Briefing Space Weather - 2022/04/04

Sun

Responsible: José Cecatto

03/28 – Fast (=< 600 km/s) wind stream; 6 CME can have component toward the Earth;
03/29 – Fast (=< 450 km/s) wind stream; No CME toward the Earth;
03/30 – Fast (=< 450 km/s) wind stream; 8 CME can have component toward the Earth;
03/31 – Fast (=< 600 km/s) wind stream; 4 CME can have component toward the Earth;
04/01 – Fast (=< 500 km/s) wind stream; 5 CME can have component toward the Earth;
04/02 – Fast (=< 600 km/s) wind stream; 4 CME can have component toward the Earth;
04/03 – Fast (=< 500 km/s) wind stream; 6 CME can have component toward the Earth;
04/04 – Fast (=< 500 km/s) wind stream with a trend of stability; 1 CME can have component toward the Earth;
Prev.: Fast wind expected up to April 05; for while low (65% M, 25% 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 (CMEs 2022-03-28T12:09Z and 2022-03-28T20:23)
● The simulation shows that the combined CMEs on Earth arrival forecast will occur on the
following date: between 2022-03-30T23:29Z and 2022-03-31T12:03Z.
WSA-ENLIL (Prediction for CME 2022-03-30T18:23Z)
● The simulation shows that the CME on Earth arrival forecast will occur on the following date:
between2022-04-02T04:06Z and 2022-04-03T02:26Z.
WSA-ENLIL (CME 2022-03-31T19:09Z)

● The simulation results indicate that the flank of CME will reach the DSCOVR mission between
2022-04-03T20:00Z and 2022-04-04T10:00Z.
WSA-ENLIL (CME 2022-04-02T13:38)
● The simulation results indicate that the flank of CME will reach the DSCOVR mission between
2022-04-04T02:57Z and 2022-04-04T22:37Z..

Coronal holes (SPOCA):

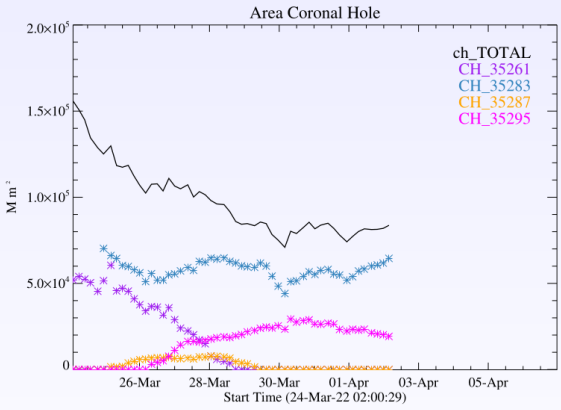


Figura: The solid line in black shows the products of the sum of areas for each detection interval performed by SPOCA between March 24 and April 02, 2022.

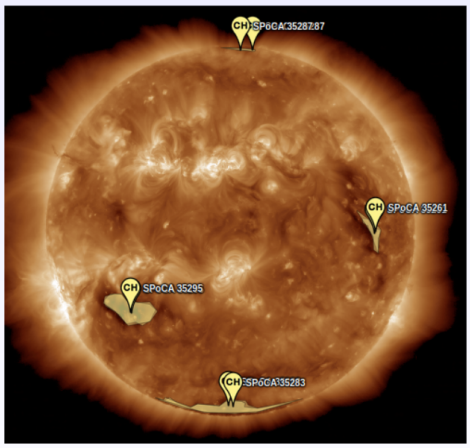
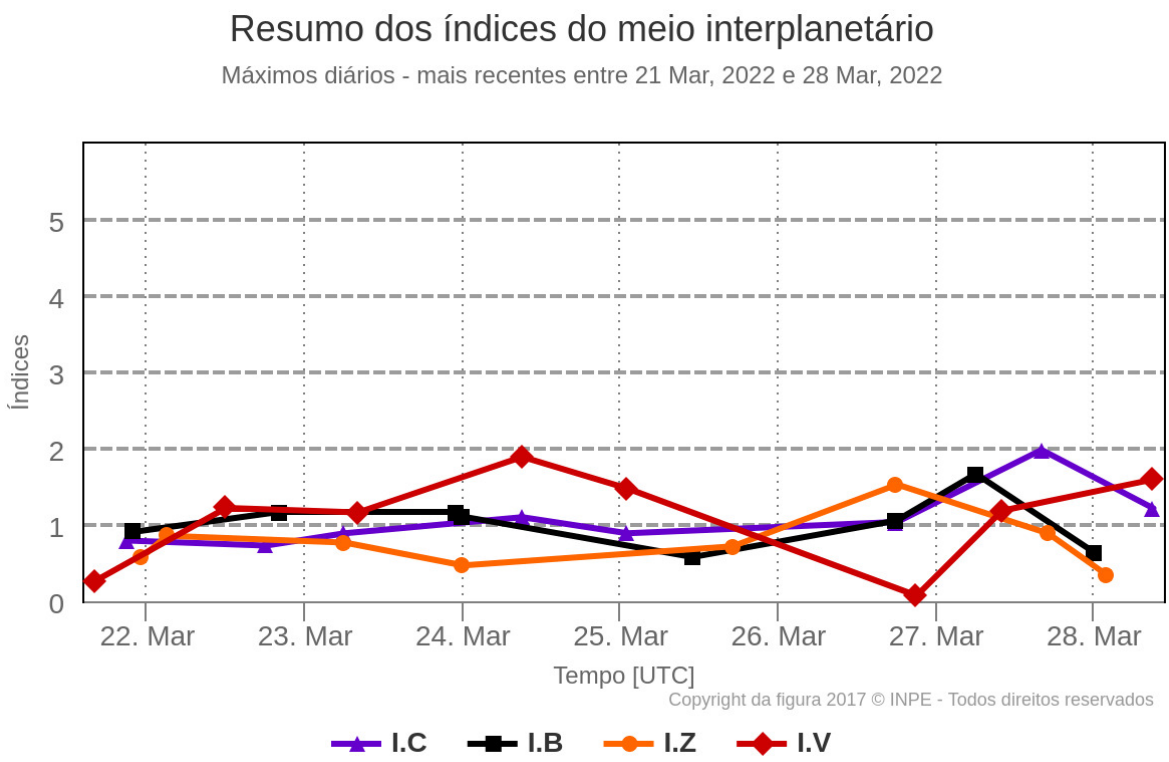
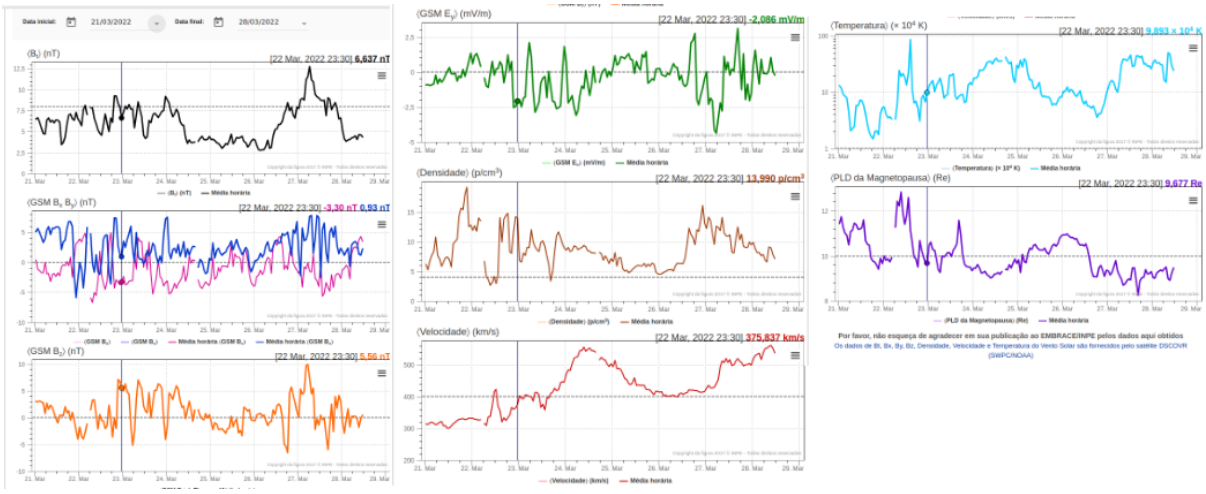


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 20:00 UT on March 27, 2022.

