Briefing Space Weather - 2021/07/05

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Sun

Responsible: José Roberto Cecatto

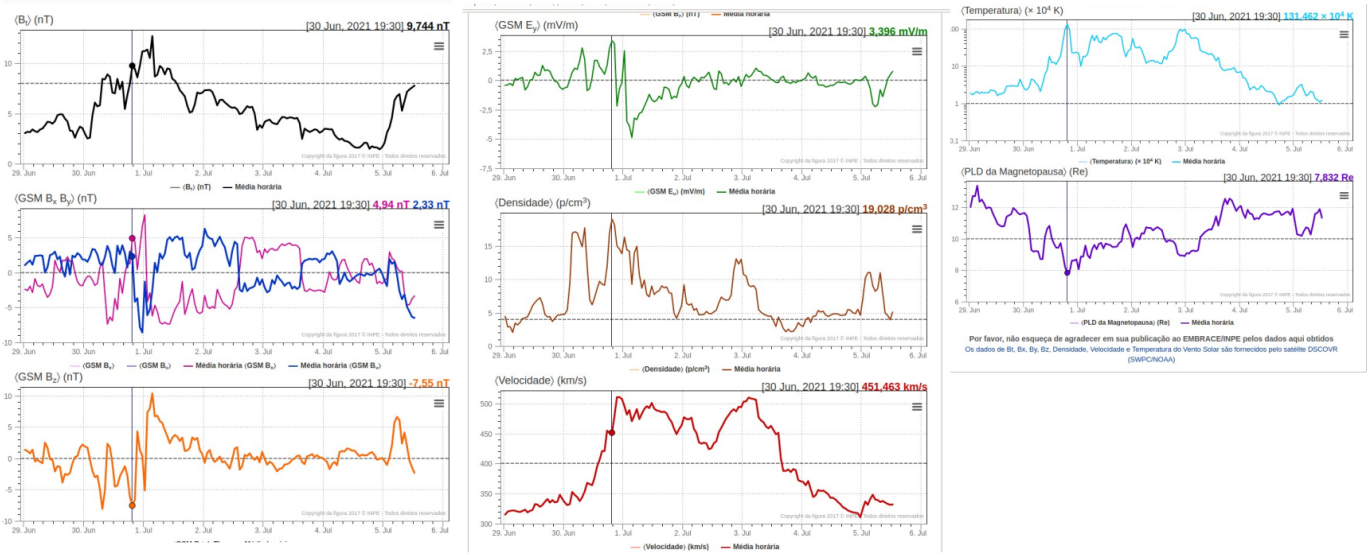
OBS: Flares: 03/07 – M2.7, X1.5, M1.0; 04/07 – M1.5; CME: 24/06 – 1, 25/06 – 2; 26/06 - 3; 27/06 – 5.
Day 28 – No fast wind stream; no CME observed toward the Earth;
Day 29 – No fast wind stream; no CME observed toward the Earth;
Day 30 – Fast wind stream; no CME observed toward the Earth;
Day 01 – Fast wind stream; 1 CME can have component toward the Earth;
Day 02 – Fast wind stream; 2 CME can have component toward the Earth;
Day 03 – Fast wind stream; 5 CME can have component toward the Earth;
Day 04 – No fast wind stream; 2 CME can have component toward the Earth;
Day 05 – No fast wind stream; no CME observed toward the Earth;
Prev.: Fast wind expected on July 08-09; low (5% M, 1% X) probability of M / X flares next days; also, occasionally
some other CME can present a component toward the Earth;

Responsible: Douglas Silva

- CME:
  - Observed a coronal mass ejection on July 02 at 15:36:00 UT for halo type II.
- WSA-ENLIL (According to the modeling)
  - CME Observed On June 27th at 02:00 UT is expected to arrive on July 1st around 12:00 UT.
  - The CME observed on June 29 at 10:53 UT has a 70% chance of reaching Earth on July 3 at 08:00 UT.
- Coronal holes:
  - The coronal hole ch1 observed in the center of the solar disk persisted from the 28th of June to the 1st of July.

