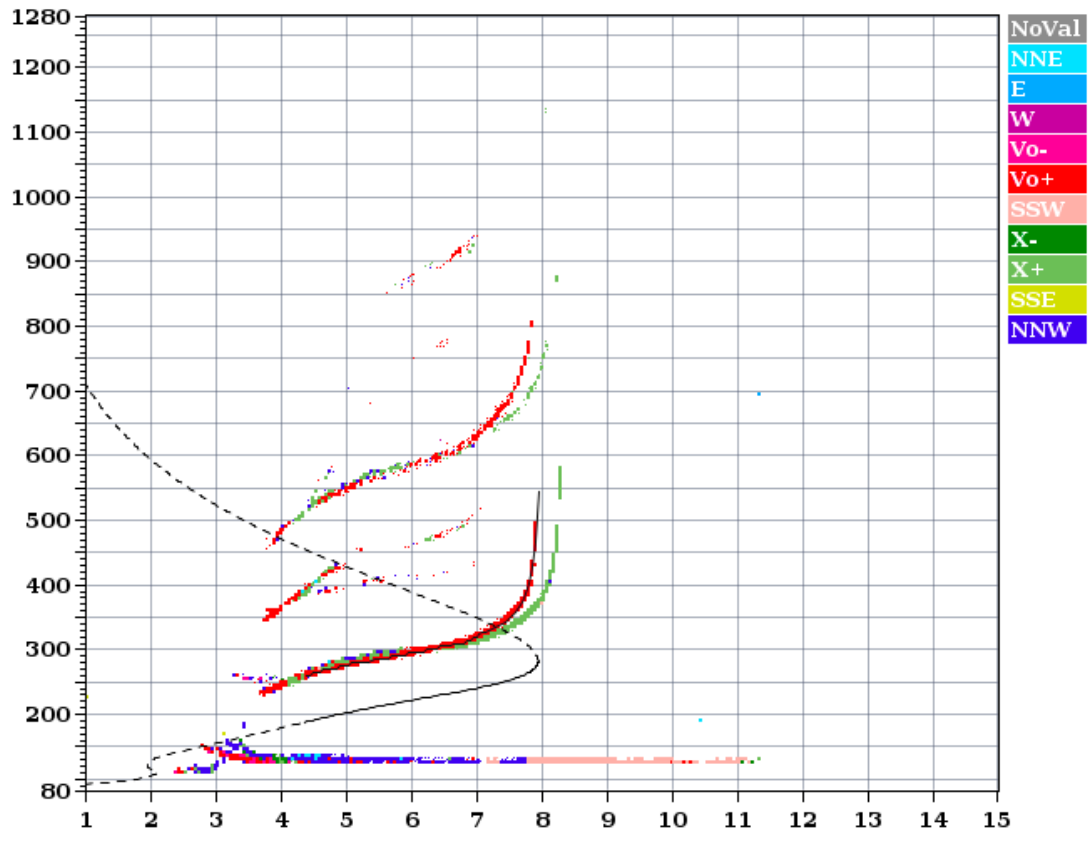
Station YYYY DAY DDD HMMSS P1 FFS S AXN PPS IGA PS
 Cachoeira Paulista 2022 Mar02 061 050000 RSF 005 2 713 100 03+ 36



São Luís:

- There were spread F during all days in this week.
- The Es layers reached scale 5 on day 03.

Station YYYY DAY DDD HHMMSS P1 FFS S AXN PPS IGA PS
 SaoLuis 2022 Mar03 062 100000 RSF 1 715 100 00- 11



Scintillation S4

Responsible: Siomel Savio Odriozola

In this report on the S4 scintillation index, data from SLMA in São Luíz/MA, PALM in Palmas/RN, 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.

Except for March 05 and 06, moderate values of the S4 index (> 0.5) were measured throughout the week at the SLMA and PALM stations (Figure 1). On 02/28-03/03 the UFBA station had no data and the rest of the week showed strong S4 values (> 0.8). Finally, SJCE station detected strong S4 values on 02/28, 03/01 and 03/05 as shown in Figure 2.