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

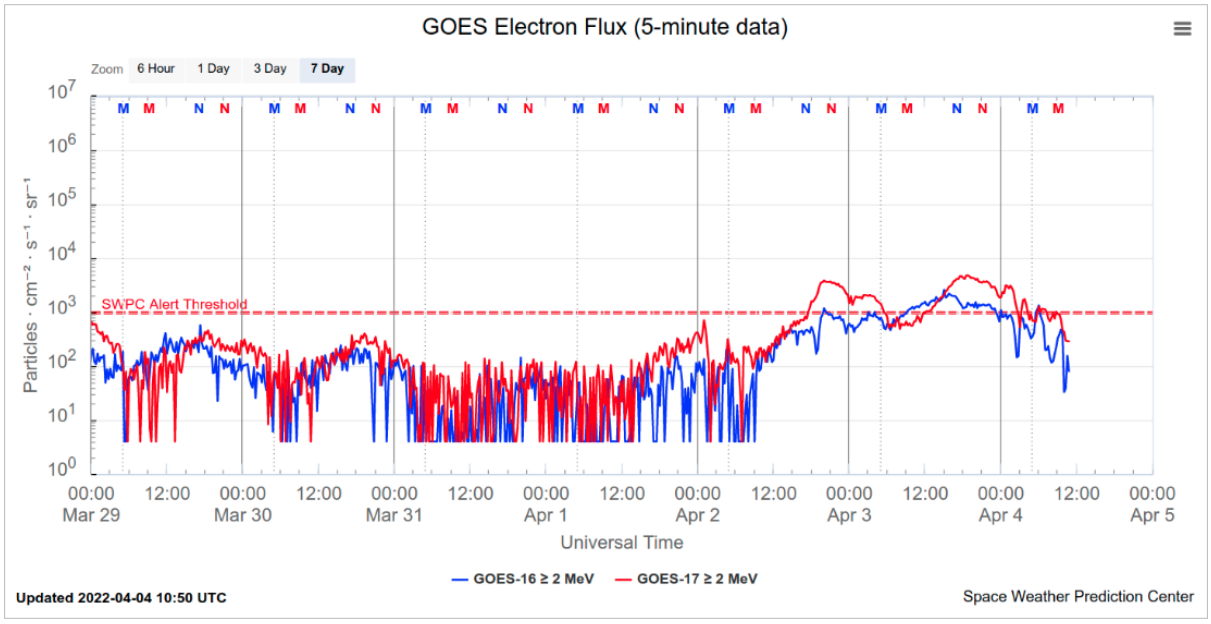


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-17 satellite. Source: https://www.swpc.noaa.gov/products/goes-electron-flux

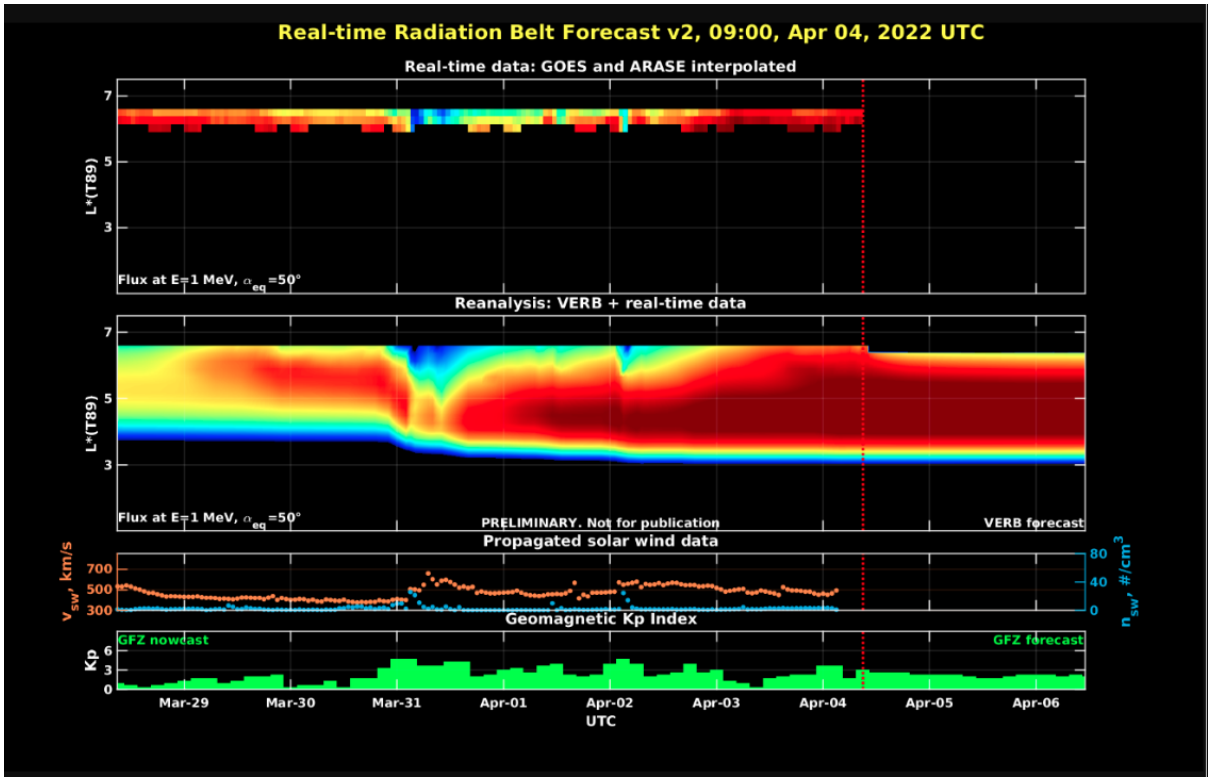


Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES-16, GOES-17
satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: https://rbm.epss.ucla.edu/realtime-forecast/

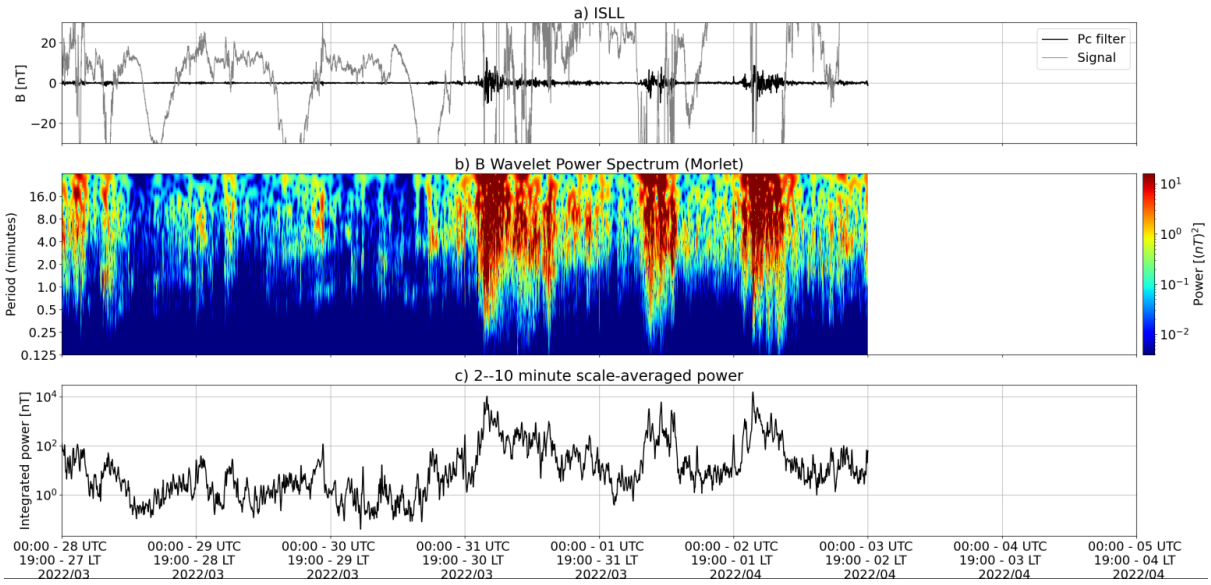
High-energy electron flux (>2 MeV) in the outer boundary of the outer radiation belt obtained from geostationary satellite data GOES-16 and GOES-17 (Figure 1) is confined close to 102 particles/(cm2 s sr) between March 29th and the beginning of the 31st of March. An electron flux decrease is observed from 03:00 Z on March 31st. This electron flux decrease persisted until mid-April 1st. A significant electron flux decrease was observed from 12:00 on April 1st, surpassing the threshold of 103 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 31st reached L-shell > 3.5, while the electron flux increase covered all the L-shell of the outer radiation belt. These variations in electron flux occurred concomitantly with the arrival of coronal mass ejections, named cannibals, and ULF wave activities. However, it is important to point out that the data from the ARASE satellite are not available for the

