Briefing Space Weather - 31/05/2021 14:39

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Sun

Responsible: José Roberto Cecatto / Douglas Silva

- OBS: 23/05 - 3 CME can have component toward the Earth.
- Day 24/05 – No fast wind stream; 2 CME can have component toward the Earth;
- Day 25/05 – No fast wind stream; 1 CME can have component toward the Earth;
- Day 26/05 – No fast wind stream; no CME observed toward the Earth;
- Day 27/05 – “Fast” wind stream from a CH; 2 CME can have component toward the Earth;
- Day 28/05 – “Fast” wind stream from a CH; 3 CME can have component toward the Earth;
- Day 29/05 – “Fast” wind stream from a CH; 4 CME can have component toward the Earth;
- Day 30/05 – “Fast” wind stream from a CH; 3 CME can have component toward the Earth;
- Day 31/05 – No fast wind stream; no CME observed toward the Earth;
- Prev.: Fast wind expected on May 18-21; low (1% M, 1% X) probability of M / X flares next days; also, occasionally some other CME can present a component toward the Earth;

Sumary of solar Events May 24 - 31; 2021

- CME:
  - partial halo CME pbserved at the end of May 28 as seen by LASCO C# coronograph.
- WSA-ENLIL
  - The partial halo CME observed on May 28 at 23:12 UT has a 30% chance of a shock wave reaching Earth between May 31 and June 1.
- Coronal holes:
  - Observed in the center of the solar disk the coronal hole ch1 between the 24th and 31st of May which evolves from an area of 2.7 to 16.0 % of the solar disk

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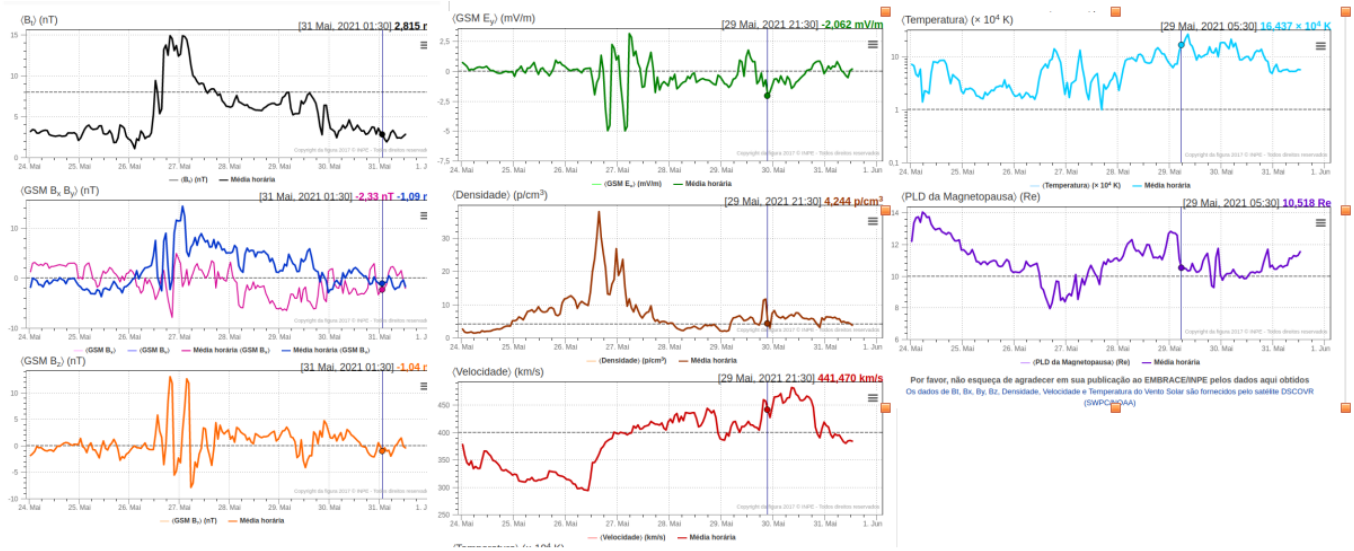
Interplanetary Medium

