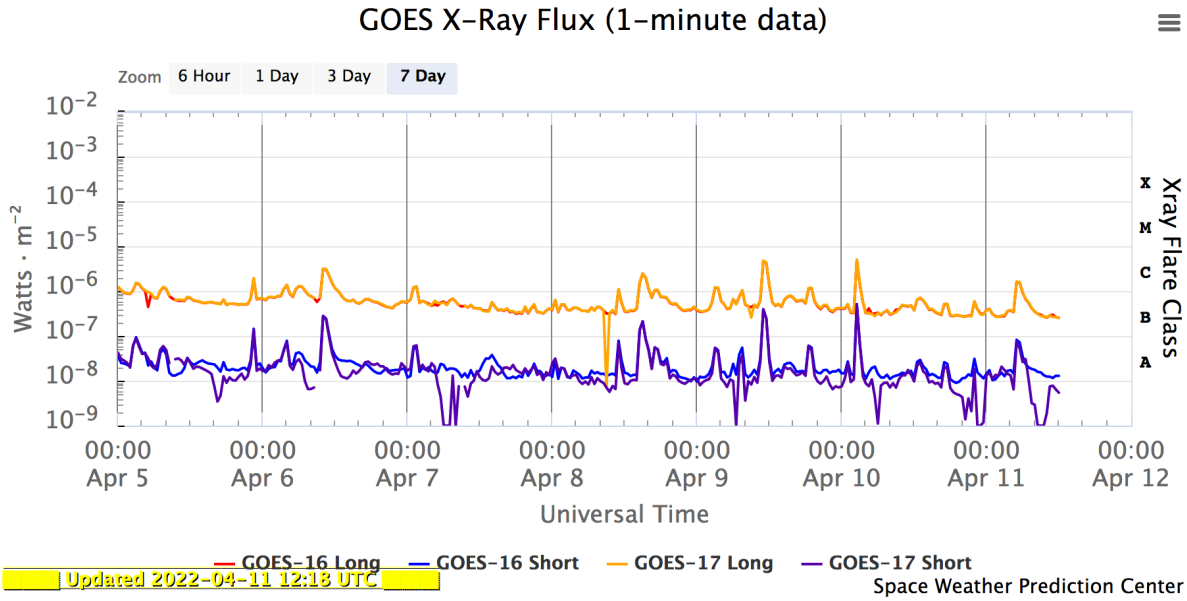
Briefing Space Weather - 2022/04/11

Sun

Responsible: José Cecatto



CMEs to the Earth – SB arrival time

- Apr. 04 – At 11:36, partial halo CME associated (ass) filam eruption ~ N23E19; Scoreboard (SB) expected arrival on April 08 from 00:23 - 06:00;
- Apr. 05 -
- Apr. 06 – At 22:45 (SB) arrival time of CME from April 03 at 16:38, ass filam eruption from SW quadrant;
- Apr. 07 -
- Apr. 08 – At 04:00 (SB) arrival of April 06 CME ! It was a weak, glancing blow, possibly lasting up to April 10 (Geomagn storm);
- Apr. 09 – At 09:12, CME ass filam eruption; SB expected arrival from April 12, at 15:13 up to
- April 13, at 02:00;

- Apr. 10 – Geomagn storm, probably due to the extended wake of April 06 CME, caused perturbed radio transmissions at Earth.
- Apr. 11 – At 06:00, halo CME ass filam eruption and C1.6 flare from S15E05 (AR 2987), SB expected arrival time on April 14 at 09:56;

Summary

04/04 – No fast wind stream; 14 CME can have component toward the Earth;
04/05 – Fast (=< 450 km/s) wind stream; 3 CME can have component toward the Earth;
04/06 – No fast wind stream; 4 CME can have component toward the Earth;
04/07 – Fast (=< 450 km/s) wind stream; 4 CME can have component toward the Earth;
04/08 – No fast wind stream; 3 CME can have component toward the Earth;
04/09 – No fast wind stream; 6 CME can have component toward the Earth;
04/10 – Fast (=< 500 km/s) wind stream; 3 CME can have component toward the Earth;
04/11 – Fast (=< 550 km/s) wind stream with a trend of stability; 3 CME can have component toward the Earth;
Prev.: Fast wind expected up to April 12-13; for while low (1% 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 (CMEs 2022-04-03T17:00Z and 2022-04-03T16:38Z)
● The simulation shows that the combined CMEs on Earth arrival forecast will occur on the
following date: between 2022-04-05T23:29Z and 2022-04-06T16:28Z.
WSA-ENLIL (Prediction for CME 2022-04-04T11:36Z)
● The simulation indicates that the flank of the Coronal Mass Ejection will reach Earth between
2022-03-13T11:43Z and 2022-04-08T09:15Z.
WSA-ENLIL (CME 2022-04-09T09:12Z)
● The simulation results indicate that the flank of CME will reach the DSCOVR mission between
2022-04-12T15:00Z and 2022-04-13T05:00Z.
WSA-ENLIL (CME 2022-04-11T06:00Z)
● The simulation results indicate that the flank of CME will reach the DSCOVR

mission between
02:56Z and 16:56Z on April 14, 2022.

Coronal holes (SPOCA):

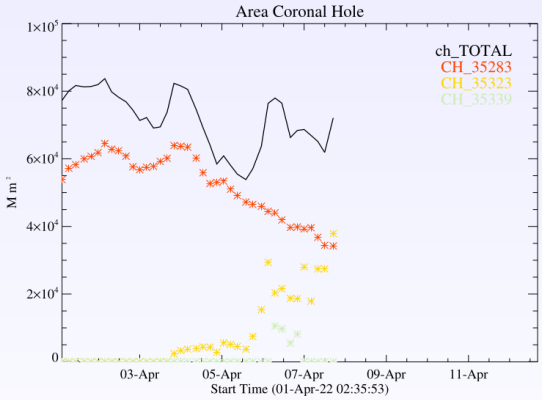


Figura: The solid line in black shows the products of the sum of areas for each detection interval performed by SPOCA between April 1st and 8th, 2022.

