Briefing Space Weather - 2022/02/07

Sun

Responsible: Douglas Silva

CME:
● Partial halo coronal mass ejection was observed around 14:09 UT on February 06 in LASCO
imagery.
WSA-ENLIL (CME 2022-02-01T07:12Z)
● No or little impact to Earth.
WSA-ENLIL (Prediction for CME 2022-01-06T14:09Z, 2022-02-06T15:38Z)
● The simulation indicates that the CME arrival forecast will occur on the following date:
2022-02-09T23:08Z (-7.0h, +7.0h).
Coronal holes (SPOCA):
● Coronal holes 35001 and 35006 were observed between January 31 and February 04.
● Coronal hole 35014 was observed on the 02nd of February.
● Coronal hole 35017 was observed on the 03rt of February.

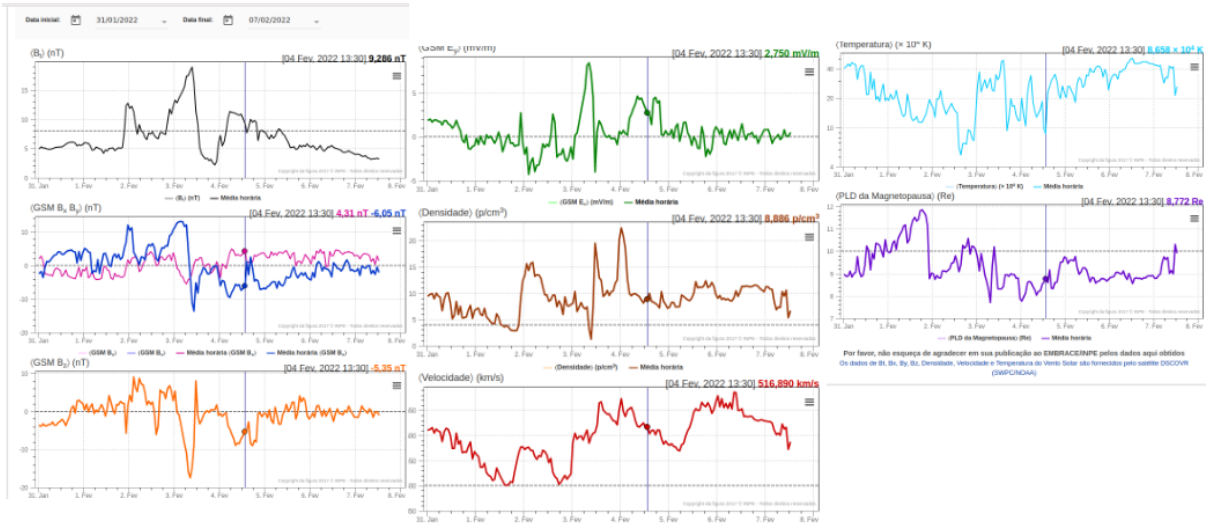
Responsible: José Cecatto

01/31 – Fast (=< 550 km/s) wind stream; No CME toward the Earth;
02/01 – Fast (=< 500 km/s) wind stream; 5 CME can have component toward the Earth; Jan, 29 CMEs SB Arrivals: Feb, 01: 21:37Z;
02/02 – Fast (=< 500 km/s) wind stream; 5 CME can have component toward the Earth;
02/03 – Fast (=< 600 km/s) wind stream; 5 CME can have component toward the Earth;
02/04 – Fast (=< 600 km/s) wind stream; 5 CME can have component toward the Earth;
02/05 – Fast (=< 600 km/s) wind stream; 1 CME can have component toward the

Earth;
02/06 – Fast (=< 600 km/s) wind stream; 2 CME can have component toward the Earth; OBS: At 14:09Z, partial halo CME assoc filament eruption and flare C3 – Pred SB arrival on Feb./09, 10:00Z-22:30Z; 15:38Z other CME;
02/07 – Fast (=< 550 km/s) wind stream; 1 CME can have component toward the Earth;
Prev.: Fast wind expected on February 12-13; for while low (15% M, 1% X) probability of M / X flares next 2 days; also, occasionally some other CME can present a component toward the Earth.

Interplanetary Medium

Responsible: Paulo Ricardo Jauer



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.