Responsible: Paulo Jauer



- The region of the interplanetary medium in the last week presented a moderate level in the disturbances of the plasma due to the passage of CME type structures and fast HSS structures identified by the DSCOVR satellite in the interplanetary medium and sector crossing boundary.
- The total Bt magnetic field was quiet during the period from 24 to 26 May 10:30 UT. The total field remained above 7nT, until May 27 at ~ 17:30, whose maximum peak was 14.8 nT . After gradually returning to oscillate around the typical values.
- The component of the IMF Bz oscillated around the quiet values during the period from 24 to 26 of May 10:30 UT. During the period from the 26 to the 27th of May it presented positive and negative incursions. The minimum value registered was ~ - 7.91 nT, at 05:30 UT, favorable to the appearance of geomagnetic disturbances. After this period, the component returns to oscillate around typical values.
- There was a sector change in the BxBy components, at 2:30 on May 26, with both components remaining in opposite sectors until May 29 at 7:30.
- The density of the Vsw during the period from 24 to 26 of May ~ 10: 30 UT, showed to be increasing, however close to the quiet values. The density also remained above the typical values during the period from the 24 to the 27 of May 22:30 at 23:30 respectively. The peak in density occurred on the 26 at 15:30 37.89 p / cm³.
- The speed of the solar wind Vsw, during the period from 24 to 26 of May ~ 10:30 UT showed oscillations keeping with values of the quiet solar wind. The speed had two instants where the values remained above 400km / s. The first was in the interval from 27 to 28 of May from 5:30 to 9:30 respectively. The second interval was between May 29t and 30 at 4:30 to 7:30, respectively. The maximum recorded value was on May 30 at 09:30 at 480 km/s.
- The subsolar Mp during the period from May 24 to 26 ~ 10:30 Am was gradually compressed. The maximum compression occurred on May 26 at 16:30 ~ 7.9 Re.

Radiation Belts

Responsible: Livia Alves da Silva

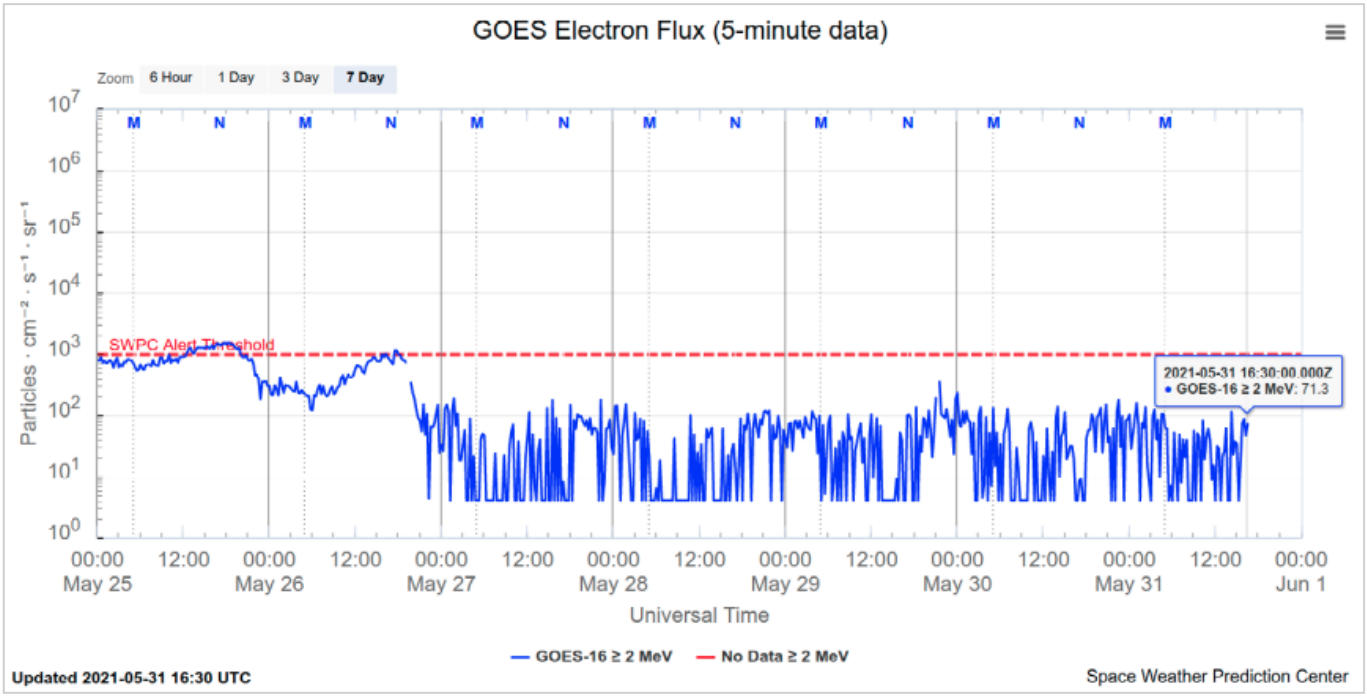


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES satellite. Source: https://www.swpc.noaa.gov/products/goes-electron-flux