Interplanetary Medium

Responsible: Paulo Jauer



- The total Bt magnetic field oscillated in magnitude showing a maximum value on July 01 at 3:30 am of ~12nT, and a minimum value on July 04 at 9:30 pm of ~1.46nT.
- The IMF Bz component was predominantly negative during the interval 06/29/07 from 00:00 to 00:30, with 2 peaks on June 30 at 07:30 and at 19:30 on ~ - 8 and -7 nT respectively. It peaked on July 01 of ~ – 5nT at 00:30. The component remained positive during July 01 to 02 from 3:30 am to 0030 am, with a maximum peak of 10nT. Afterwards it returns to oscillating around zero, with a positive peak detected on July 05 at 5:30 am of ~ 6.6 nT.
- There was a change of sector in the BxBy components, on June 30, July 02 and 03 at 5:30 pm, 2:30 pm and at 6:30 am respectively. -Vsw density showed a minimum value on June 29 at 03:30 of ~ 2p/cm³. Density peaked on June 30 at 8:30 am and 7:30 pm at 17 and 19 p/cm³ respectively. It also presented peaks on June 02 and 05 at 23:30, 03:30 and at 07:30 on 13, 11p/cm³.
- The solar wind speed Vsw remained above 400km/s during the range of June 30 to July 03 from 14:30 to 15:30. The maximum value observed was on June 30 at 22:30 of 510km/s, also on June 03 at 02:30 a value of 509 km/s was observed.
- Subsolar Mp had a maximum expansion of 13 Re on June 29 at 3:20 am. MP also presented a minimum compression value on June 30 at 7:30 pm of 7.8 Re. The Mp remains oscillating around the quiet position.

Radiation Belts

Responsible: Ligia Alves da Silva

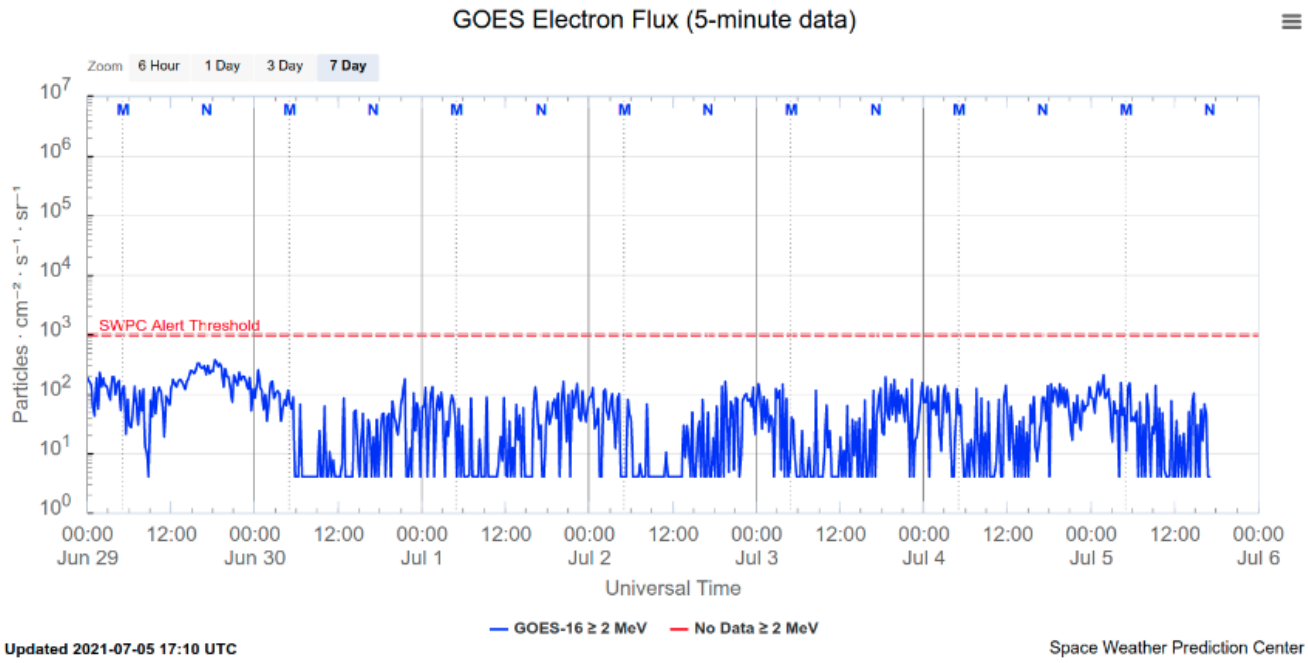


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES satellite. Source: https://www.swpc.noaa.gov/products/goes-electron-flux