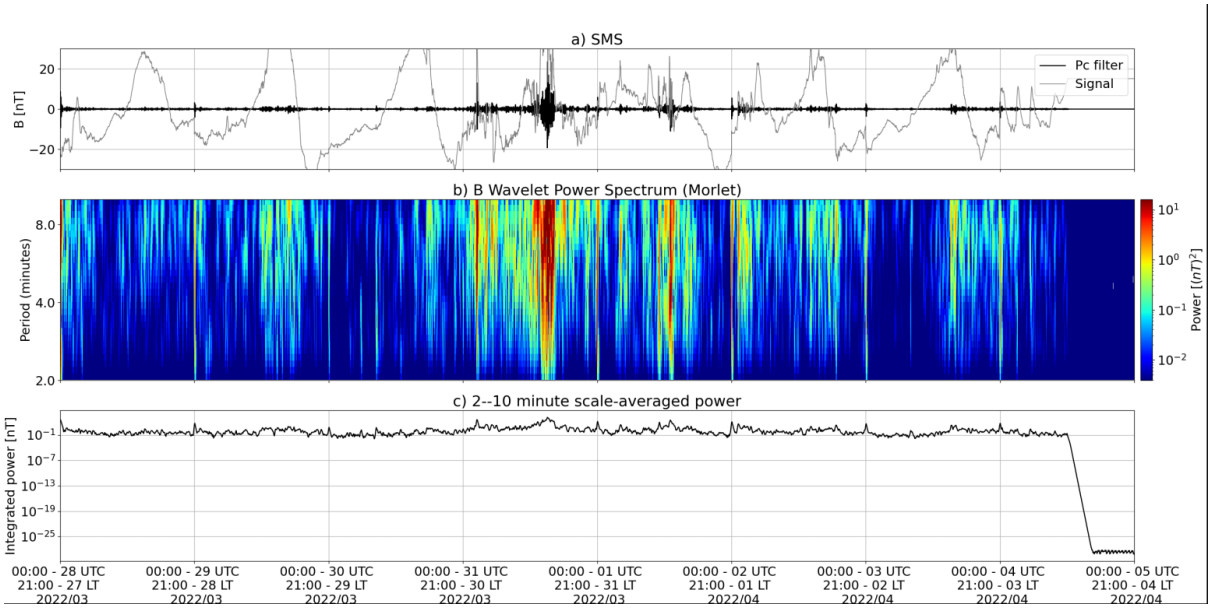
week under analysis to confirm the L-shell level of this referred electron flux decrease.

ULF waves in the Magnetosphere

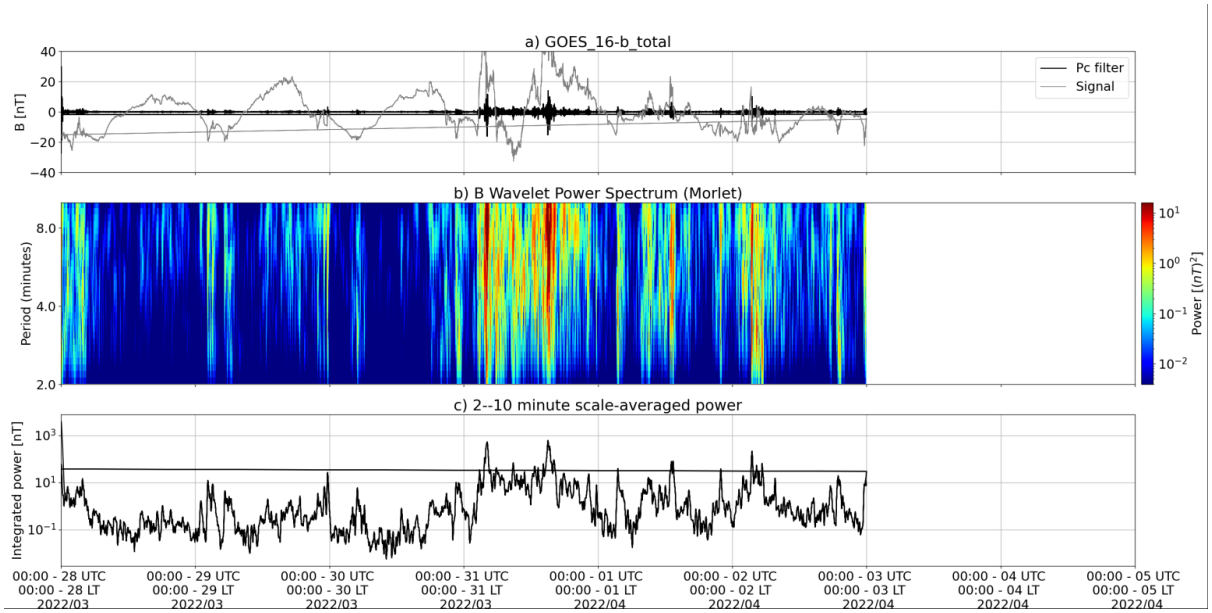
Responsible: José Paulo Marchezi



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 SMS 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).



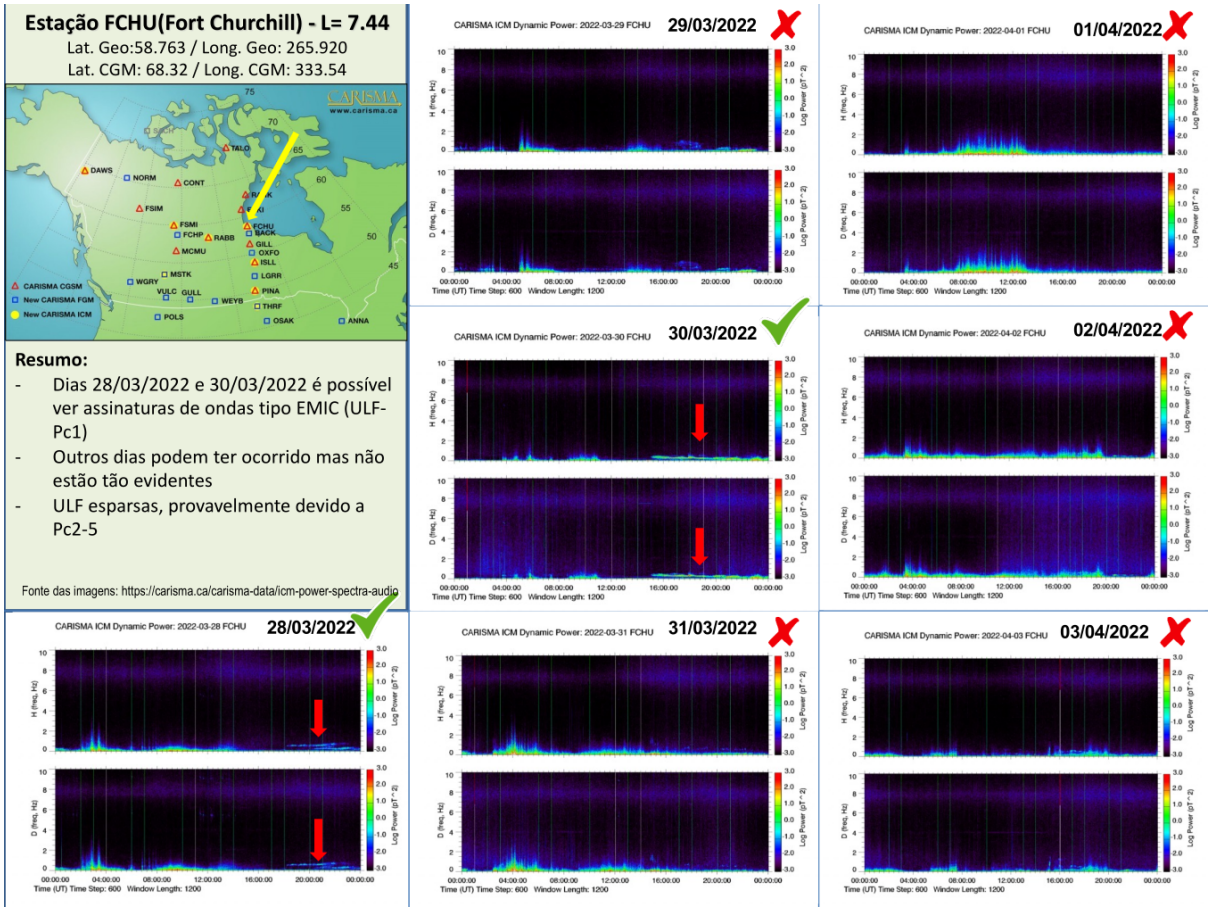
a) signal of the total magnetic field measured by the GOES 16 satellite, together with the fluctuation in the range of Pc5 in black. b) Wavelet power spectrum of the filtered signal. c) Average spectral power in the ranges from 2 to 10 minutes (ULF waves).