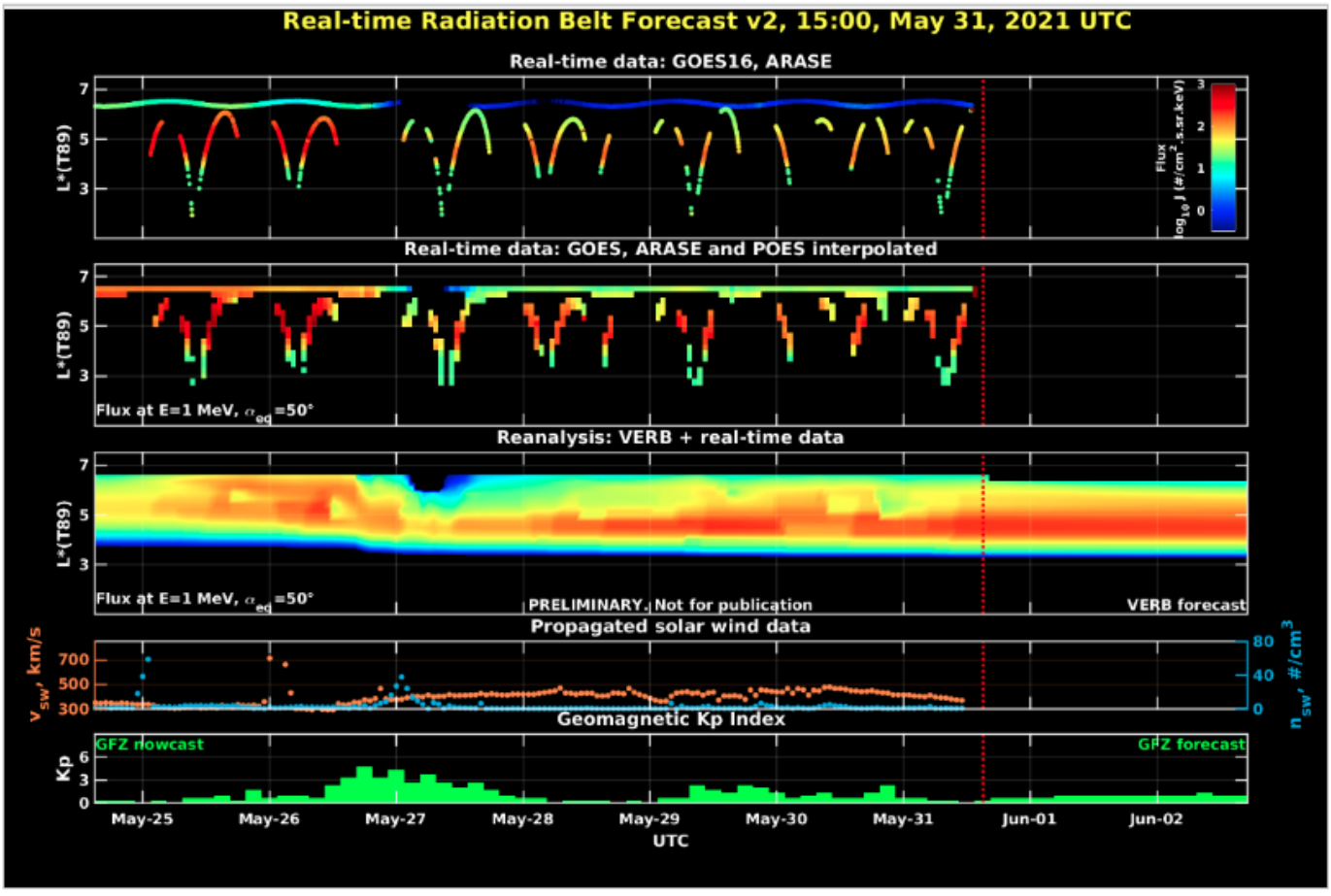


Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES 16, POES satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: https://rbm.epss.ucla.edu/realtime-forecast/

High-energy electron flux (>2 MeV) in the outer boundary of the outer radiation belt obtained from geostationary satellite data - GOES 16 (Figure 1) showing next to the minimum threshold (103 particles/(cm2 s sr) until at 16:00 UT on May 26. After the arrival of a coronal mass ejection, a flux

decrease is observed that reaches approximately 102 particles/(cm2 s sr) and persists until today (May 31).