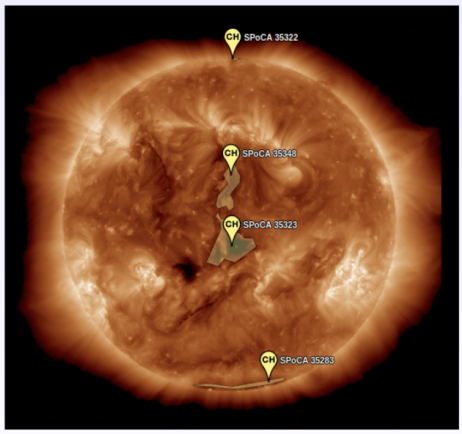
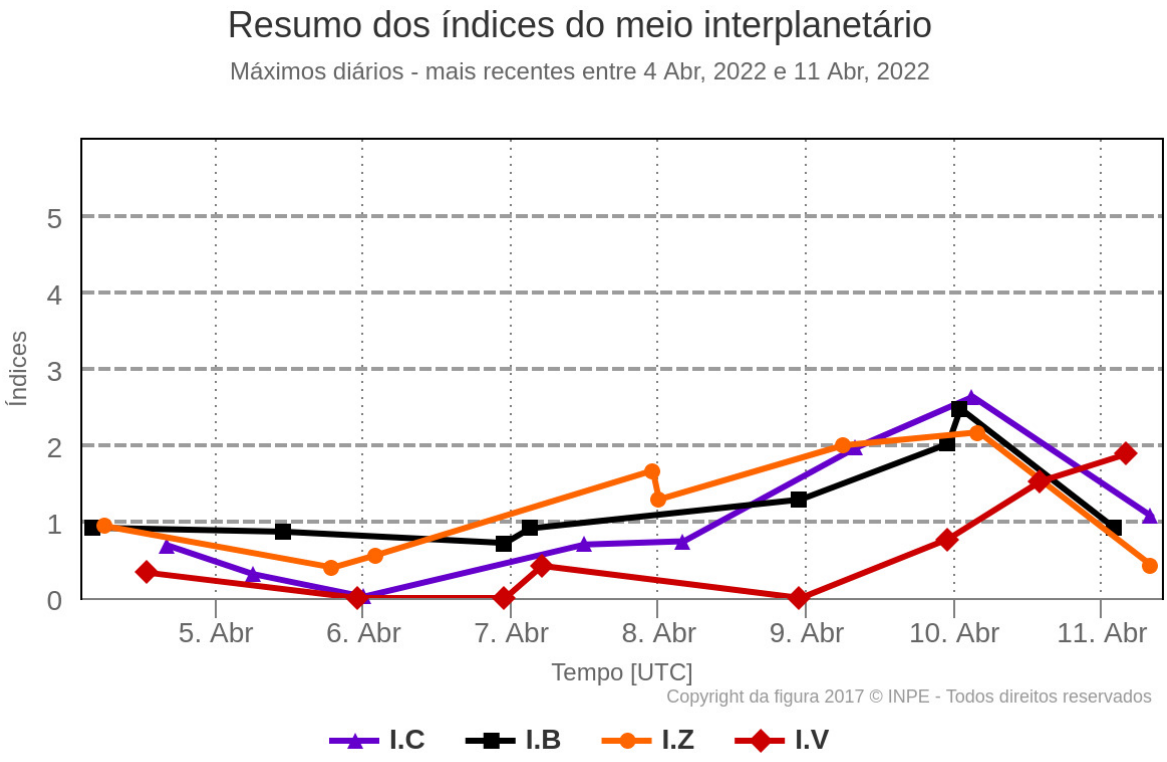
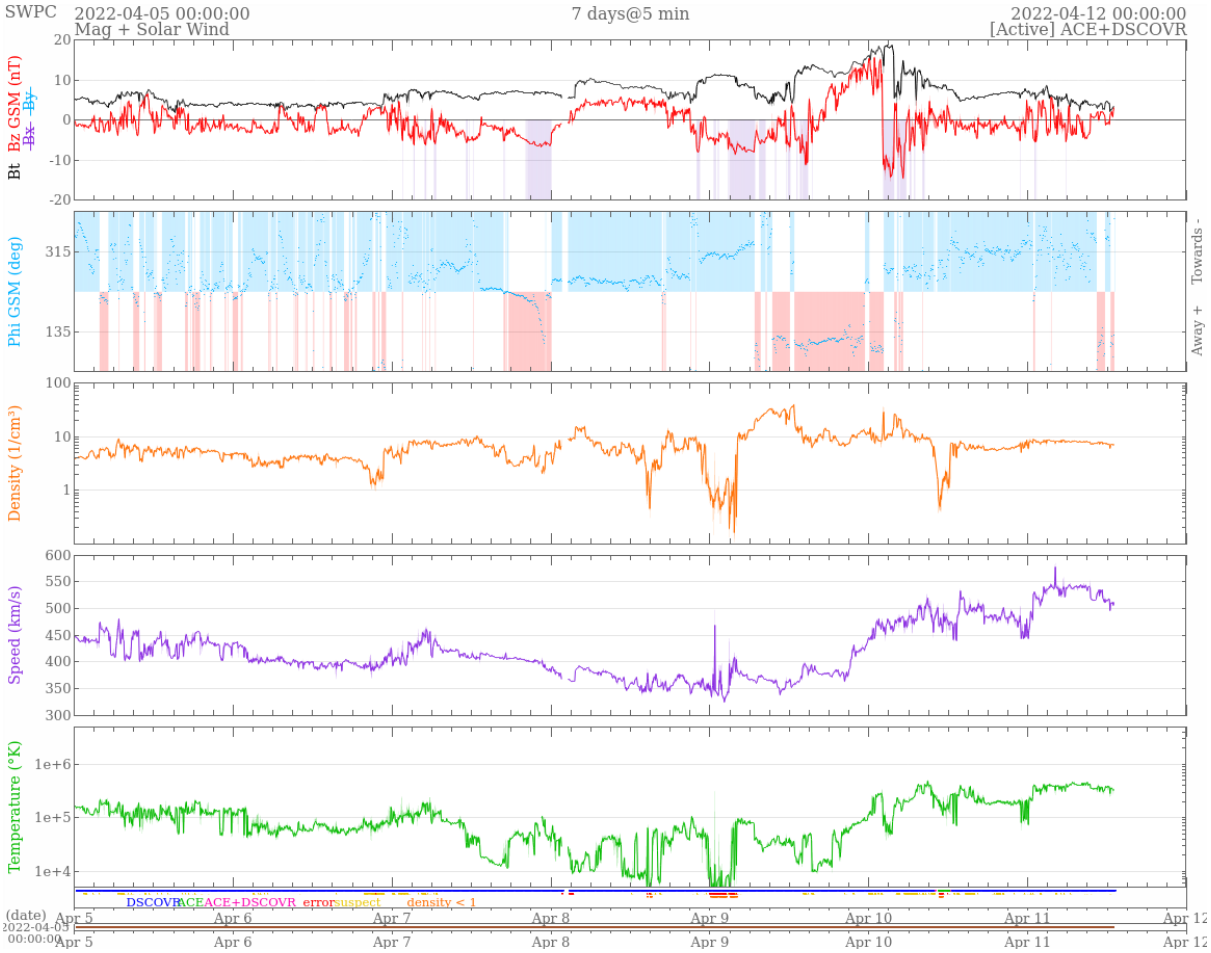
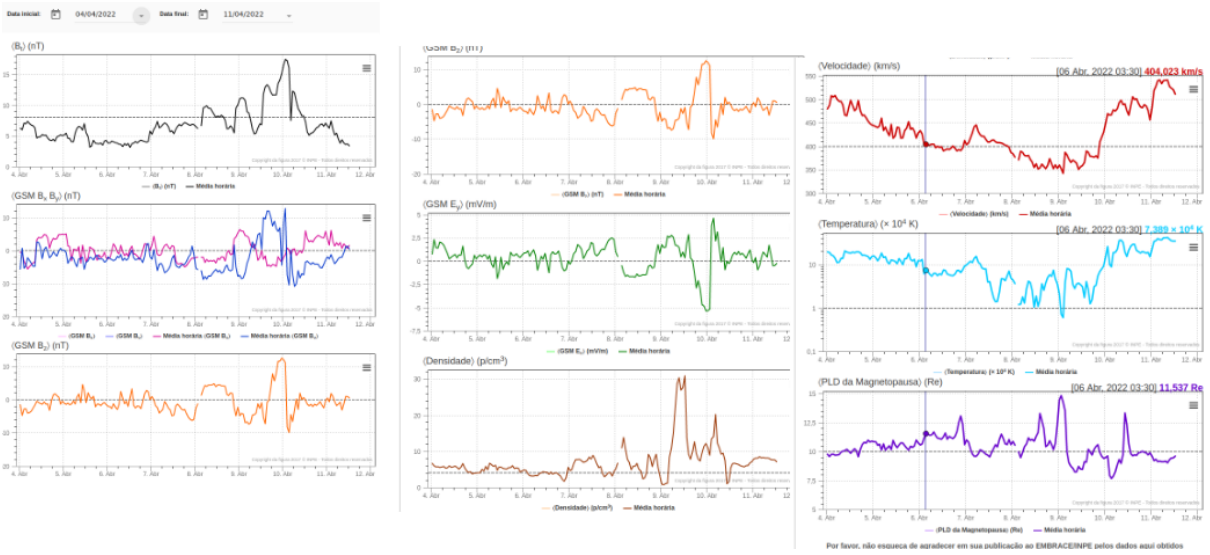


Figura: Above the 193 Å image of the Sun are highlighted coronal holes observed by SPOCA around 20:00 UT on April 06, 2022.

Responsible: Paulo Ricardo Jauer







- The modulus of the interplanetary magnetic field component showed 1 maximum peak : 10/Apr at 01:30 of ~ 17.4 nT.
- The BxBy components showed intense variations in the analyzed period, due to the characteristic of magnetic cloud with rotation initiated in the components on Apr/09 at 01:30 UT

- The component of the bz field presented a rotation due to the magnetic cloud-like interplanetary structure.
- The minimum value presented in the bz component was -9.89 nT on Apr/10 at 03:30 UT. Conditions favoring the emergence of geomagnetic storms
- The solar wind density showed a maximum peak on 09/Apr at 12:30 UT of 30.8 p/cm³. However, the density showed variations before and after this maximum peak due to the interaction of the fast solar wind and CME.
- The solar wind speed had oscillated mostly above 400 km/s throughout the presenting period. It presented a minimum value of 342km/s on 9/Apr at 2:30 am, and a maximum value of 540 km/s at 6:30 am on 11/Apr.
- The magnetopause position was on average above the typical position. The maximum compression was observed on 10/Apr at 03:30 UT of 7.6 Re.