L'attività dell'onda ULF mostra un aumento di potenza dal 31 marzo sotto forma di variazioni brusche, rilevate dalle alte latitudini ai magnetomerti alle basse latitudini della rete EMBRACE (Figura 2, SMS). Nei giorni 1 e 2 aprile si osservano nuovi incrementi di potenza ULF della durata di circa 10 ore alle alte latitudini e con caratteristica impulsiva prevalentemente nei magnetometri della rete EMBRACE e del satellite GOES. Il 4 aprile si osserva una nuova attività, meno intensa rispetto ai

giorni precedenti, rilevata con maggiore intensità nel magnetometro RGA della rete EMBRACE.

EMIC waves in the Magnetosphere

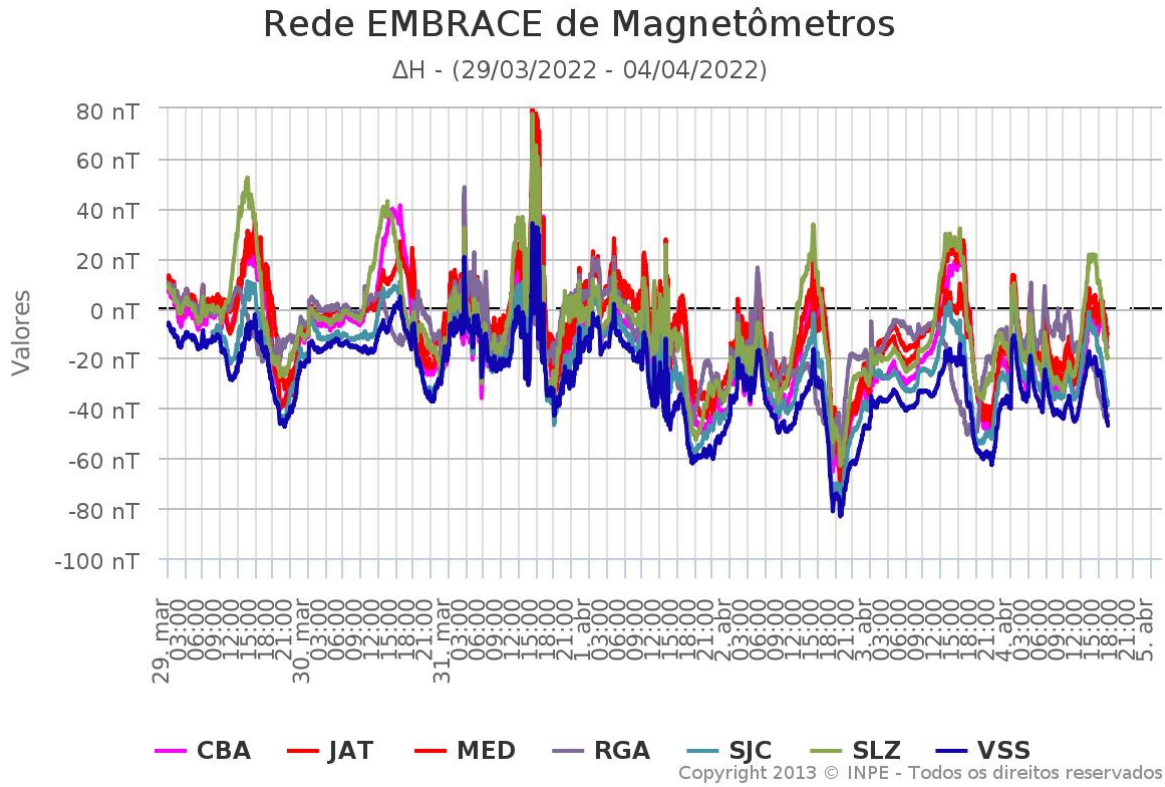
Responsible: Claudia Medeiros



- Days 03/28/2022 and 03/30/2022 is possible see EMIC type wave signatures (ULF-Pc1)
- Other days may have occurred but not are so evident
- sparse ULF, probably due to Pc2-5