The modulus of the component of the interplanetary magnetic field presented 2 signals: 11/Feb at 23:30 at ~ 12.7 nT and another 03/Feb at 09:30 ~ 18.9nT. bxby components do not show a clear sector switch. The by component was more active with a variation of 12.76 nT on February 1st at 11:30 pm and another on February 3rd at 4:30 am of 13.04 nT. A possible sector switch on Feb/03 at 08:30 UT.

The bz south field component showed three significant peaks. On February 01, 02 and 03 at 22:30, 14:30 and 08:30 of -5.7, -6.11 and 17.4 nT respectively.
The density of the solar wind showed three significant peaks. On the 1st, 02nd and 03rd of February at 21:30, 11:30 and 00:30 of 15.6, 19.5 and 22.4 p/cm³ respectively.
The solar wind speed was mostly above 400km/s during the analyzed period, with a peak around ~589km/s on 06/Feb at 09:30 UT.
The position of the magnetopause was mostly below the typical positions. Featuring two significant compressions on February 3rd and 4th at 07:30 and 0030 UT of 7.7 Re.

Radiation Belts

Responsible: Ligia Alves Da Silva

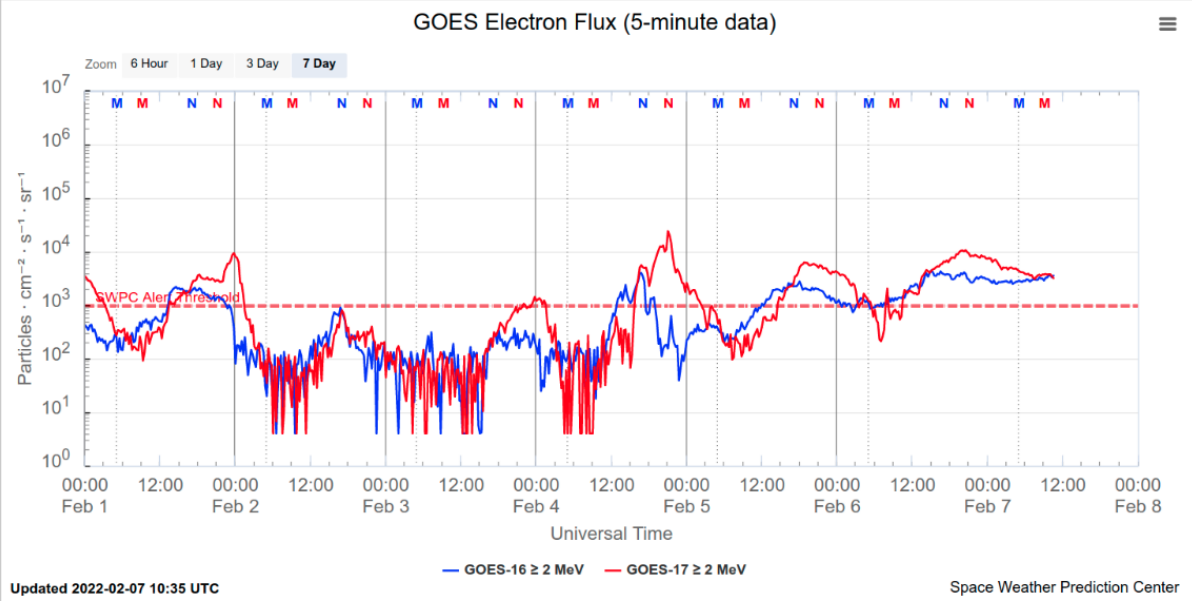


Figure 1: High-energy electron flux (> 2MeV) obtained from GOES-16 and GOES-17 satellite. Source: https://www.swpc.noaa.gov/products/goes-electron-flux