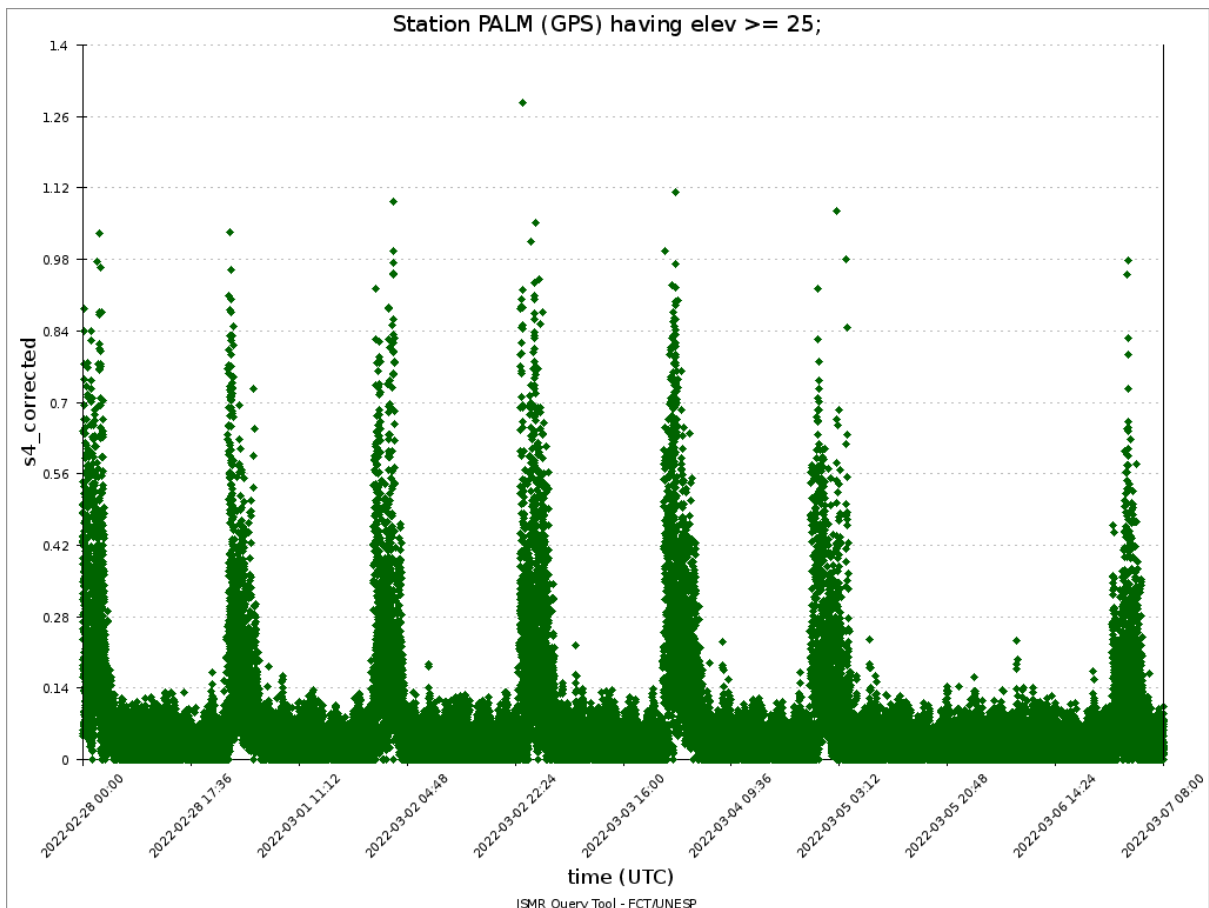