Geomagnetism

Responsible: Livia Ribeiro Alves


Rede EMBRACE de Magnetômetros
ΔH - (29/03/2022 - 04/04/2022)
Valores
80 nT
60 nT
40 nT
20 nT
0 nT
-20 nT
-40 nT
-60 nT
-80 nT
-100 nT
29. mar
30. mar
31. mar
1. abr
2. abr
3. abr
4. abr
5. abr
CBA
JAT
MED
RGA
SJC
SLZ
VSS
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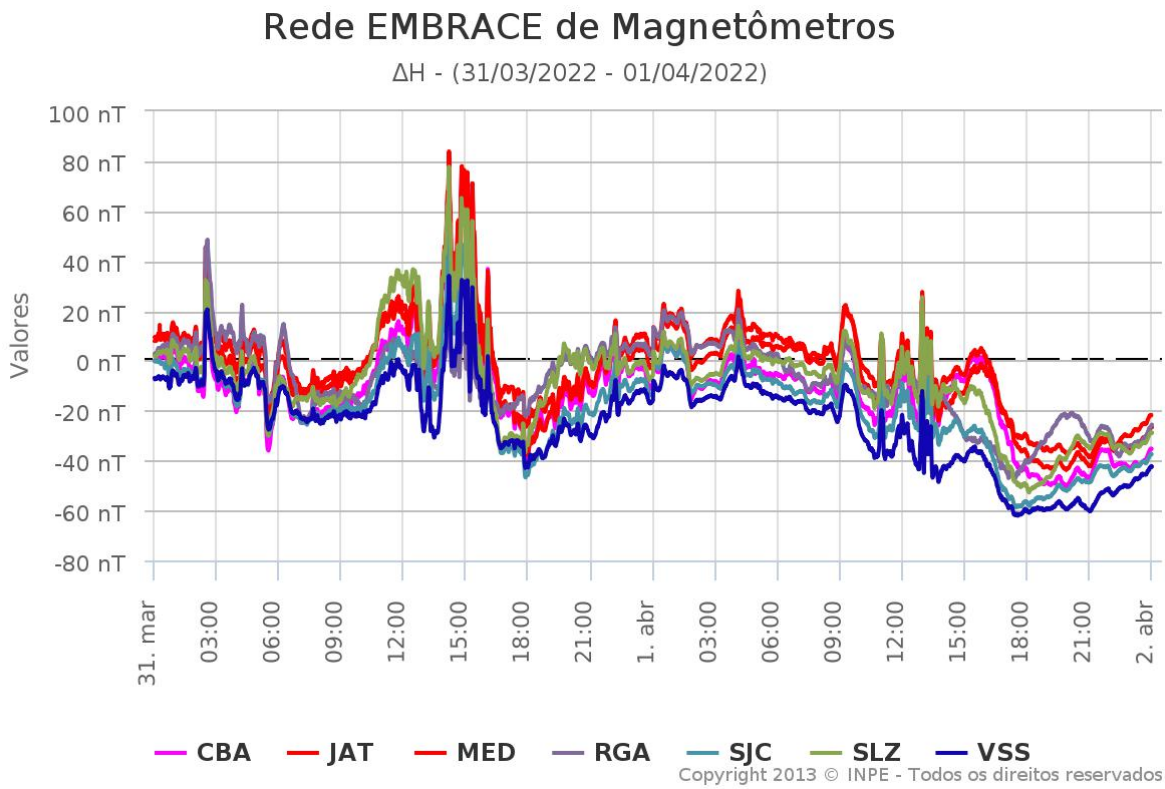
Rede EMBRACE de Magnetômetros
ΔH - (31/03/2022 - 01/04/2022)
Valores
100 nT
80 nT
60 nT
40 nT
20 nT
0 nT
-20 nT
-40 nT
-60 nT
-80 nT
31. mar
03:00
06:00
09:00
12:00
15:00
18:00
21:00
1. abr
03:00
06:00
09:00
12:00
15:00
18:00
21:00
2. abr
CBA
JAT
MED
RGA
SJC
SLZ
VSS
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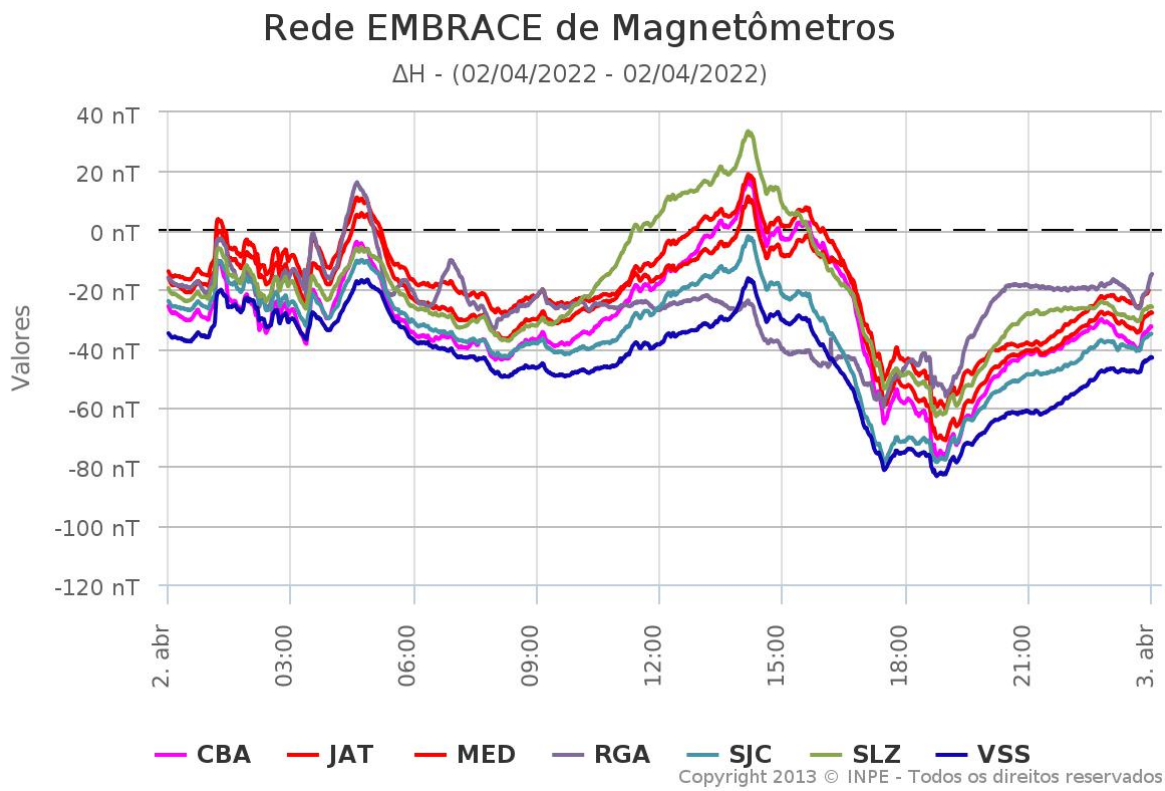
Rede EMBRACE de Magnetômetros
ΔH - (02/04/2022 - 02/04/2022)
Valores
40 nT
20 nT
0 nT
-20 nT
-40 nT
-60 nT
-80 nT
-100 nT
-120 nT
2. abr
03:00
06:00
09:00
12:00
15:00
18:00
21:00
3. abr
CBA
JAT
MED
RGA
SJC
SLZ
VSS
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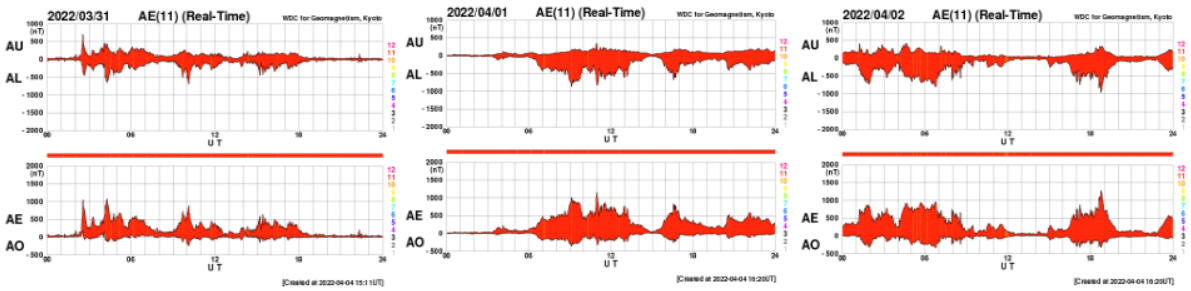
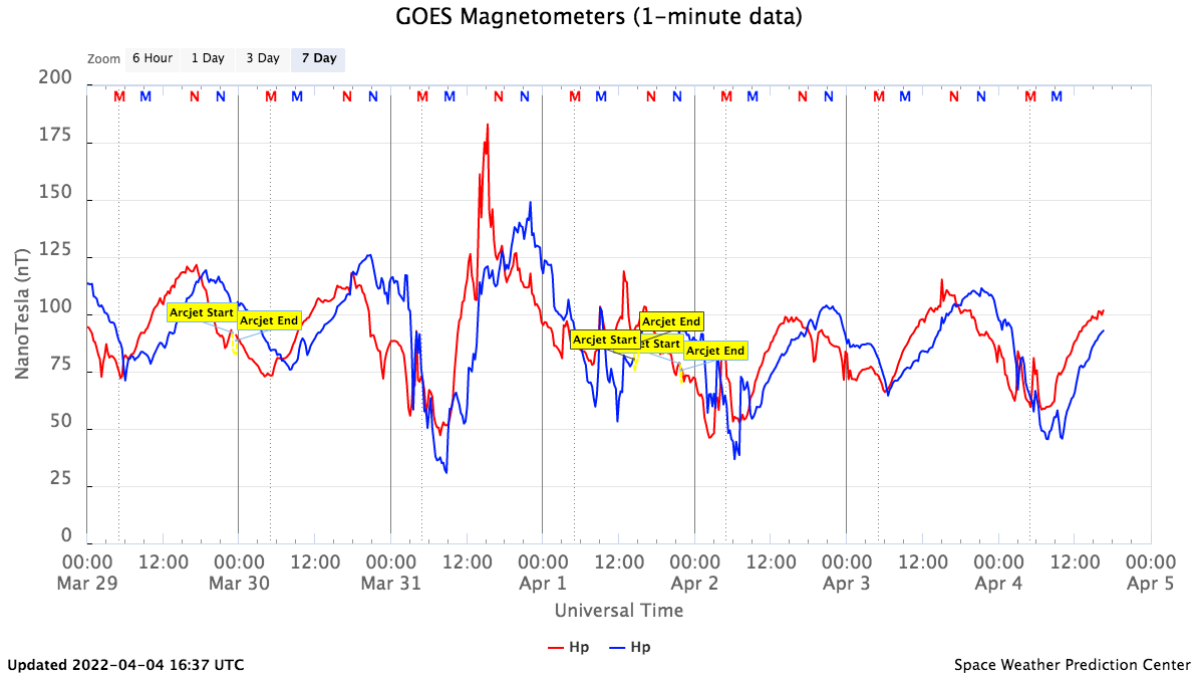
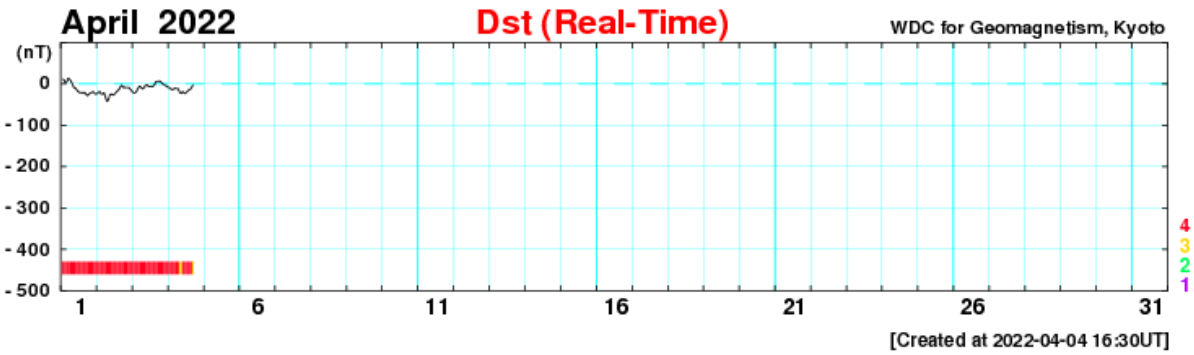
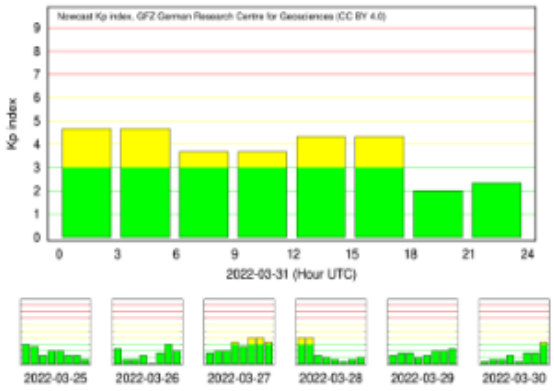
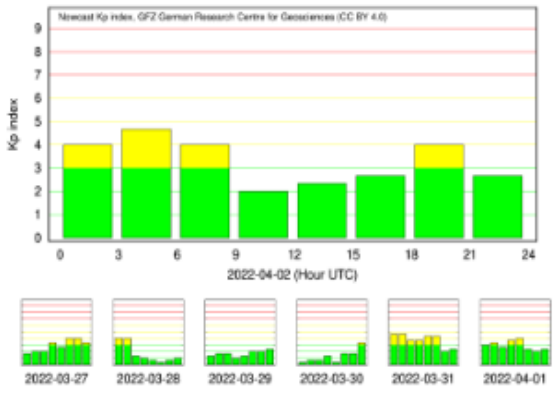