Radiation Belts

Responsible: Ligia Alves Da Silva

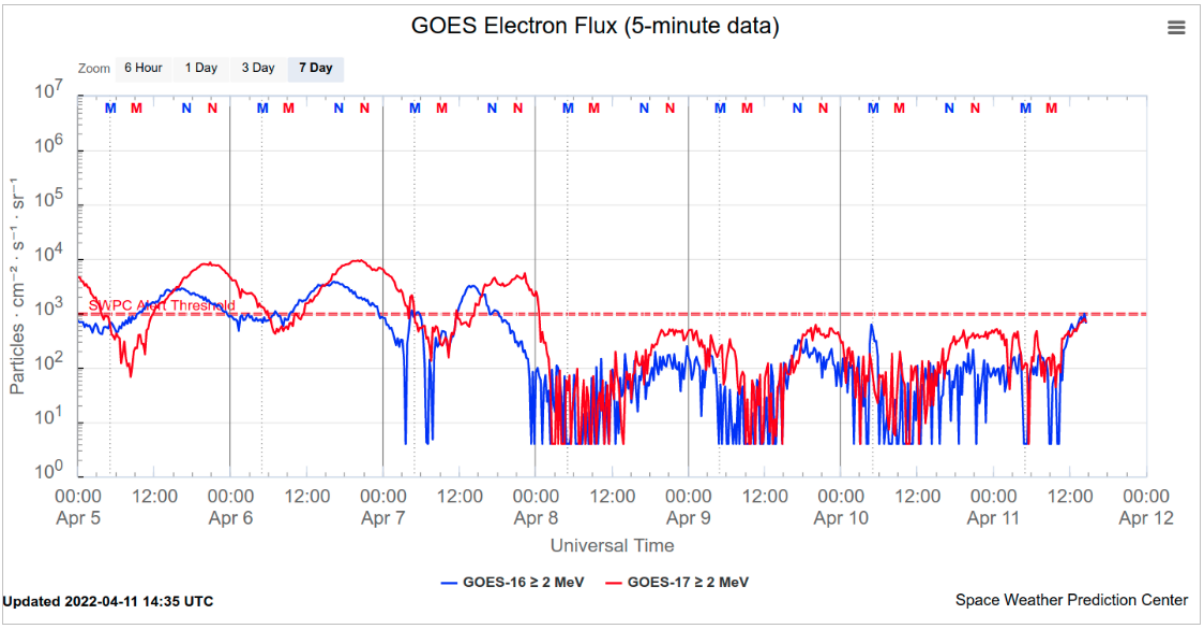


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-17 satellite. Source: https://www.swpc.noaa.gov/products/goes-electron-flux

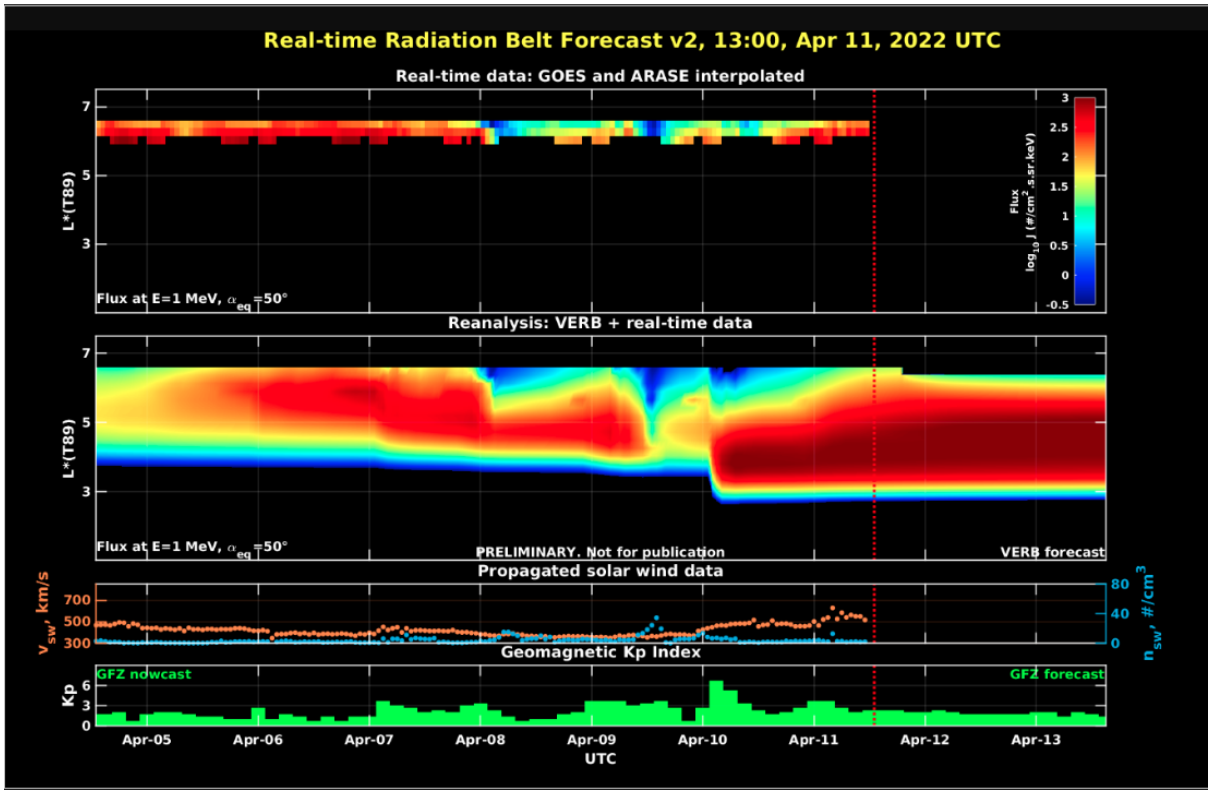


Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES-16, GOES-17
satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: https://rbm.epss.ucla.edu/realtime-forecast/

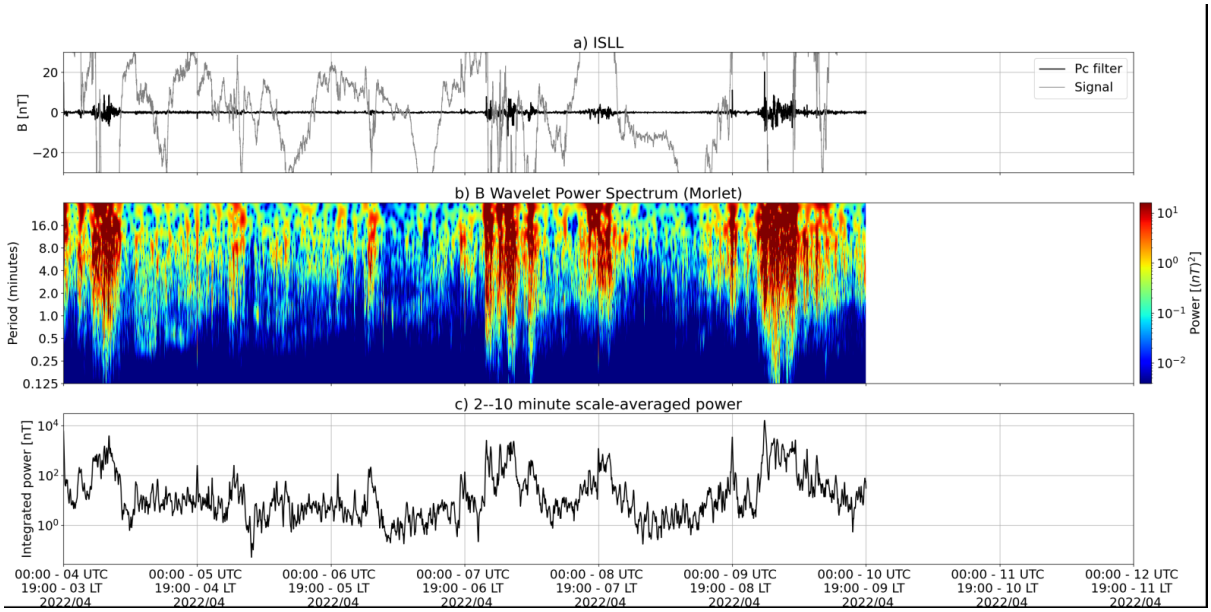
High-energy electron flux (>2 MeV) in the outer boundary of the outer radiation belt obtained from geostationary satellite data GOES-16 and GOES-17 (Figure 1) is oscillating around the minimum threshold (103 particles/(cm2 s sr)) between April 5th and 7th. An electron flux decrease of approximately 3 orders of magnitude is observed from 03:00 Z on April 8th. Two further electron flux decreases were observed on April 9 and 10, respectively, followed by slight electron flux increases that reached values above 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 decreases observed on April
8th and 10th reached L-shell > 5.0, while the electron flux decrease occurred on 9th April reached L-shell > 3.5. These variations in electron flux occurred concomitantly with the arrival of coronal mass ejections and ULF wave activities. However, it is important to point out that the data from the ARASE satellite are not available for the