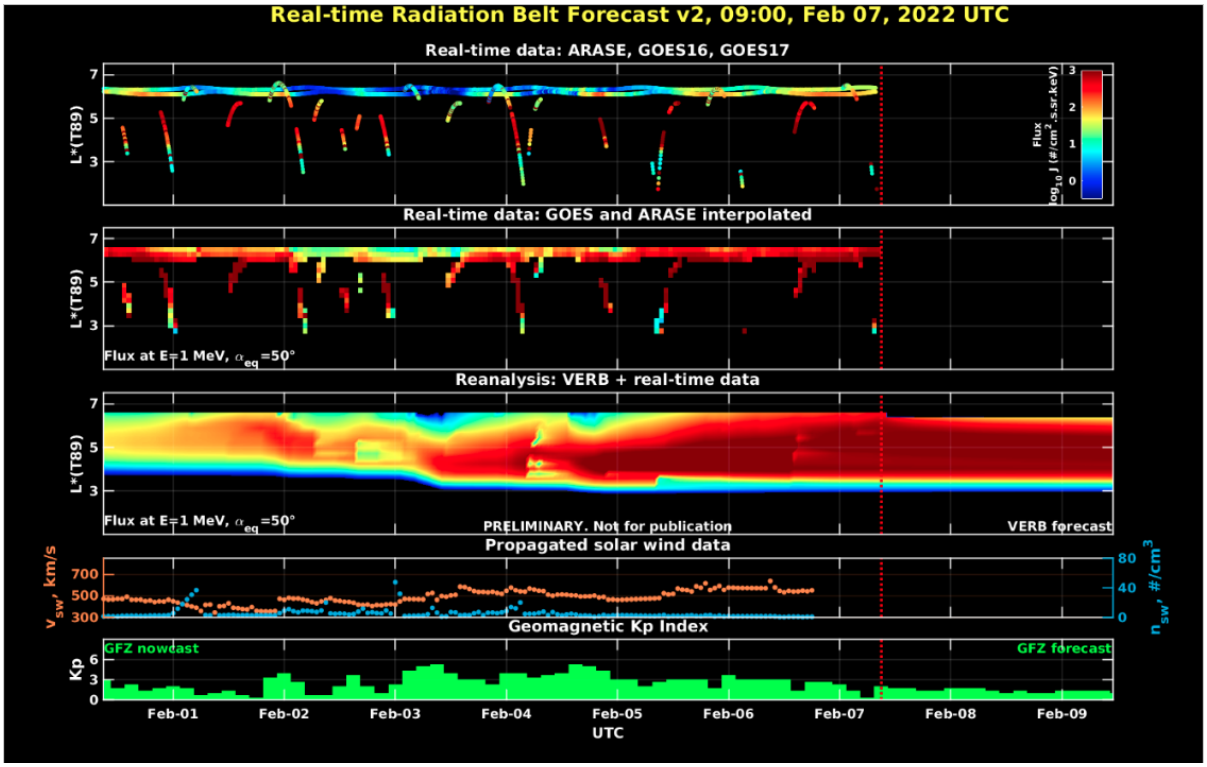


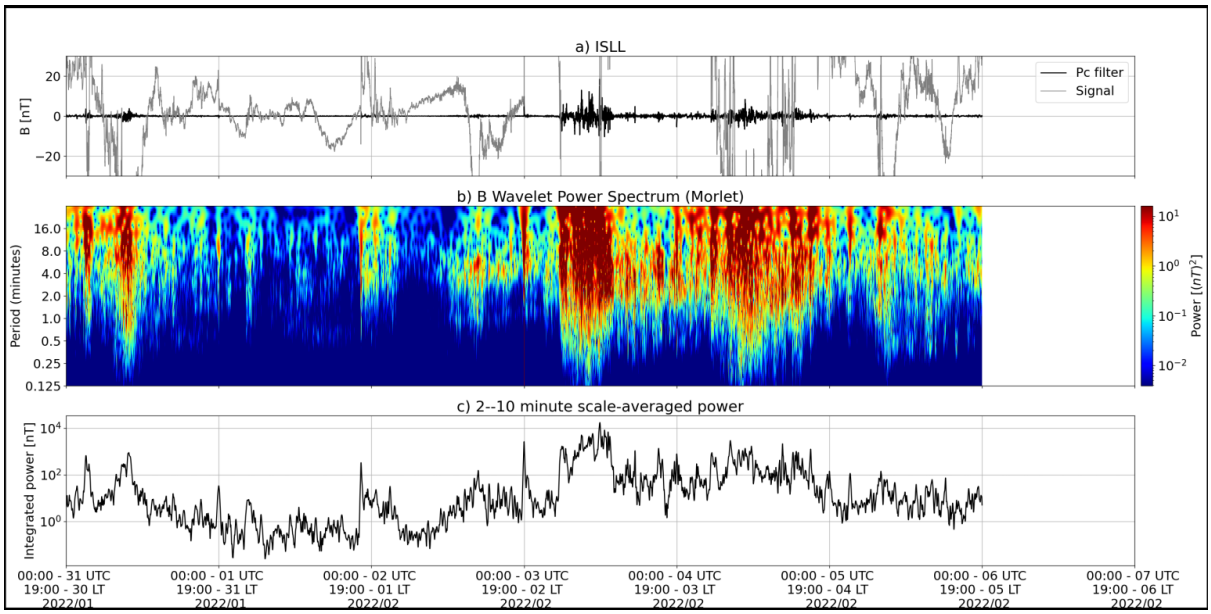
Figure 2: high-energy electron flux data (real-time and interpolated) obtained from ARASE, GOES-16, GOES-17
satellites. Reanalysis's data from VERB code and interpolated electron flux. Solar wind velocity and proton density data from ACE satellite. Source: https://rbm.epss.ucla.edu/realtime-forecast/