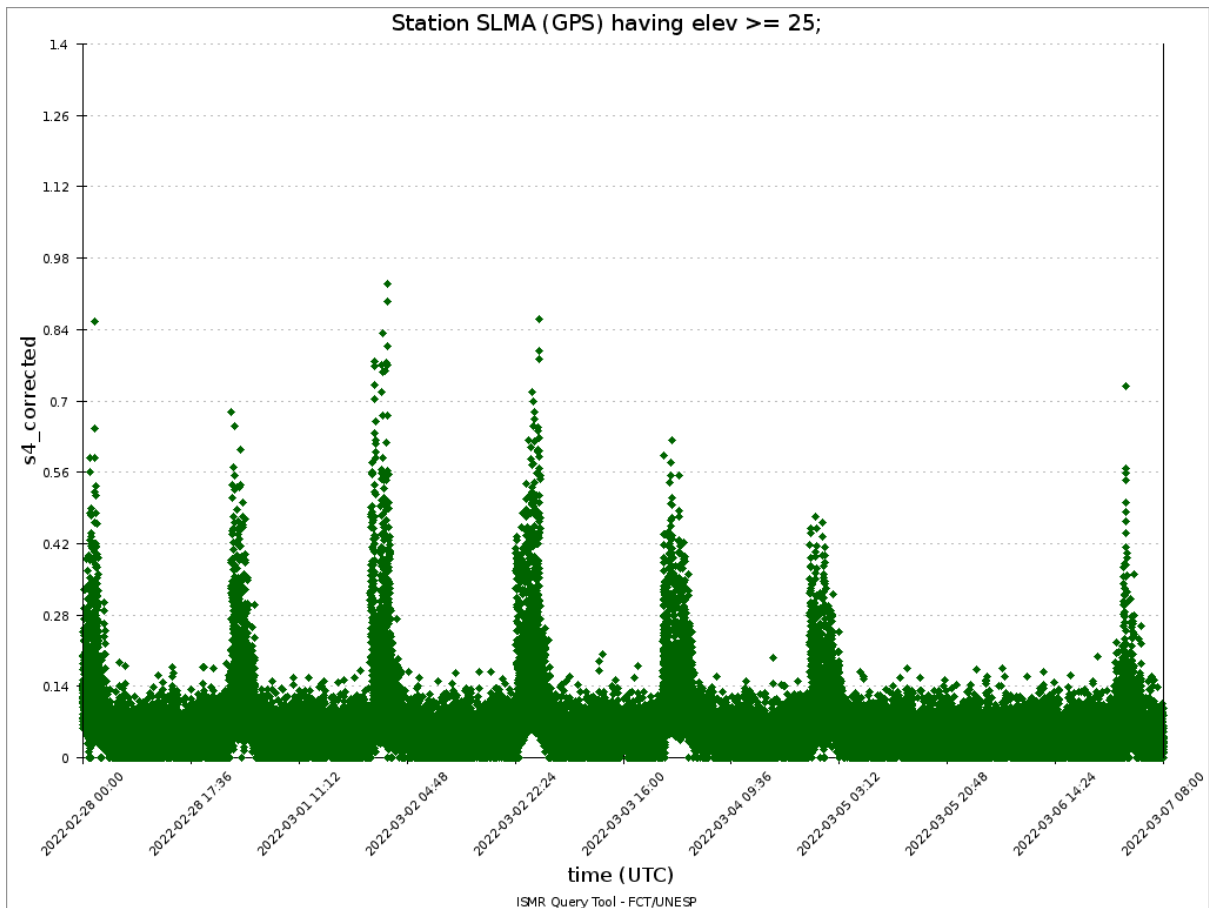