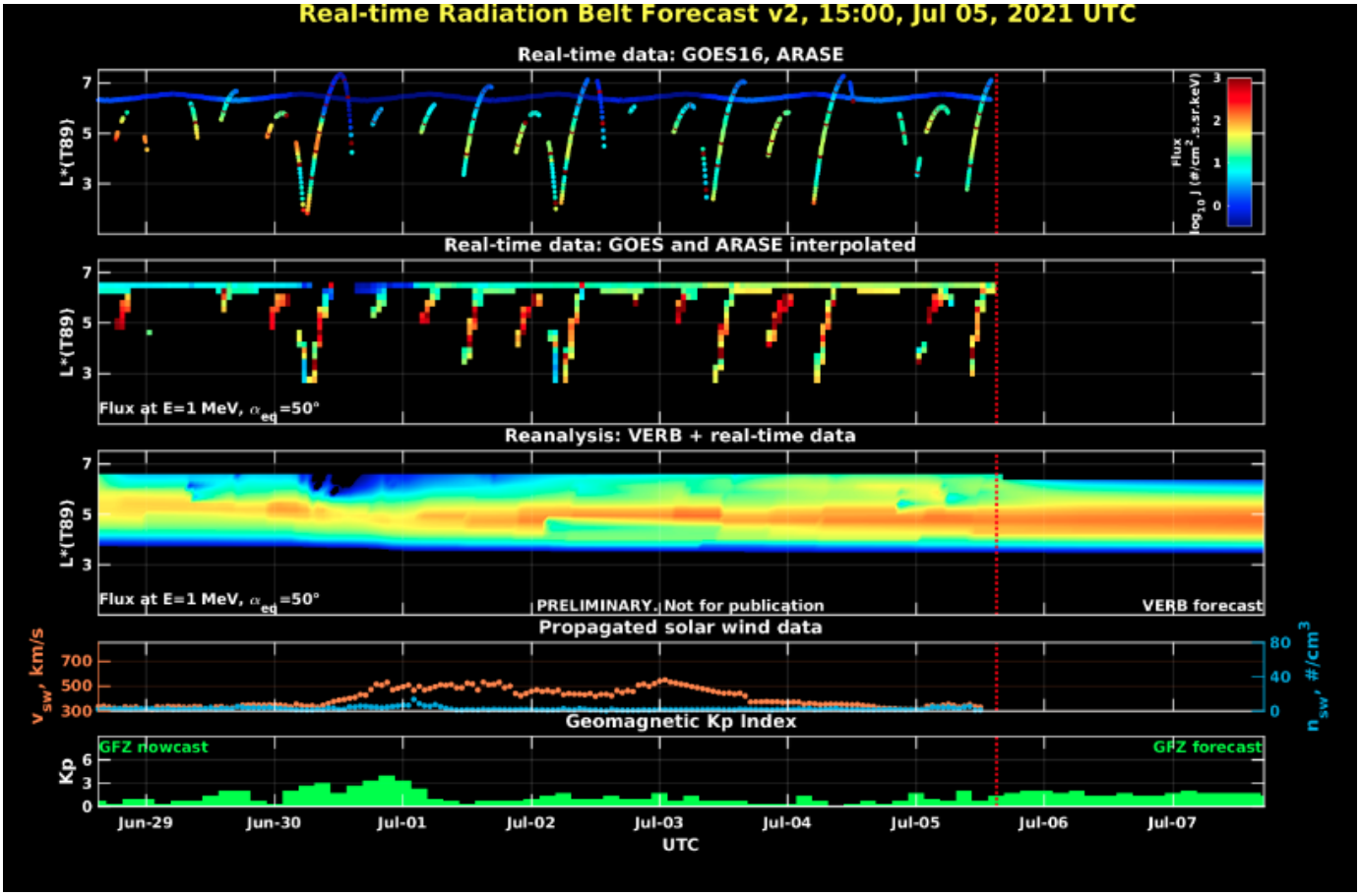


Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES 16, POES satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: Fonte: https://rbm.epss.ucla.edu/realtime-forecast/

High-energy electron flux (>2 MeV) in the outer boundary of the outer radiation belt obtained from geostationary satellite data - GOES 16 (Figure 1) is shown to be close to 102 particles/(cm2 s sr) on June 29th and beginning of June 30th followed by an electron flux decrease. Also, on June 22nd, there

is an electron flux increase that persisted until the end of June 24th. This electron flux decrease is associated with the arrival of coronal mass ejections embedded in a high speed stream.

The GOES-16 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 ULF waves' radial diffusion. The electron flux decrease observed at the beginning of June 30th reaches at L-shell ≥ 5.0. This electron flux decrease also occurs concomitantly with strong Ultra Low Frequency (ULF) wave activity.