2022/03/31
AE(11) (Real-Time)
2022/04/01
AE(11) (Real-Time)
2022/04/02
AE(11) (Real-Time)
AU
AL
AE
AO
U T









- Data from the MagNet showed instabilities throughout the period, with persistent oscillations, several sudden impulses, and a geomagnetic storm recorded.

03/31 H component of magnetometers increased up to +80nT

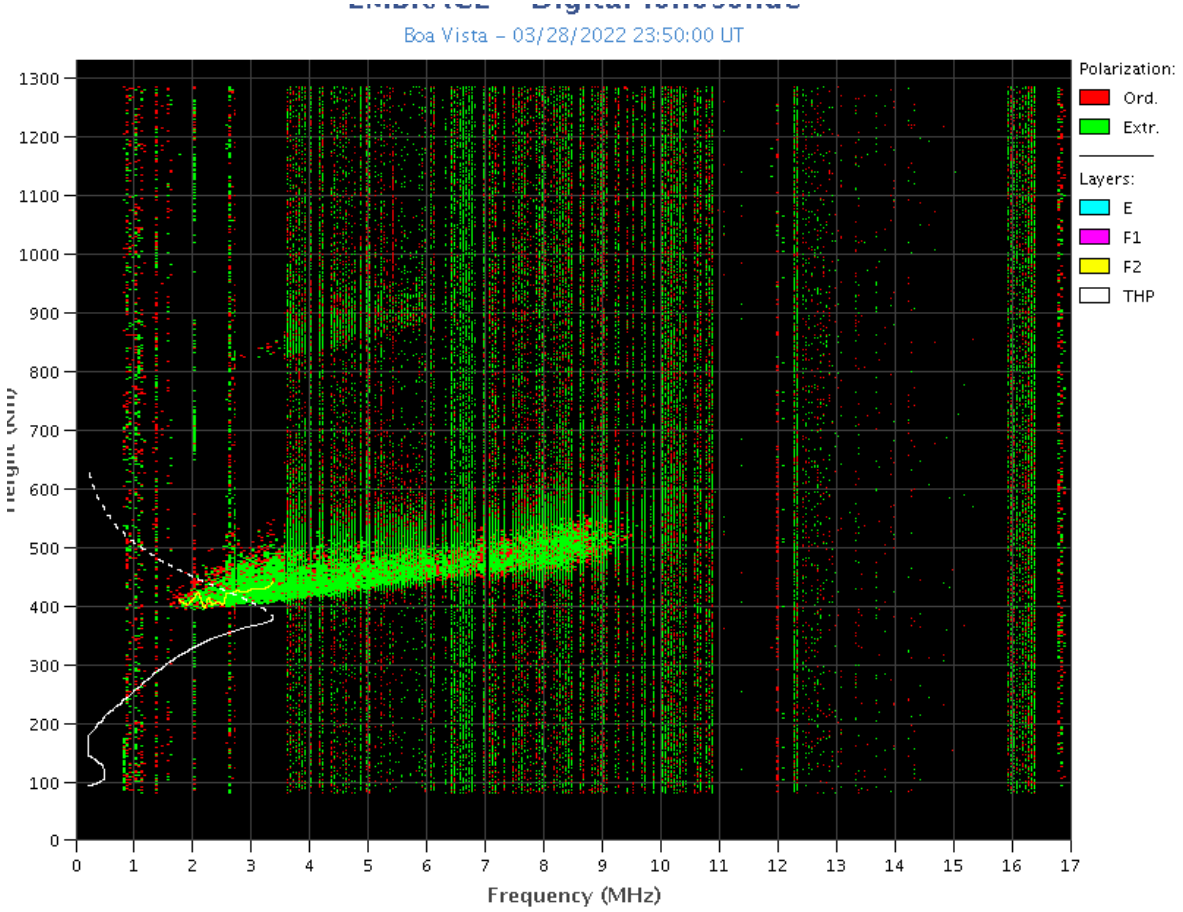
- The Dst index reached its minimum value of -42 nT on 01/04. The highest Kp of the week was 5- recorded on 03/31
- The auroral activity was slightly intensified on the 31st, 01st, and 02/04.
- Magnetic field measured in the orbit of the GOES satellite showed disturbances on 03/31.

Ionosphere

Responsible: Laysa Resende

Boa Vista: Available data until March 29.

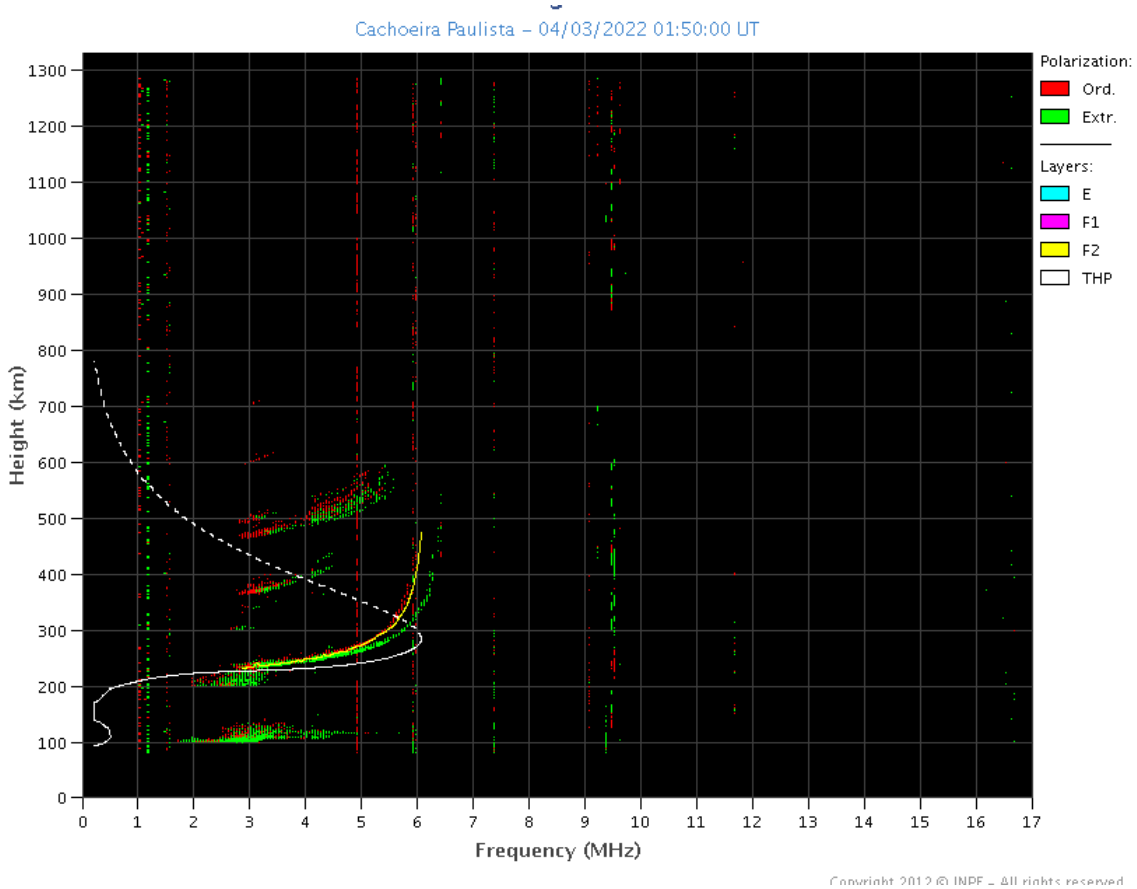
- There were spread F during all days in this week.
- The Es layers reached scale 3 on March 29