The GOES-16, Arase, and POES 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 ULF waves' radial diffusion. It is observed that the high-energy electron flux decrease concomitant with the arrival of the coronal mass ejection reaches since the outer boundary of the radiation belt until L-shells deeper (> 4.5). Exist clear evidence of the concomitance between the electron flux decrease and the Ultra Low Frequency (ULF) activity.

Geomagnetism

Responsible: Livia Ribeiro Alves / José Paulo Marchezi

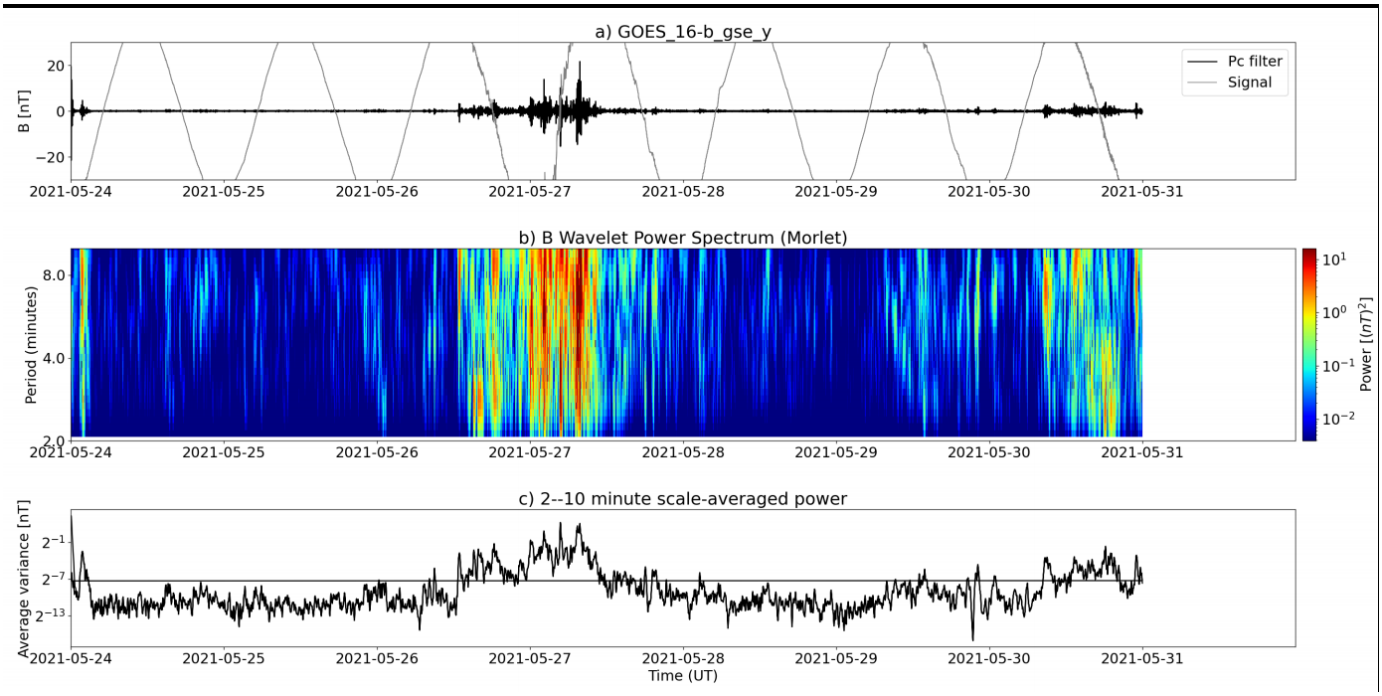


Figure 1: a) Total magnetic field signal measured by the GOES 16 satellite, together with the fluctuation in the black Pc5 range. b) Wavelet power spectrum of the filtered signal. c) Average of the spectral power in the ranges of 2 to 10 minutes (ULF waves).

- Day 26/05 Notable Increased ULF waves, from high to low latitudes and Satellite Goes 16.
  - There is an increase in the solar wind speed, concomitant with the increase of density. Possible interaction with CME;
  - Fluctuations continue to begin on 27/05.
- Day 27/05 There is a second increase in fluctuations.
  - Second increase in density, followed by an increase in solar wind speed;
  - Oscillations in IMF BZ loses from 26 to 27/05;
  - In the second half of the day 27/05 until mid-05/05, the Bz component of the IMF remains negative, which maintains the high wave activity. A discontinuity is noted at the time the Bz changes to the north, on Day 29/05.