Geomagnetism

Responsible: Livia Ribeiro Alves / José Paulo Marchezi

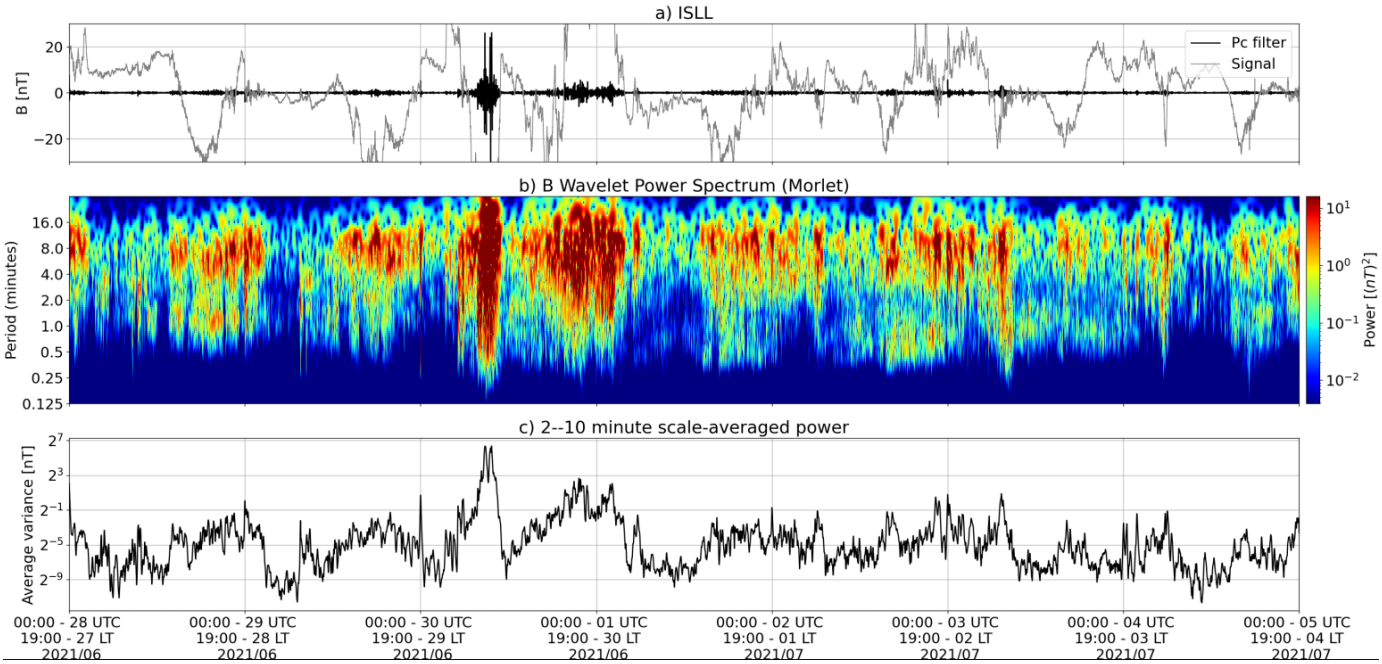


Figure 1: a) signal of the total magnetic field measured at the ISLL Station of the Carisma network in gray, together with the fluctuation in the range of Pc5 in black. b) Wavelet power spectrum of the filtered signal. c) Average spectral power in the ranges from 2 to 10 minutes (ULF waves).