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) shows up with significant variability during this week. A dropout of more than two orders of magnitude is observed in the early hours of February 2nd. The electron flux remained confined below 103 particles/(cm2 s sr) until mid-February 4th, showing only two incursions at 103 particles/(cm2 s sr). An electron flux increase is observed from 12:00 UT on February 4th, exceeding 104 particles/(cm2 s sr) at 21:00 Z on February 4th.

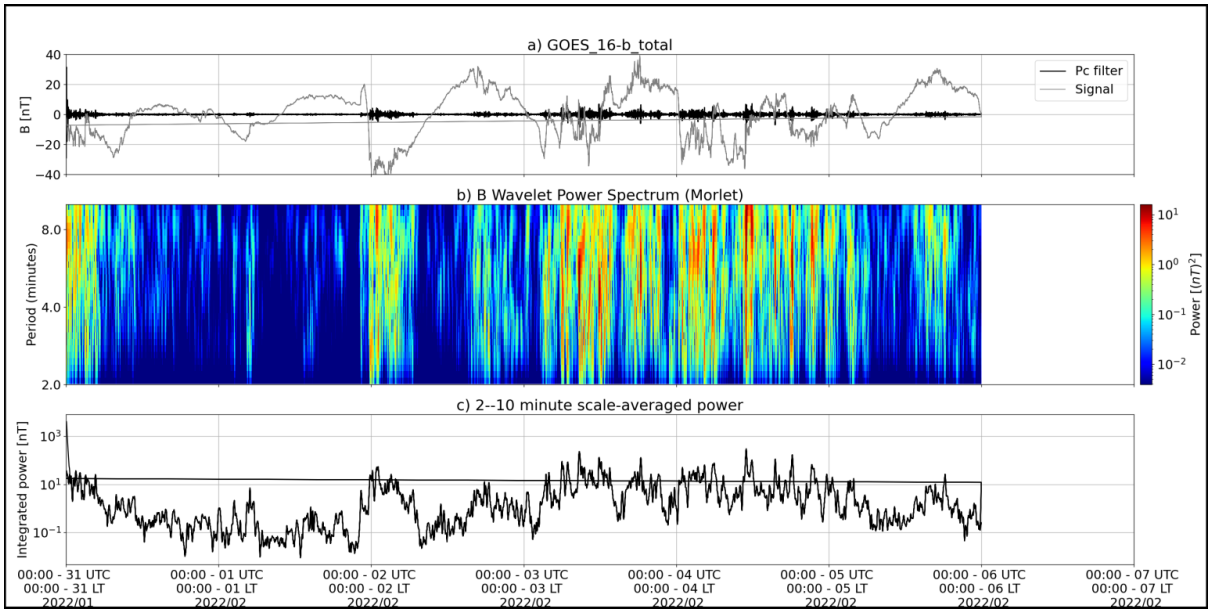
The GOES-16, GOES-17, and Arase satellite data are analyzed and interpolated to observe the high-energy electron flux variability (1 MeV) in the outer radiation belt (Figure 2). Additionally, the VERB code rebuilds this electron considering the Ultra Low Frequency (ULF) waves' radial diffusion. The dropout observed during this week is associated with the arrival of a coronal
mass ejection, while the electron flux increase observed is associated with the arrival of a high speed solar wind stream. These observed variabilities occurred concomitantly with ULF wave activity.