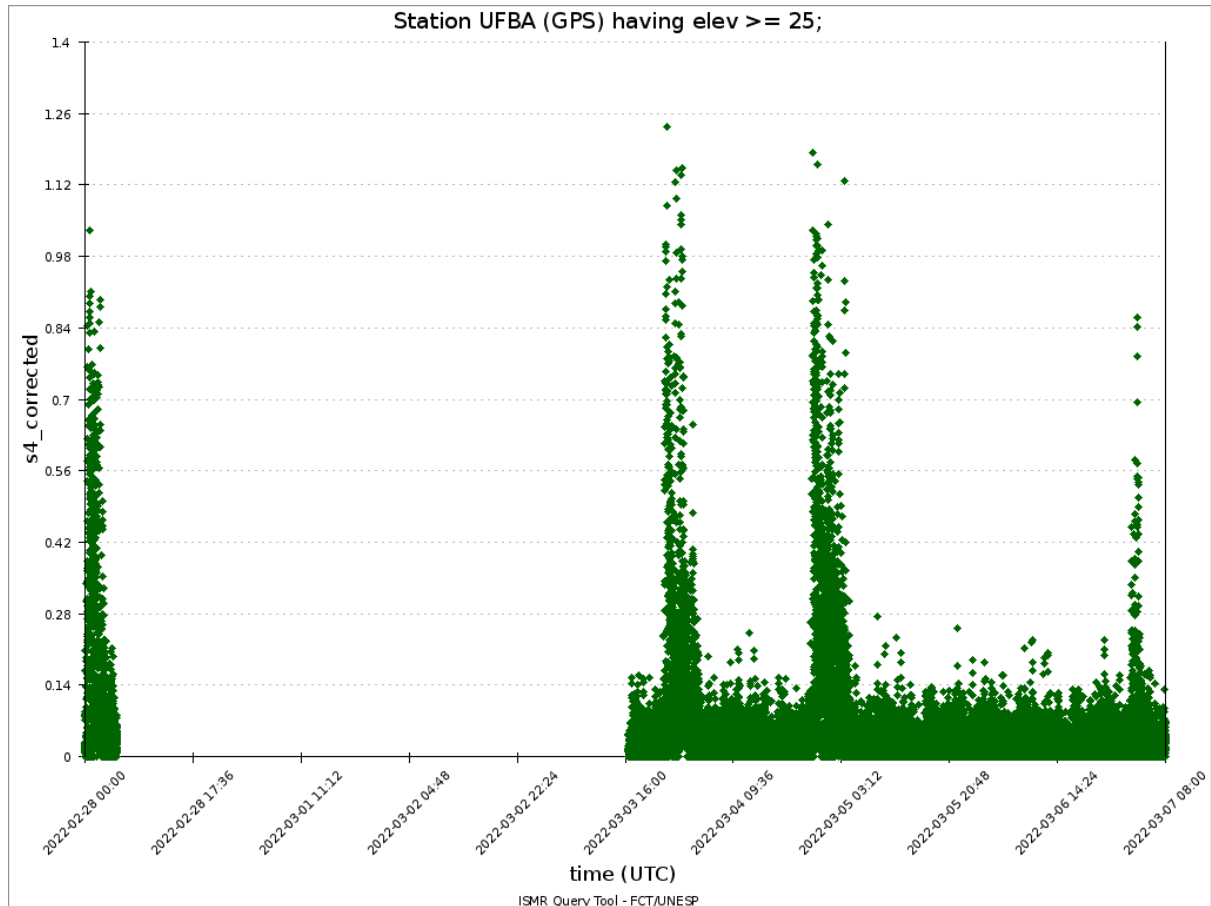