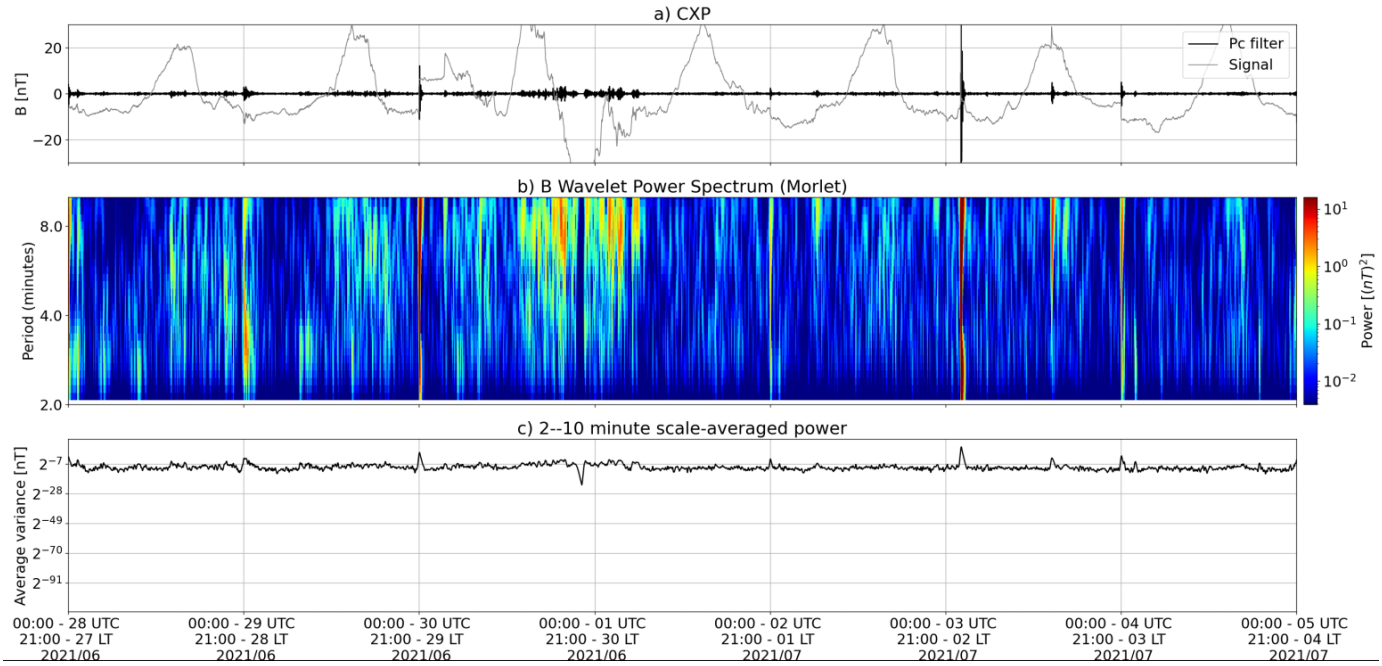


Figure2: a) signal of the total magnetic field measured at the CXP Station of the EMBRACE network in gray, together with the fluctuation in the range of Pc5 in black. b) Wavelet power spectrum of the filtered signal. c) Average spectral power in the ranges from 2 to 10 minutes (ULF waves).

- Day 06/30: wave activity from high and low latitudes
  - Complex structure interacting with the magnetosphere
  - It may be related to two negative incursions of the Bz component of the IMF
- End of June 3rd and July 1st
  - Magnetosphere under the effect of a high-speed Stream, generates continuous fluctuations at high latitudes and GOES satellite.
- Day 02/07: Continuous fluctuations in different frequency bands
  - Possibly related to a sector change and a shock to the magnetosphere