Cachoeira Paulista:

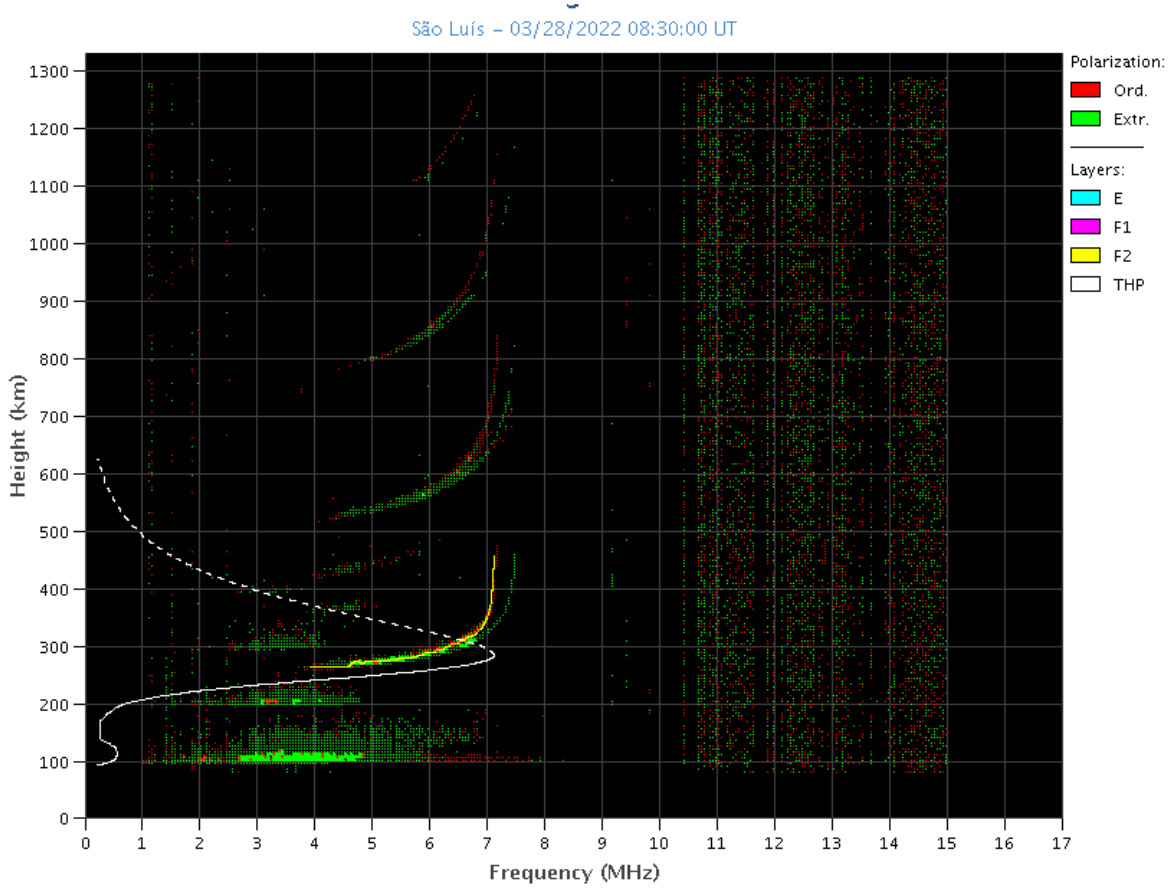
- Do not occurr spread F during the week.

- The Es layers reached scales 3 on March 28 and April 03.



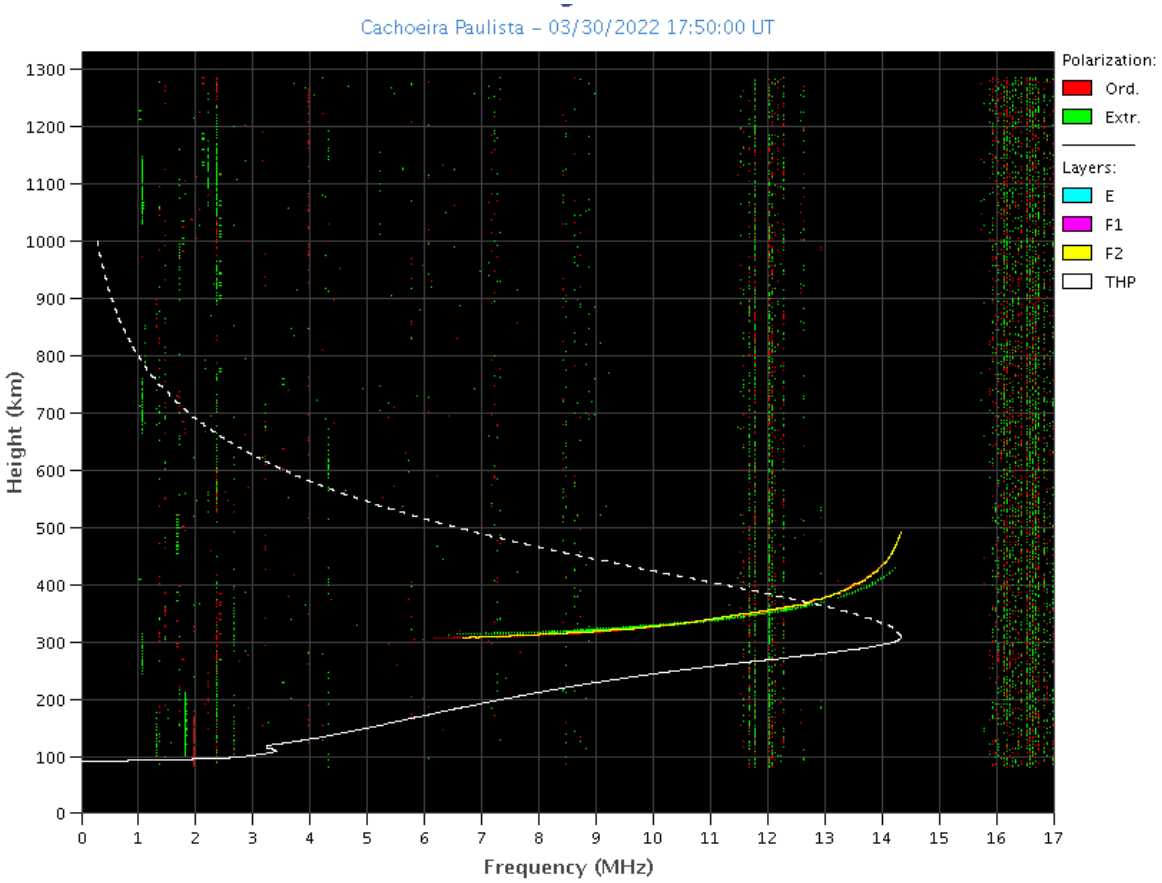
São Luís:

- There were spread F during all days in this week.
- The Es layers reached scales 4 on March 28.



Blackout:

- There was parcial blackout in the ionosonde data on March 20 due to the solar flare X.



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.

Moderate values of the S4 index (> 0.5) were measured over the first five days of the week described in this report at both the SLMA station and the STSN station (Figure 1). At the UFBA station, scintillation events only appeared on the 28th, 30th of March and 04th of April. In the case of the SJCE station, there were no scintillation events throughout the week (Figure 2) which confirms that bubble´s season in Brazilian territory begins to enter its final stage.