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 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).

At the beginning of the week, on the 31st of January, there is a wave activity for a short period. The main activity days of the week are January 03, 04 and 05. On the 3rd, the waves are possibly generated by the interaction of a CME with the Earth's magnetosphere, due to abrupt disturbances, characteristic of a shock of the interplanetary medium. In the following days, the disturbances are characteristic of a substorm generated by reconnection processes in the magnetosphere tail that provided an injection of energy for more than a day, mainly at high latitudes.

Geomagnetism

Responsible: José Paulo Marchezi

In the week of January 31 to February 7, the following events related to geomagnetic activity stand out:

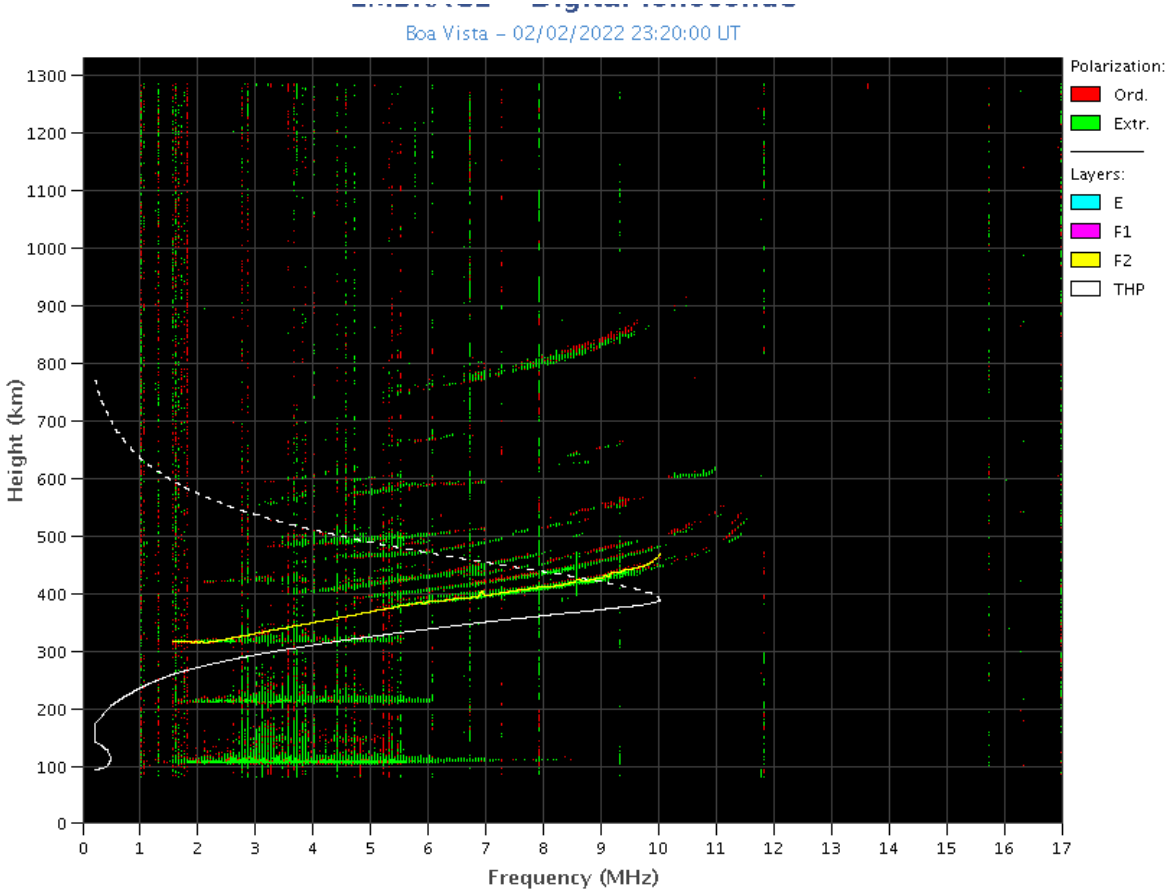
- The data from the Embrace magnetometer network showed instabilities throughout the period, with some highlighted events:
    - February 03 and 04, fall in component H in all seasons, from to -140 nT on 4 February
- The highest Kp of the week was 4+ during the 3rd and 4th of February.
- The auroral activity was intensified on the 3rd and 4th of February, with a long period with an AE index above 1000 nT