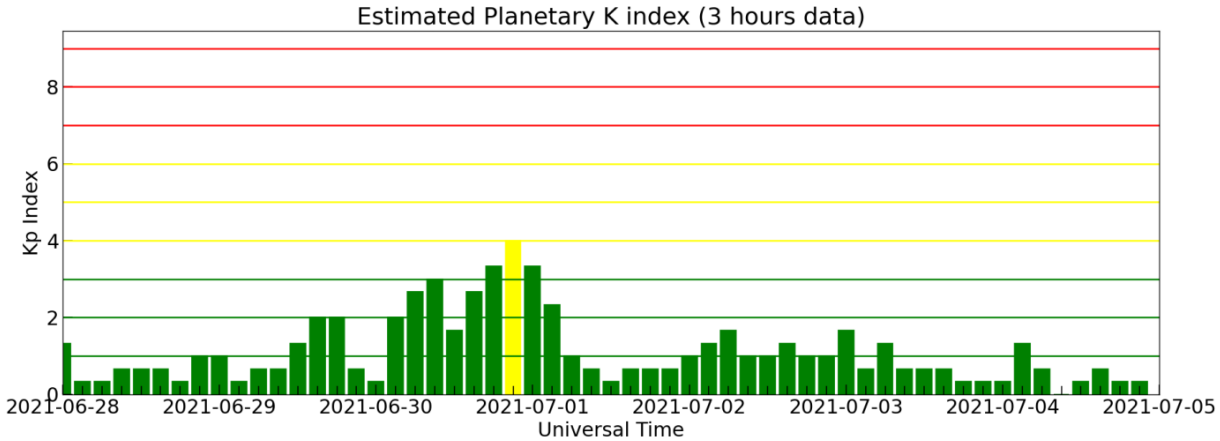


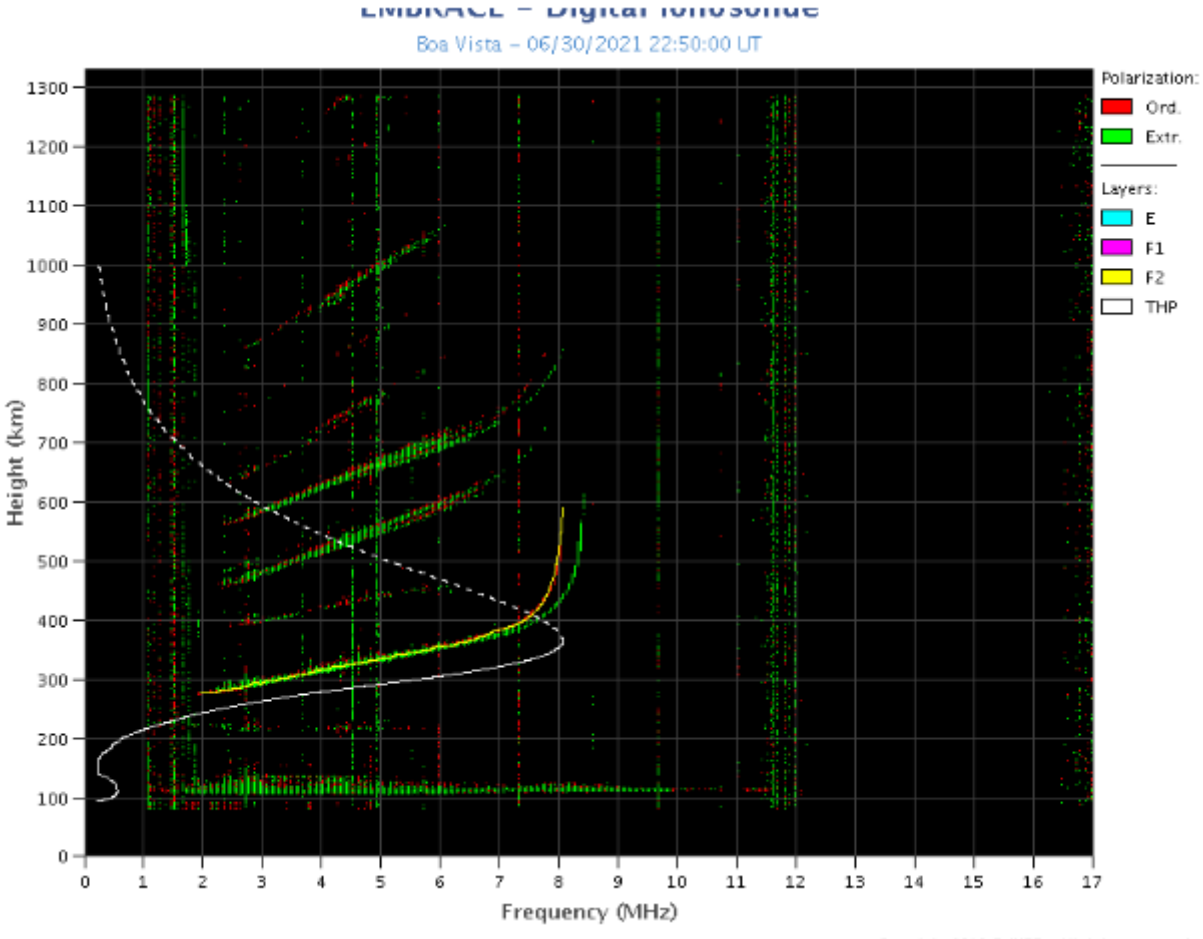
Figure 3:Geomagnetic Kp index

Ionosphere

Responsible: Laysa Resende

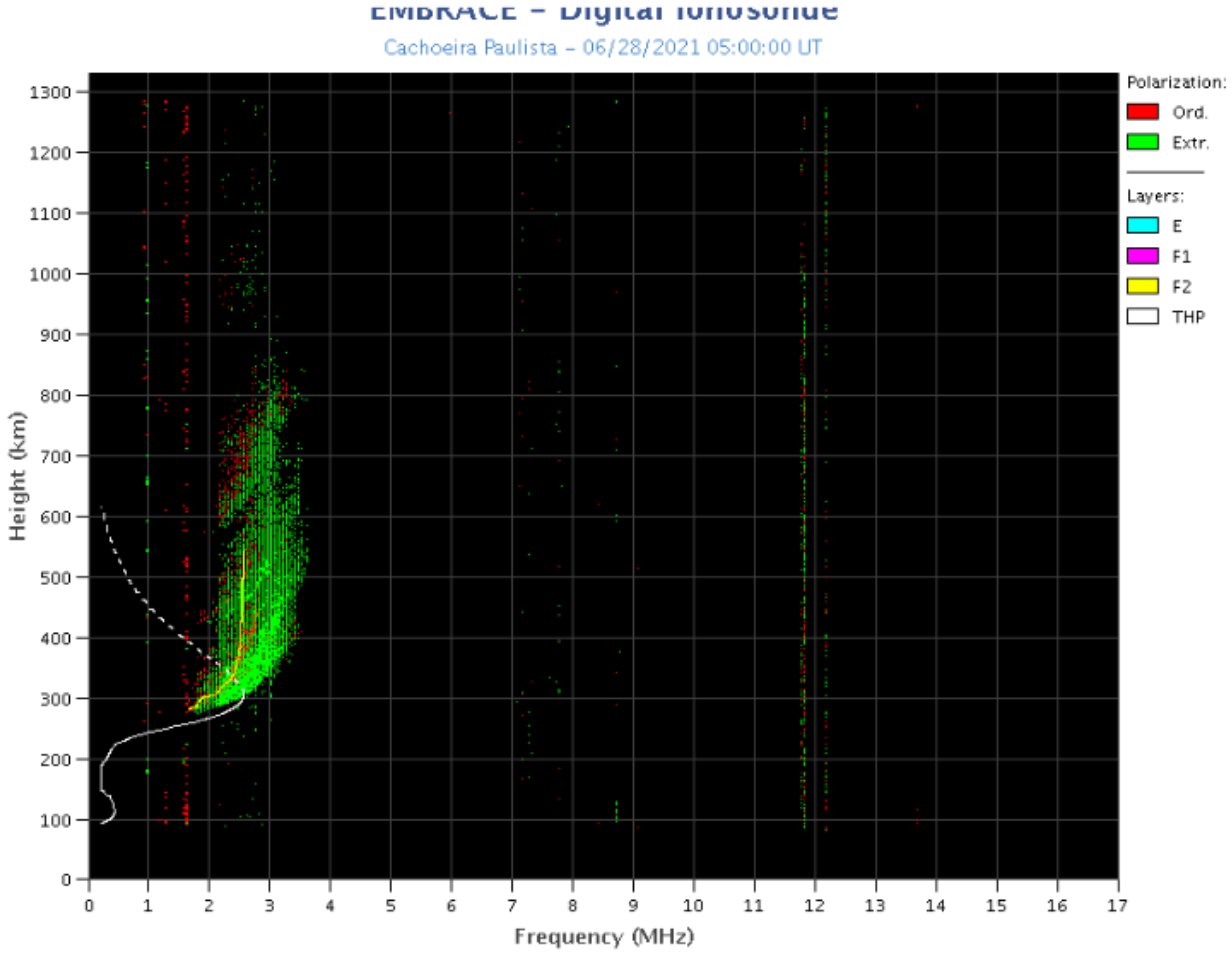
Boa Vista

- There was a weak spread-F that started after the pre-reversal enhacement on days 21, 22, 24, and 25.