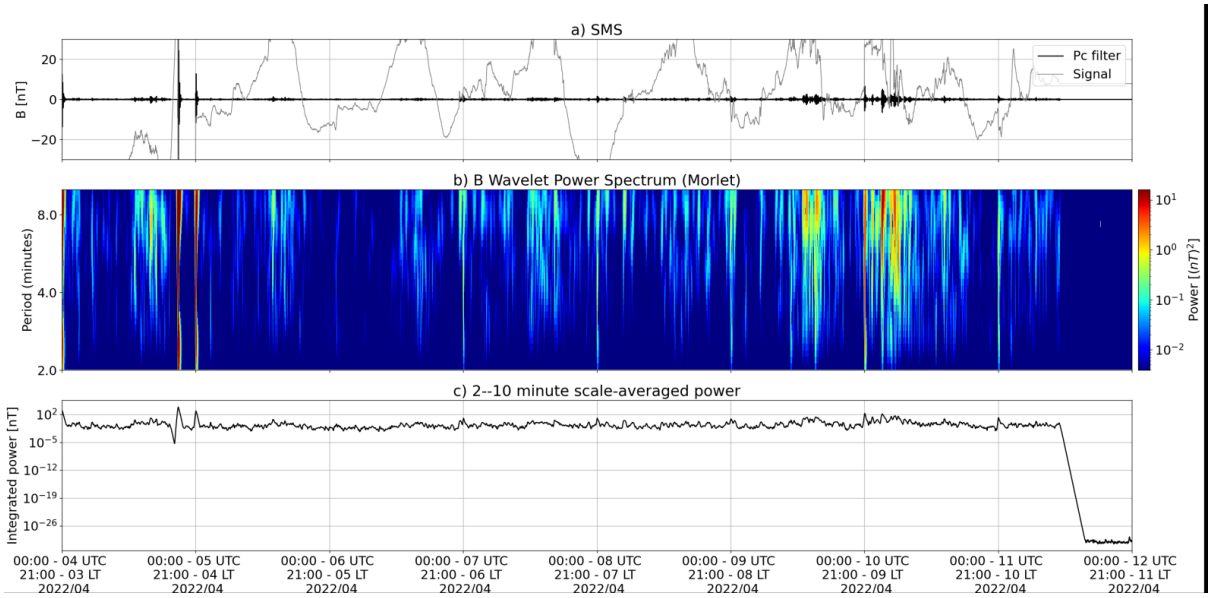
week under analysis to confirm the L-shell level of this referred electron flux decrease.

ULF waves in the Magnetosphere

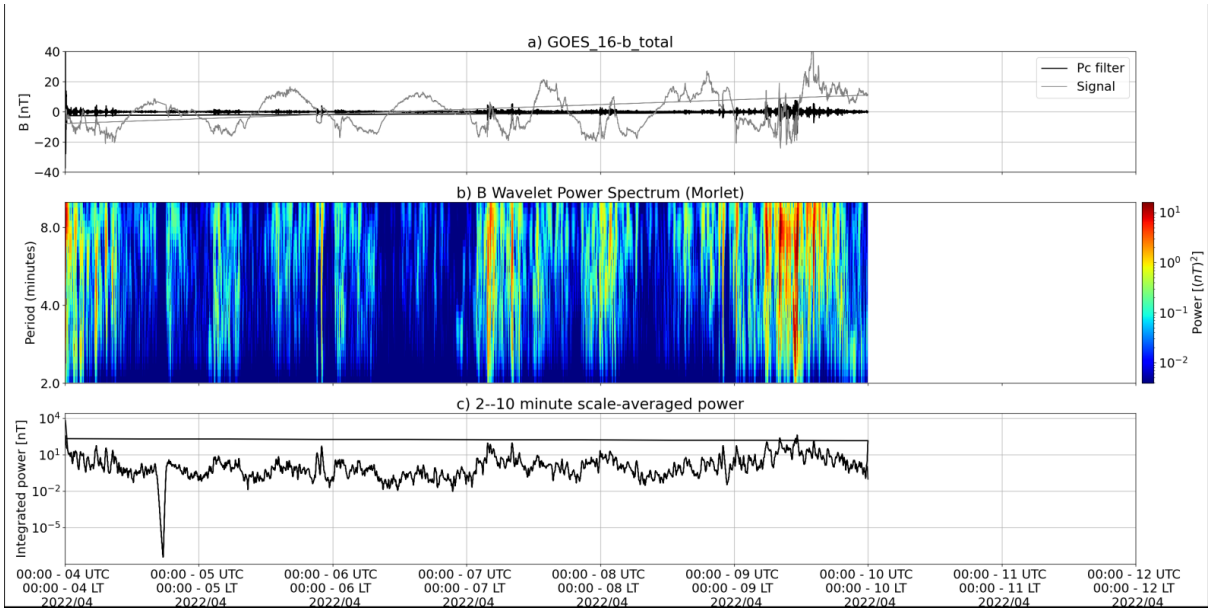
Responsible: José Paulo Marchezi



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).



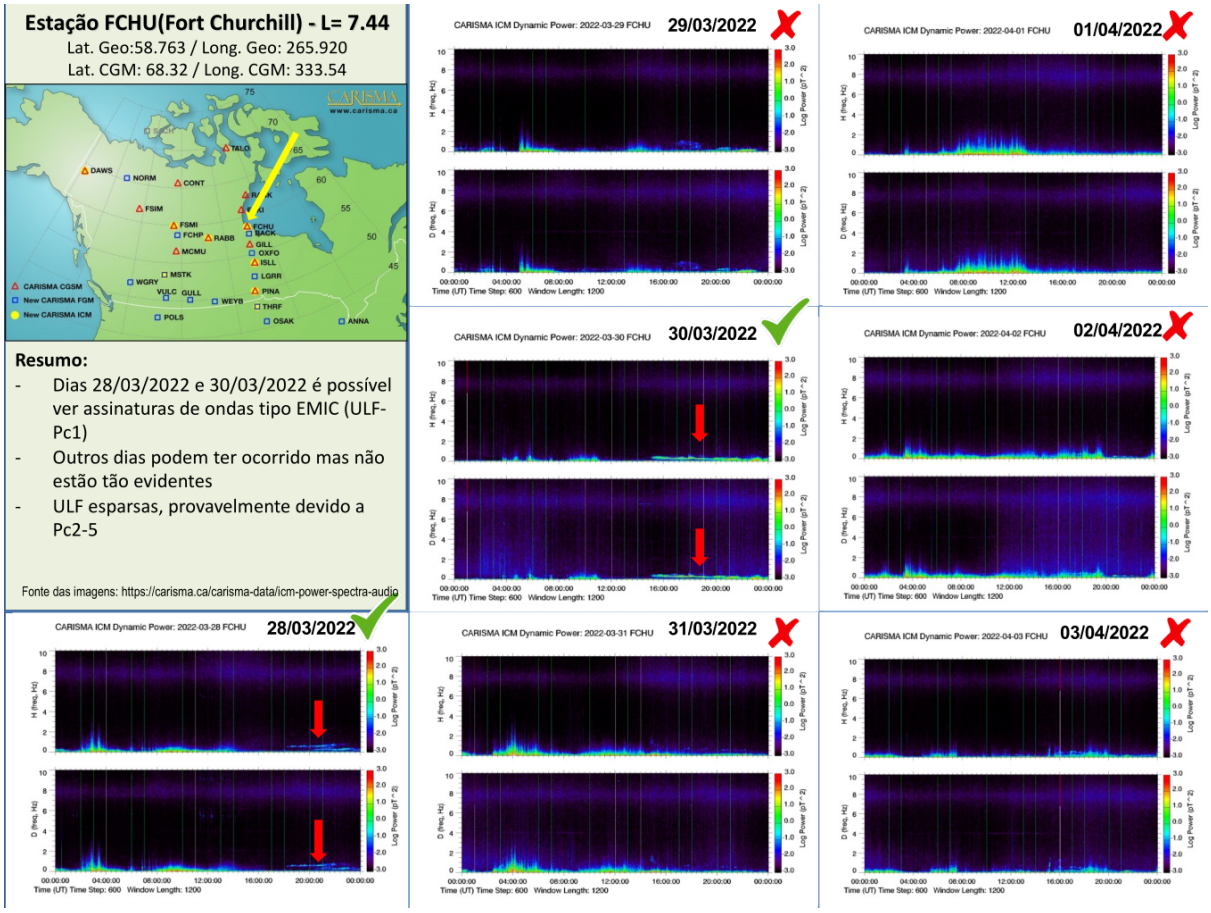
a) signal of the total magnetic field measured by the GOES 16 satellite, together with the fluctuation in the range of Pc5 in black. b) Wavelet power spectrum of the filtered signal. c) Average spectral power in the ranges from 2 to 10 minutes (ULF waves).