- Day 30/05 There is a new shock in Magnetosphere
- High PC3, PC4, and PC5 activity globally;
- Note two pulsation bands, PC3.4, and PC5. Possibly two mechanisms are acting in the generation of these waves;
- Higher frequency band is prevalent in the Y component of the magnetic field registered by satellite Goes.

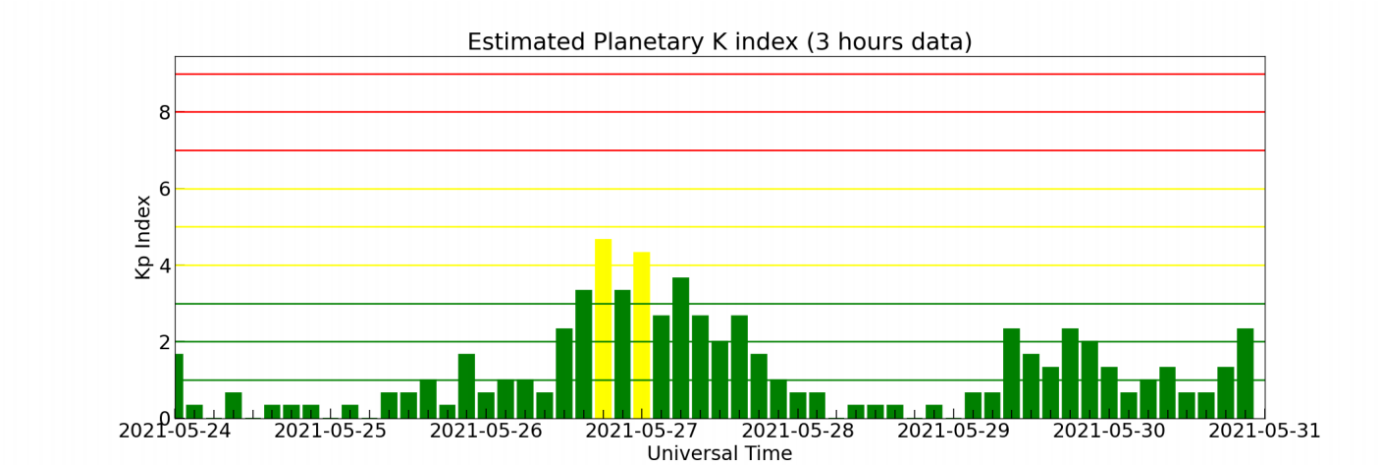


Figura 2: Kp geomagnetic index for the period from 24 to 2021/05/31.

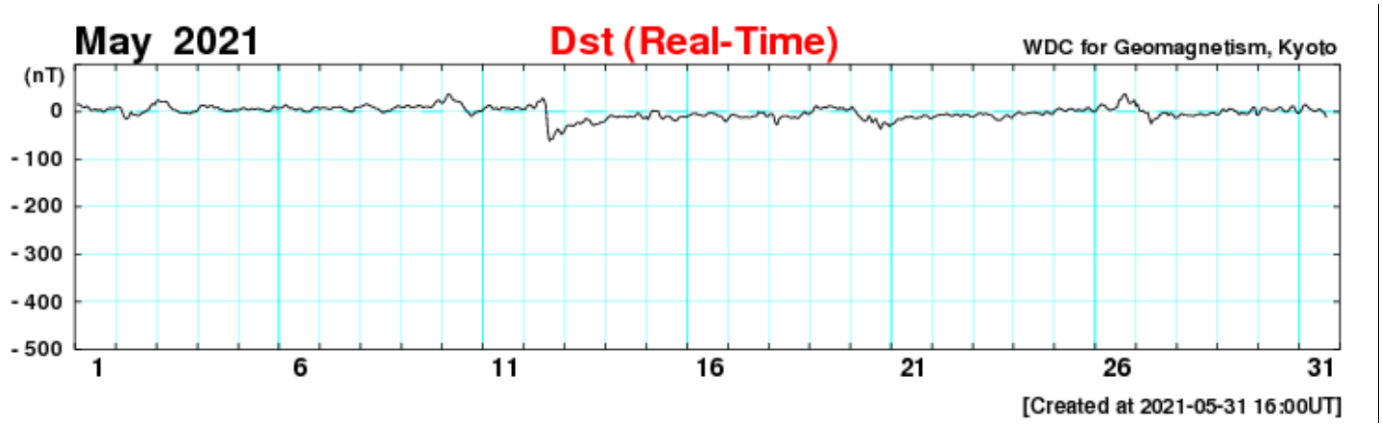


Figura 3: Dst geomagnetic index for the period from 24 to 2021/05/31..