- There was very strong Es layer on day 24, reaching scale 5.



Cachoeira Paulista

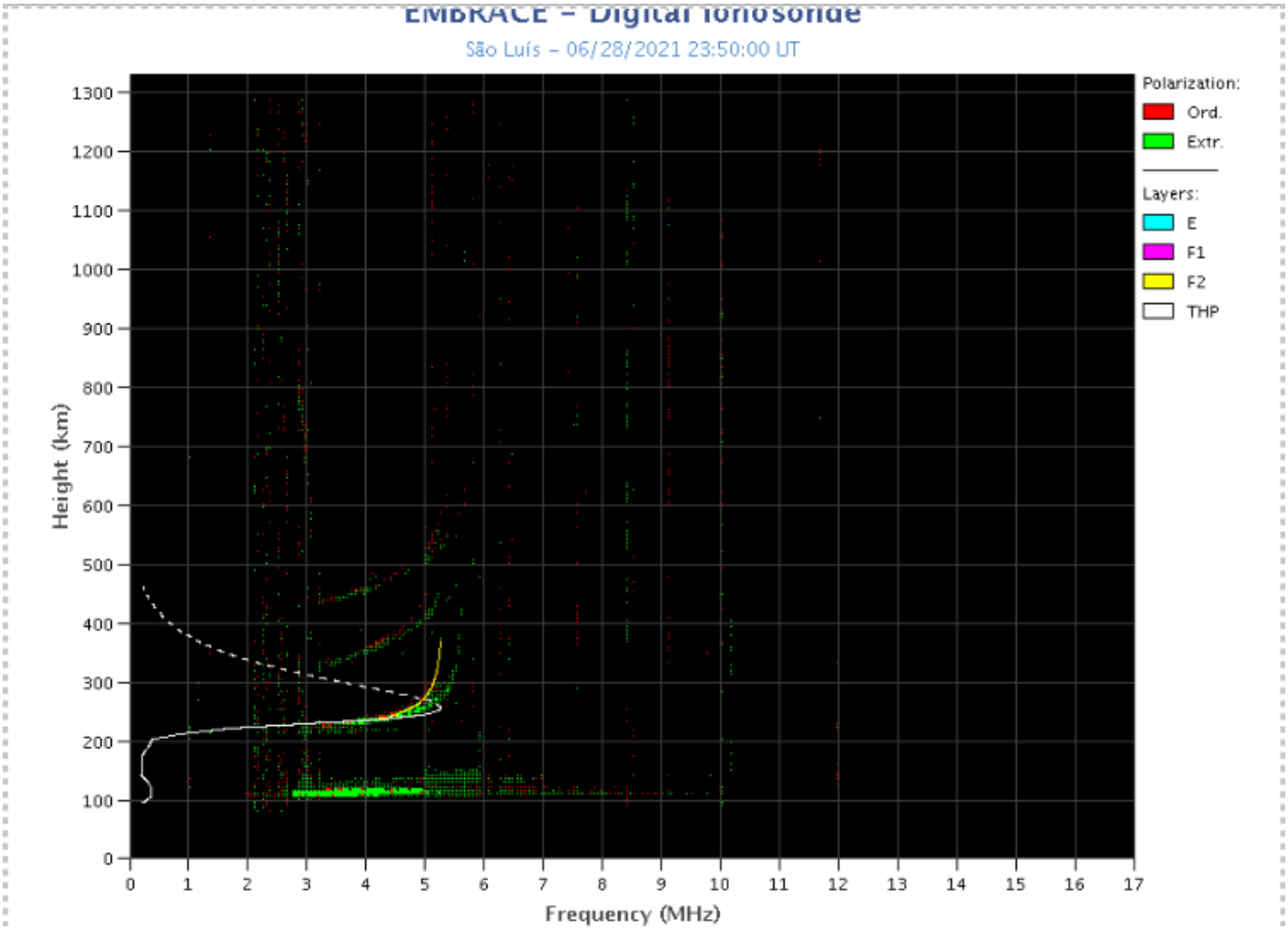
- There was a weak spread-F that started after the pre-reversal enhancement on days 21, 24, 25, and 25.
- The Es layers in this region were generally weak.