The ULF wave activity shows an increase in power from the 7th of April in the form of abrupt variations, detected from high latitudes to the magnetomerts at low latitudes of the EMBRACE network (Figure 2, SMS). On the 9th and 10th of April, new increases in ULF power are observed at high latitudes and with an impulsive

characteristic predominantly in the magnetometers of the EMBRACE network and GOES satellite.

EMIC waves in the Magnetosphere

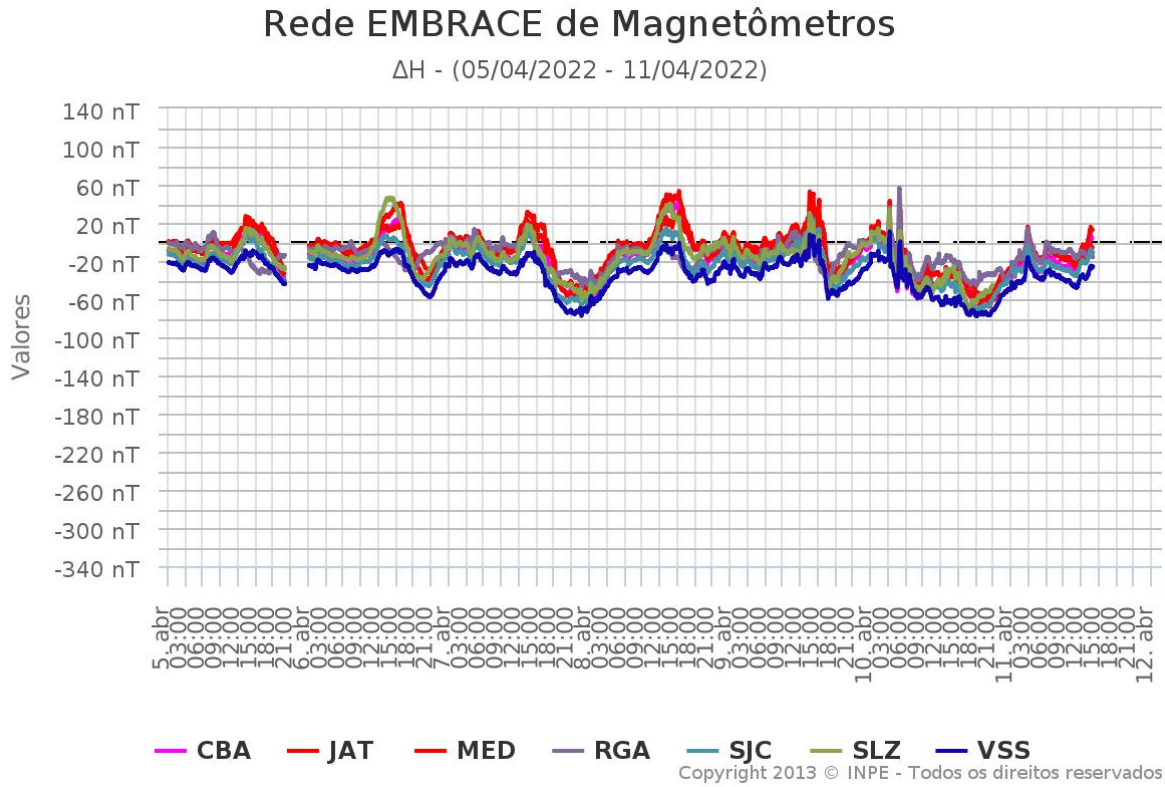
Responsible: Claudia Medeiros



- 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 - (05/04/2022 - 11/04/2022)
Valores
140 nT
100 nT
60 nT
20 nT
-20 nT
-60 nT
-100 nT
-140 nT
-180 nT
-220 nT
-260 nT
-300 nT
-340 nT
5. abr
6. abr
7. abr
8. abr
9. abr
10. abr
11. abr
12. abr
CBA
JAT
MED
RGA
SJC
SLZ
VSS
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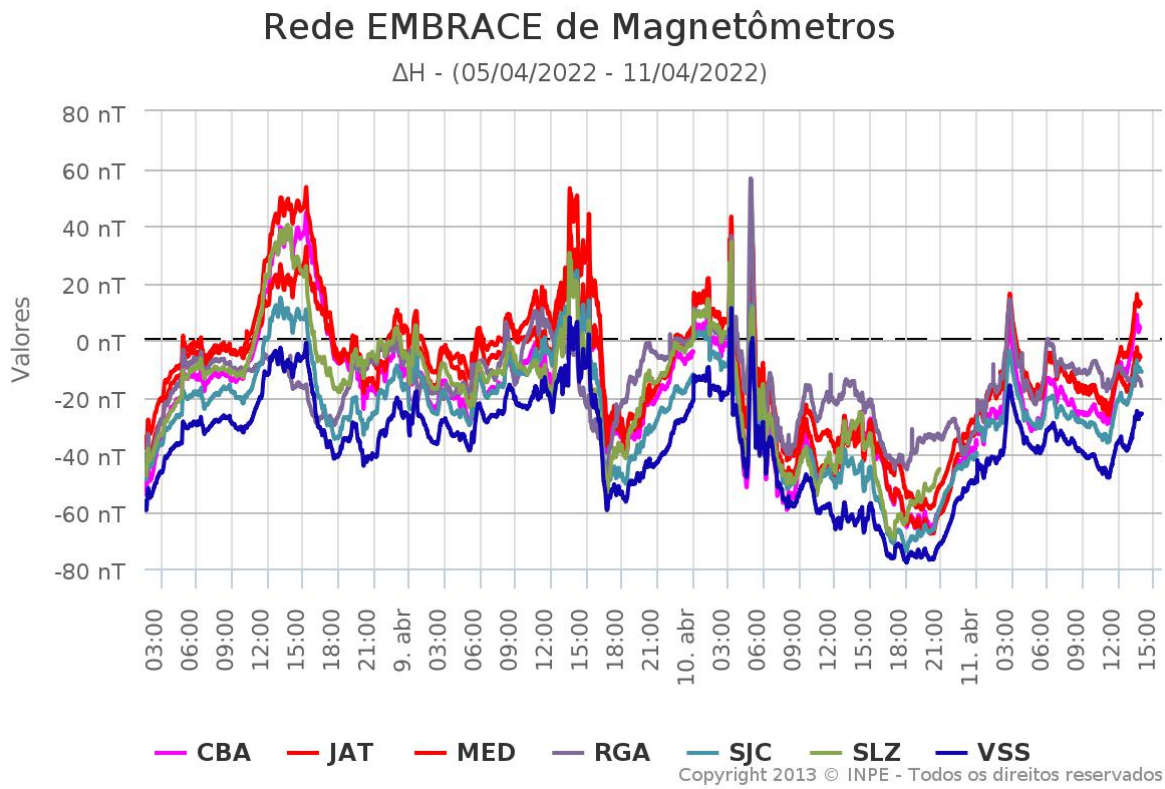
Rede EMBRACE de Magnetômetros
ΔH - (05/04/2022 - 11/04/2022)