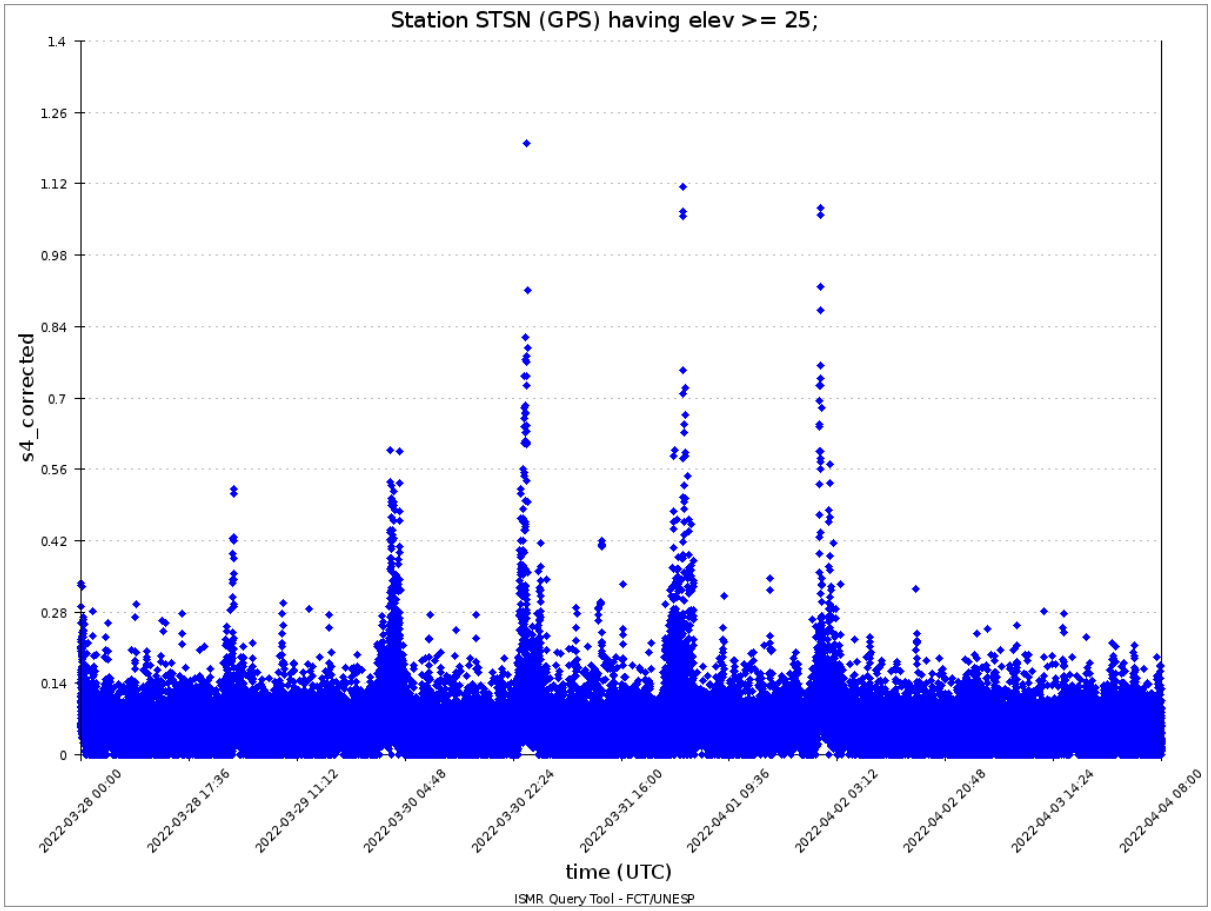


Figure 1: S4 index values for the GPS constellation measured at STSN station during the week from 03/28 to 04/04/2022.

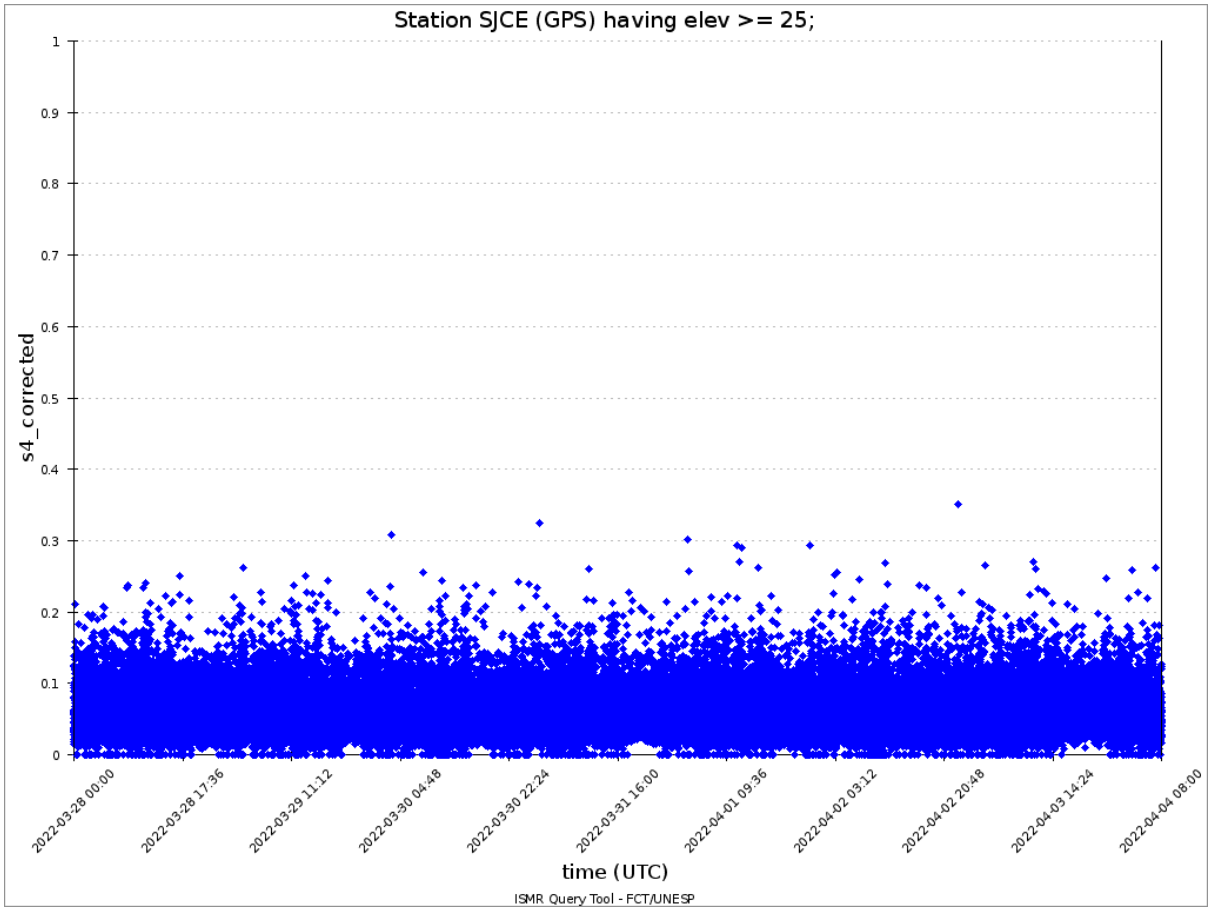


Figure 2: S4 index values for the GPS constellation measured at SJCE station during the week from 03/28 to 04/04/2022.

All-Sky Imager

Responsible: Cosme Alexandre

All-Sky Imager EPBs Observation || Mar 27 - Apr 02, 2022
Observações das EPBs por meio do imageador All-Sky - || 27 mar - 02 abril, 2022

Observatory Observatório	Mar 27 Mar 27	Mar 28 Mar 28	Mar 29 Mar 29	Mar 30 Mar 30	Mar 31 Mar 31	Apr 01 abril 01	Apr 02 abril 02
CA	✓◗	✓◗	✓◗	✓◗	✓◗	✓◗	✓◗
BJL	✓❍	✓❍	✓❍	✓❍	✓❍	✓❍	✓❍
CP	✓●	✓●	✓◗	✓◗	✓●	✓●	✓●
SMS	✓◗	✓◗	✓◗	✓◗	✓◗	✓◗	✓◗

CA	São João do Cariri
BJL	Bom Jesus da Lapa
CP	Cachoeira Paulista
SMS	São Martinho da Serra

✓	Observation - Observação
✗	No Observation - Sem Observação
❍	Clear sky - Céu limpo
◗	Partly Cloudy - Parcialmente Nublado
●	Cloudy - Nublado
✺	Blur image - Desfocar Imagem

- At the São João do Cariri observatory, plasma bubbles were observed during the entire period with the sky partially cloudy.
- At the Bom de Jesus da Lapa observatory between March 27 st and April 1st, the sky was with few clouds and plasma bubbles were observed during those days. However, on April 2nd, plasma bubbles were not observed and the sky was cloudless.
- At the Cachoeira Paulista no plasma bubbles were observed during the period. On the 29 th and 30 th of March the sky was partially cloudy, while the rest of the period the sky was cloudy .
- Finally, at the observatory of São Martinho da Serra, plasma bubbles were observed in the northern part of the images on March 29, 31 and April 2. The sky was partially cloudy throughout the period.

TEC Map

- Plasma bubbles were observed throughout the period. However, as the bubble seasonality is at the end, the bubbles have small spatial dimensions and it is not always possible to observe them in the TEC maps.