S

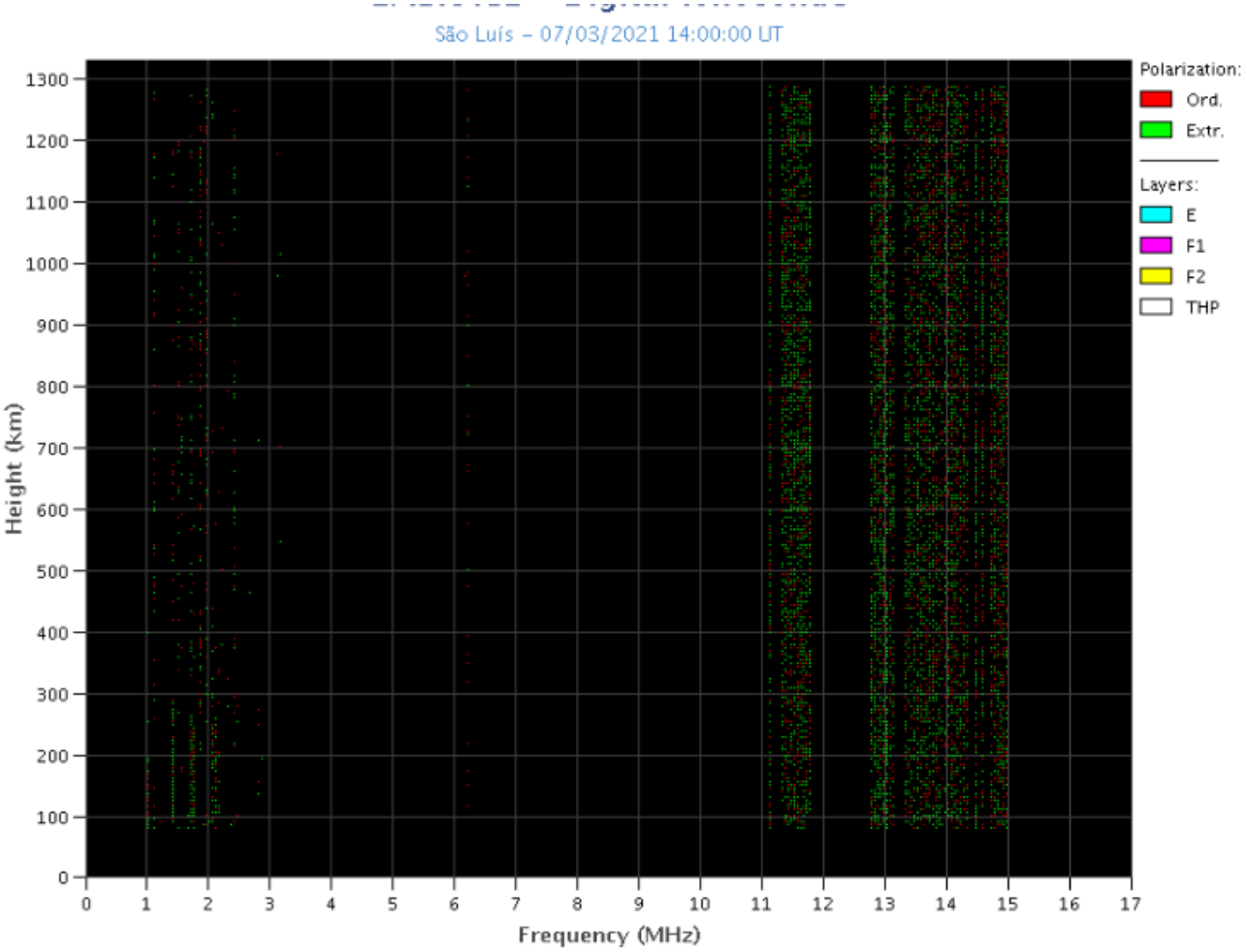
São Luis

- There was only Spread F on the day 27.
- There was Es layer on day 21, reaching scale 4. The other days reached scales 2 and 3 throughout the week.


EMBRACE – Digital Ionosonde
São Luís – 06/28/2021 23:50:00 UT
Height (km)
Frequency (MHz)
Polarization:
Ord.
Extr.
Layers:
E
F1
F2
THP

Blackouts:

- Ocorreram blackouts em todas as estações no dia 03 de julho devido ao flare de classe X.



Cintilation S4