Valores
80 nT
60 nT
40 nT
20 nT
0 nT
-20 nT
-40 nT
-60 nT
-80 nT
9. abr
10. abr
11. abr
CBA
JAT
MED
RGA
SJC
SLZ
VSS
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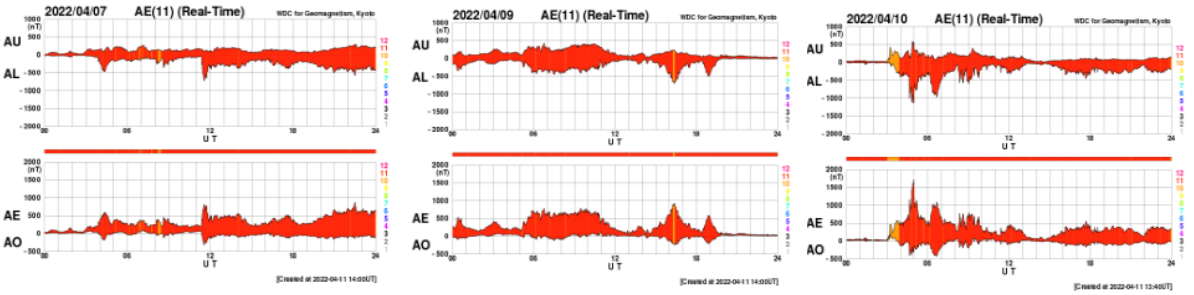
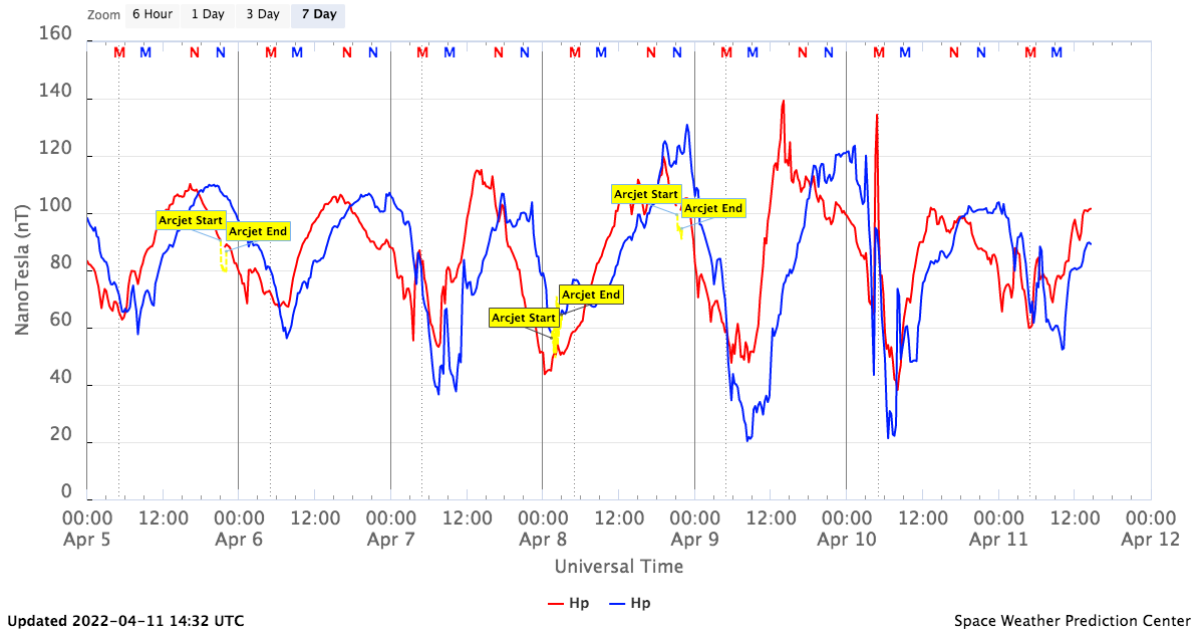
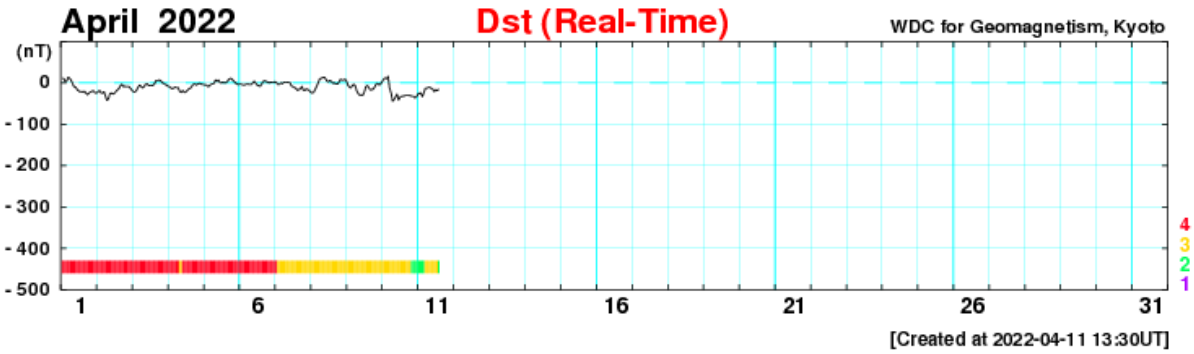
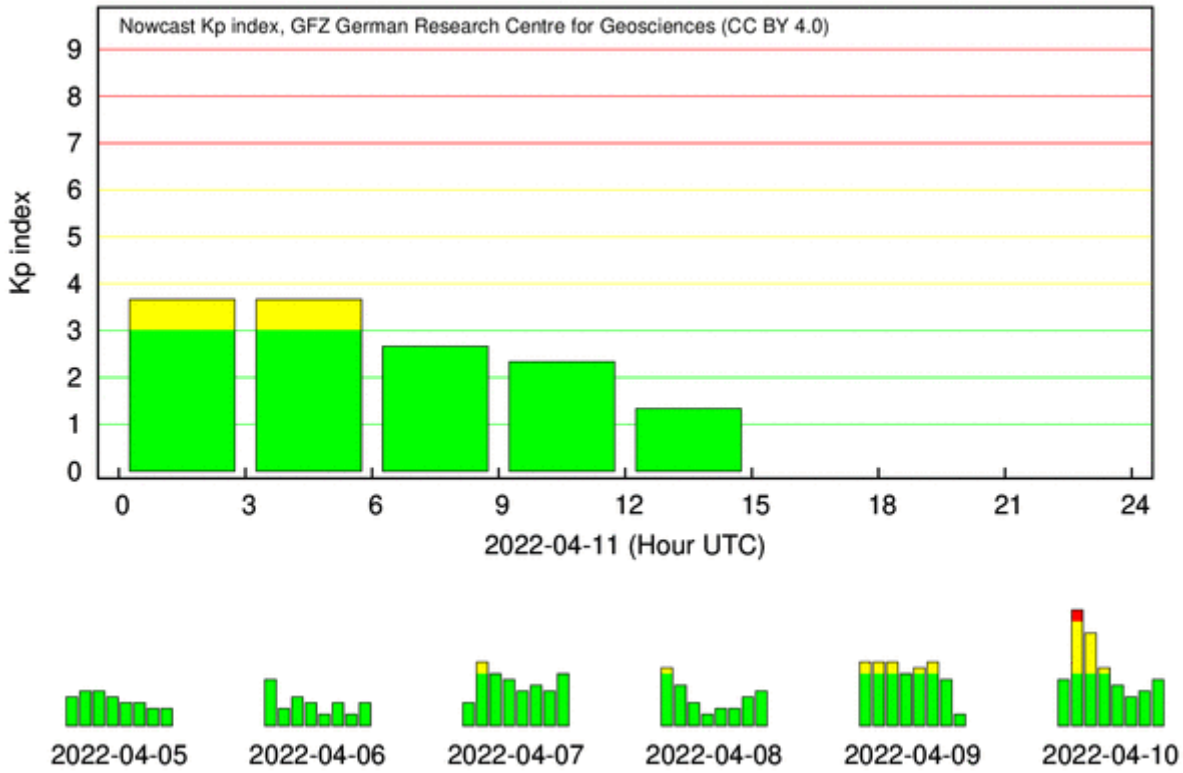


GOES Magnetometers (1-minute data)







- The data from the Embrace magnetometer network showed instabilities throughout the period, maintaining the characteristic behavior of fluctuations and active periods. Featured events:
- April 09 and 10 - a drop of up to -80nT in the H component of the magnetometers
- The Dst index reached its minimum value of -44 nT on 04/10. The Highest Kp of the week was 6+ recorded on April 10
- The auroral activity was intensified on April 07, 09, and 10.
- Magnetic field measured in the orbit of the GOES satellite showed disturbances on April 09 and 10.