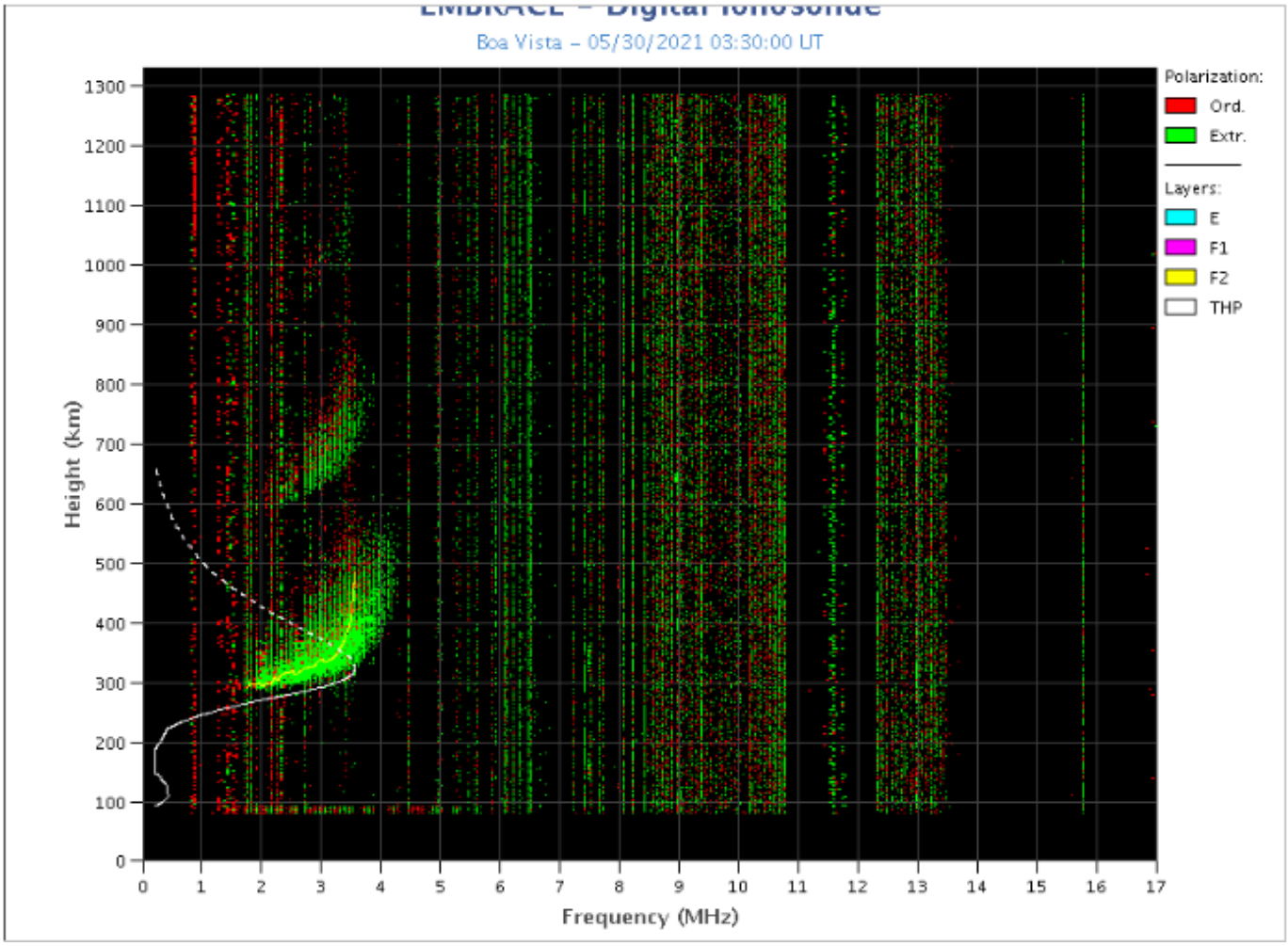
- Disturbed period between the 26th and 27th of May;
- Compression in the magnetosphere was due to possible interaction with a CME;
- Possible to verify the sudden beginning of the geomagnetic storm on 05/26;