Figure 1: S4 index values for the GPS constellation for the station SLMA (upper panel) and PALM (lower panel) during the week 02/28—03/07/2022.



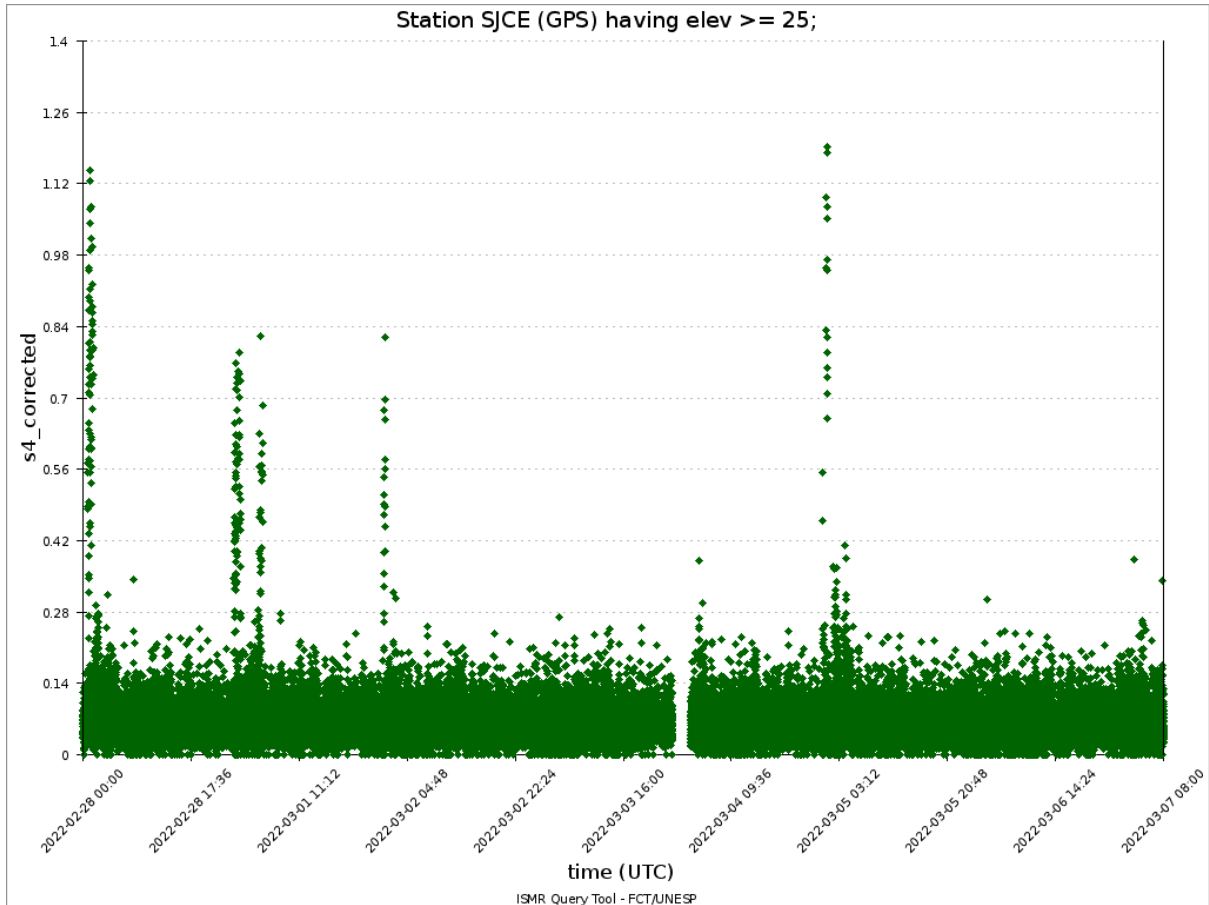


Figure 1: S4 index values for the GPS constellation for the station UFBA (upper panel) and SJCE (lower panel) during the week 02/28—03/07/2022.

All-Sky Imager

Responsible: Prosper Nyassor

All-Sky Imager EPBs Observation || Feb 28 - Mar 06, 2022

Observatory	Feb 28	Mar 01	Mar 02	Mar 03	Mar 04	Mar 05	Mar 06
Observatório	Fev 28	Mar 01	Mar 02	Mar 03	Mar 04	Mar 05	Mar 06
CA	✓☾	✓☾	✓☾	✓☾	✓☾	✓☾	✓☾
BJL	✓☾	✓☾	✓☾	✓☾	✓●	✓●	✓☾
CP	✓☾	✓☾	✓☾	✓☾	✓●	✓☾	✓☾
SMS	✓●	✓☾	✓○	✓○	✓☾	✓●	✗
CA	São João do Cariri						
BJL	Bom Jesus da Lapa						
CP	Cachoeira Paulista						
SMS	São Martinho da Serra						
✓	Observation						
✗	No Observation						
○	Clear sky						
☾	Partly Cloudy						
●	Cloudy						

- Between February 28 and March 06, 2022, there were plasma bubbles observations over Brazilian region.
- At the São João do Cariri observatory, between February 28 and March 06, there were observations with plasma bubble activity even though the sky was partially cloudy.
- At the Bom de Jesus da Lapa observatory, except March 04 and 05 that the sky was totally cloudy, the rest of the days were partially cloudy. For the days with partial cloudy sky, plasma bubbles were observed.
- At the Cachoeira Paulista observatory, between February 28 and March 06, there were observations with partially cloudy sky except for March 04 that the sky was totally cloudy. There were observations of plasma bubbles on the days with partial cloudy sky.
- Finally, in São Martinho da Serra, there were no observation on March 06. On February 28 and March 05 the sky were totally cloudy whereas, on March 01 and 04, the sky was partially cloudy. On March 02 and 03, the sky was clear. For the clear sky and partially cloudy sky, plasma bubble were observed

TEC Map

- Between February 28 and March 06, 2022, TEC maps showed plasma bubbles signature throughout the week. In addition, equatorial ionization anomalies

were observed.