Ionosphere

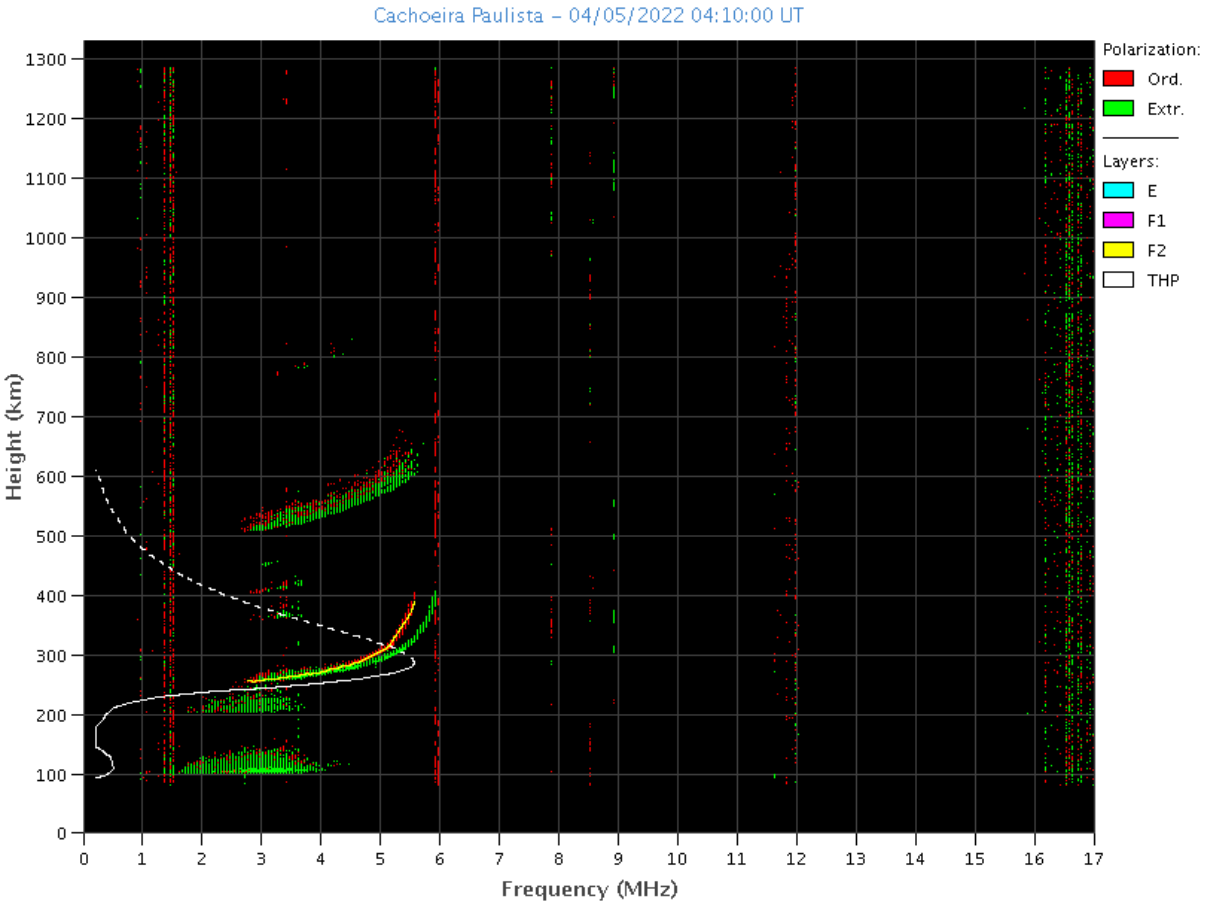
Responsible: Laysa Resende

Boa Vista:

No Data.

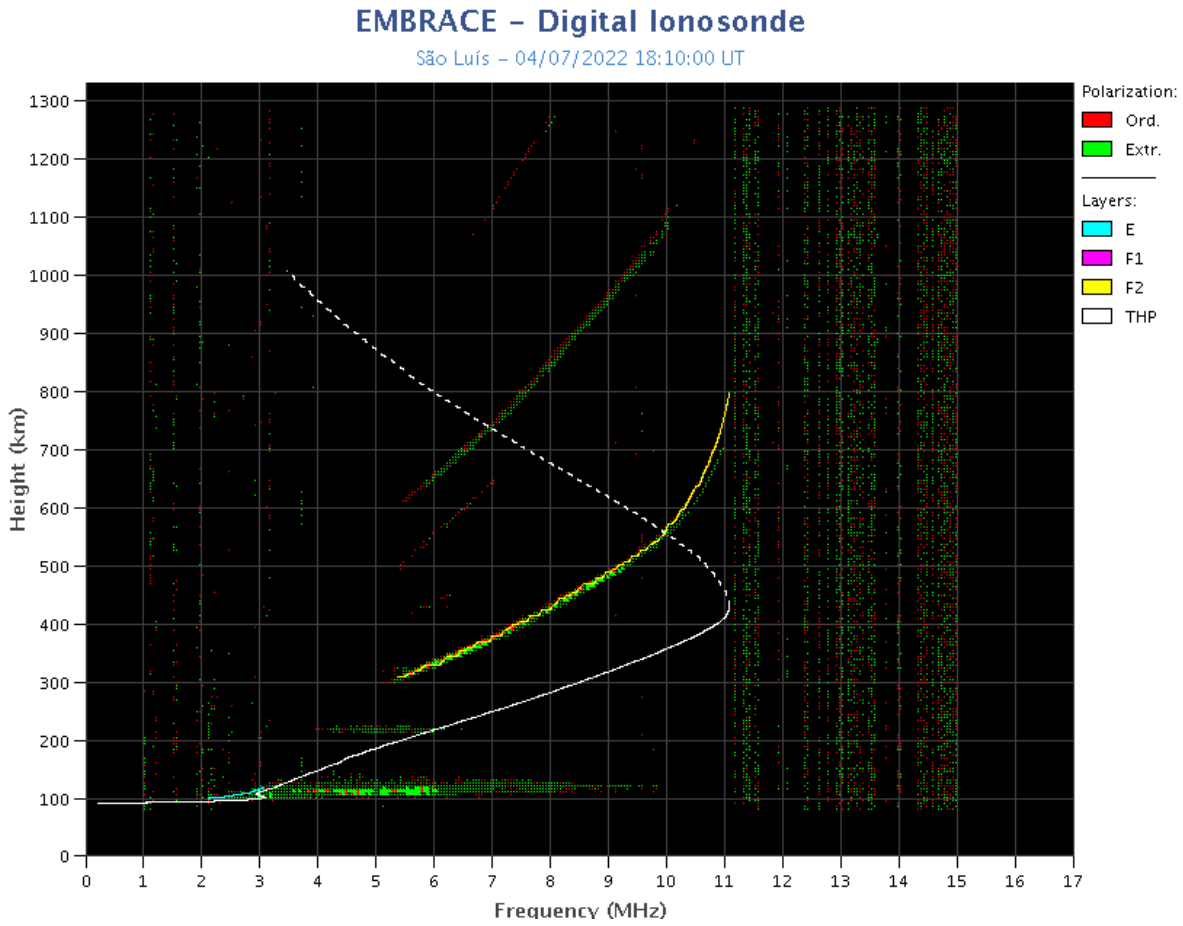
Cachoeira Paulista:

- Do not occurr spread F during the week.
- The Es layers reached scale 2 only in this week.



São Luís:

- There were spread F during all days in this week.
- The Es layers reached scale 5 on April 07.