Ionosphere

Responsible: Laysa Resende

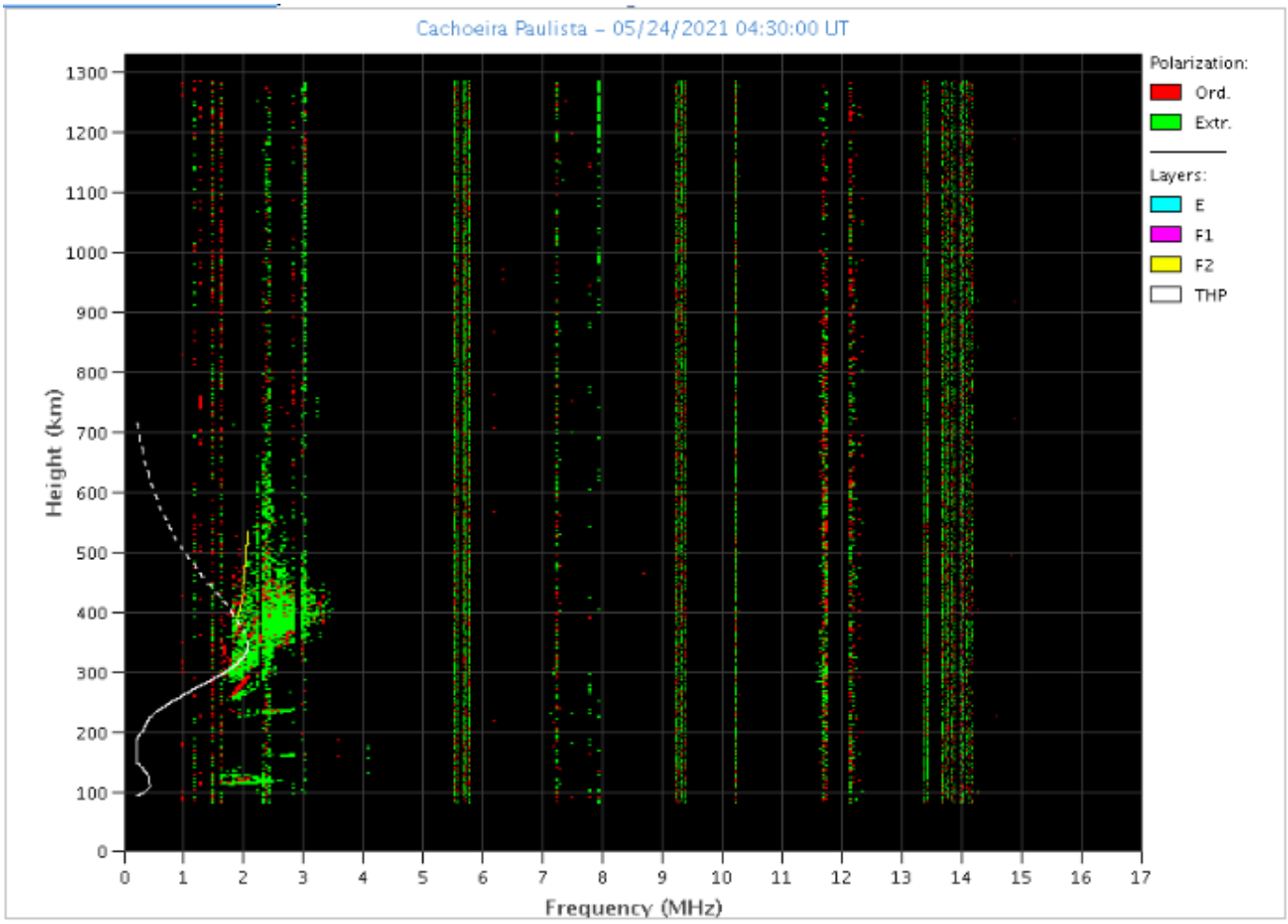
Boa Vista

- Between May 24 and 28, there were no data.
- There was a weak spread-F that started after the pre-reversal enhancement.
- The Es layers in this region reached scale 2.