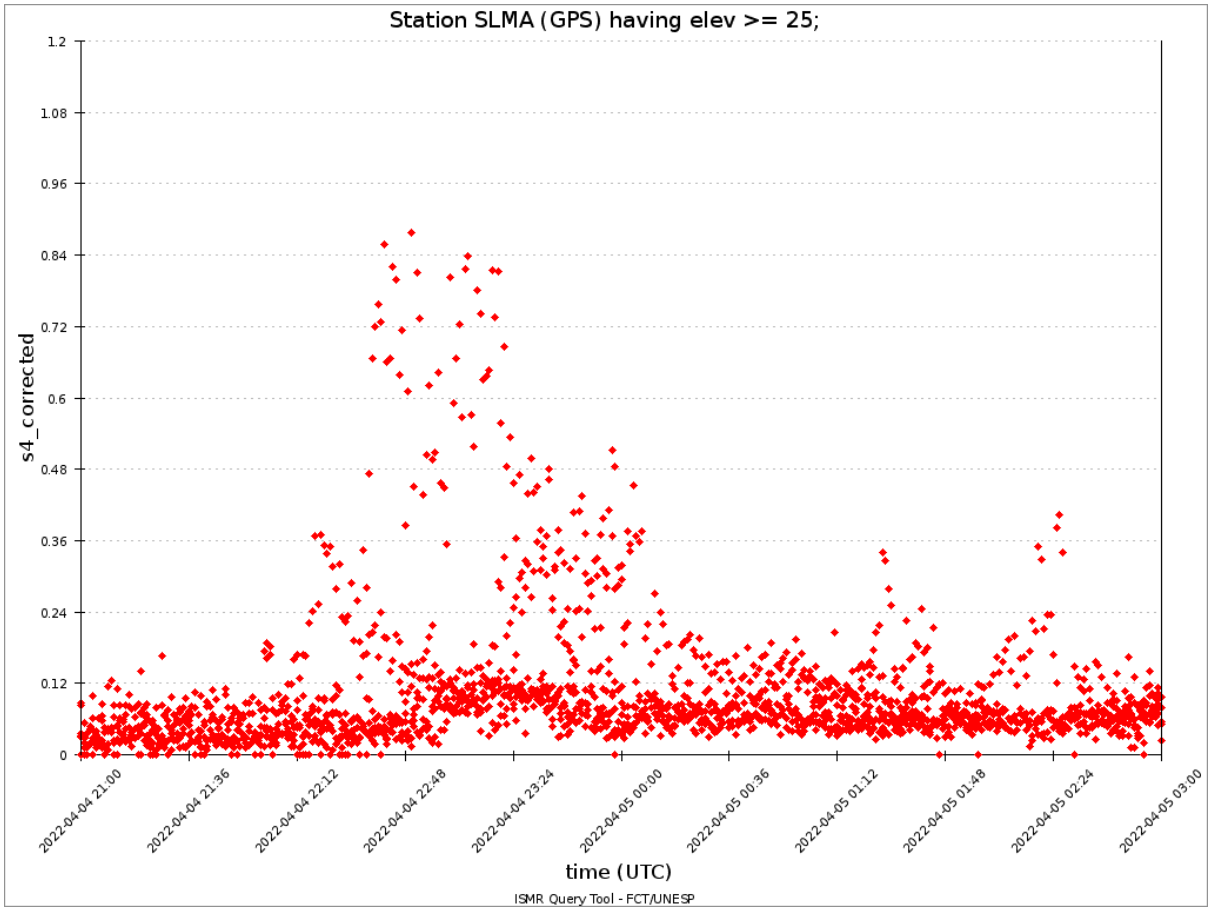


Scintillation S4

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 to severe values of the S4 index (> 0.8—1.2) were measured after the sunset on 04/04 at SLMA, STSN and UFBA stations (Figure 1). For the rest of the week, another event with a scintillation greater than 0.5 was recorded only in the last hours on the April 6th at the SLMA and STSN stations. Similar to the previous week, the SJCE station had no scintillation events.


Station SLMA (GPS) having elev >= 25;
s4_corrected
1.2
1.08
0.96
0.84
0.72
0.6
0.48
0.36
0.24
0.12
0
2022-04-04 21:00
2022-04-04 21:36
2022-04-04 22:12
2022-04-04 22:48
2022-04-04 23:24
2022-04-05 00:00
2022-04-05 00:36
2022-04-05 01:12
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2022-04-05 02:24
2022-04-05 03:00
time (UTC)
ISMR Query Tool - FCT/UNESP

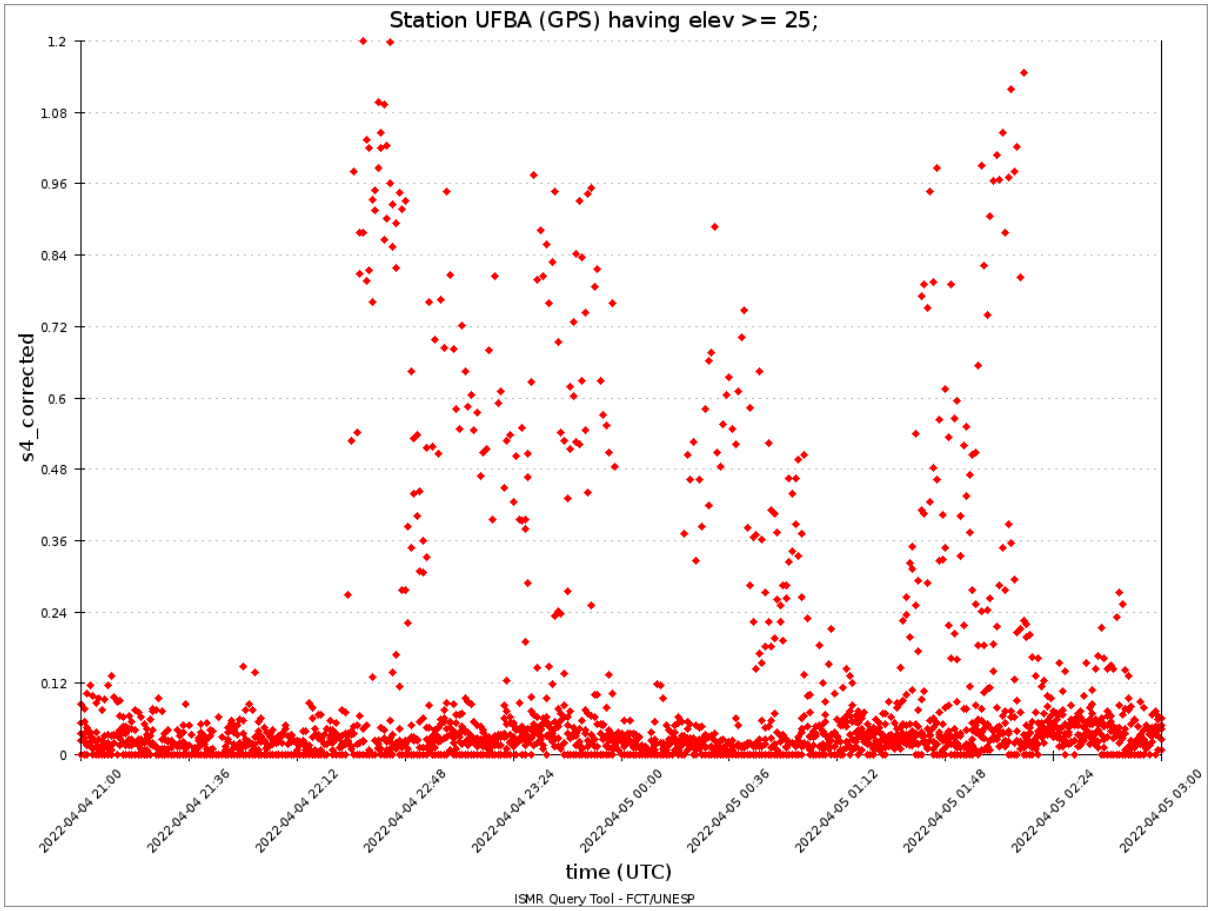

Figure 1: S4 index values for the GPS constellation measured at SLMA (upper panel) and UFBA (lower panel) between 2100 UT on 04/04 and 0300 UT on 06/05.