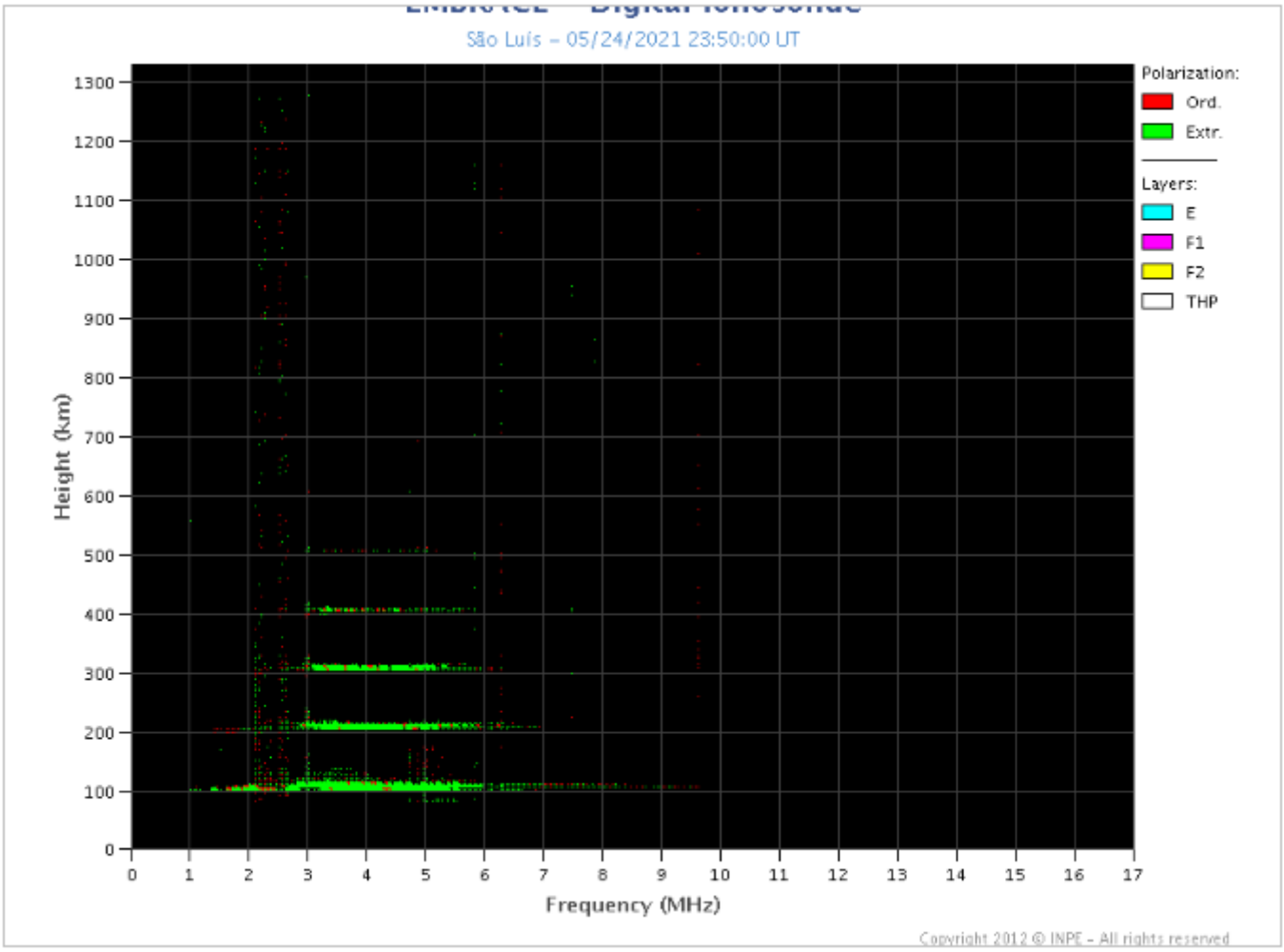
Cachoeira Paulista

- A weak -F spread occurred on the 24th, 25th, and 26th.
- The Es layers in this region reached the scale of 3 on May 25 and a scale of 2 for the rest of the week.



São Luis

- The Es layer of this region reached scales 3 and 4 throughout the week and blocked region F, not being possible to observe spread F..



Cintilation S4

Responsible: Siomel Savio Odriozola

In this report on the S4 scintillation index, data from the SLMA stations in São Luís / MA, PALM in Palmas / TO, UFBA, in Bahía / BA and SJCE in São José dos Campos / SP were presented. The S4 index tracks the presence of irregularities in the ionosphere having a spatial scale ~ 360 m.

None of the stations showed appreciable values above the noise value in the analyzed period. Particularly on 26/05 some low values of S4 were detected around 10 hours LT at low latitude stations of SLMA e PALM, but it cannot be
affirmed that it is exclusively a consequence of the effects of external processes in the magnetosphere.