Ionosphere

Responsible: Laysa Resende

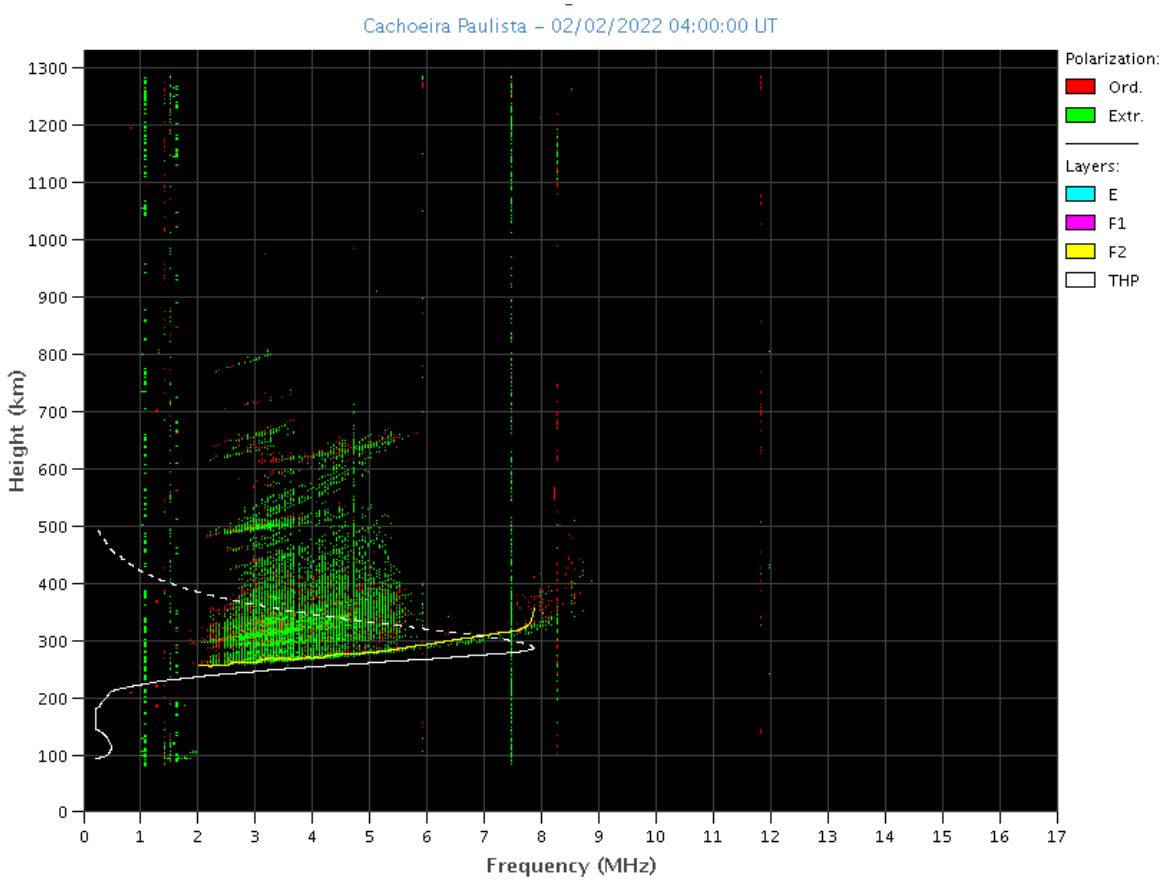
Boa Vista:

- There were spread F during all days in this week.
- The Es layers reached scale 3 on days 02, 03, and 04.



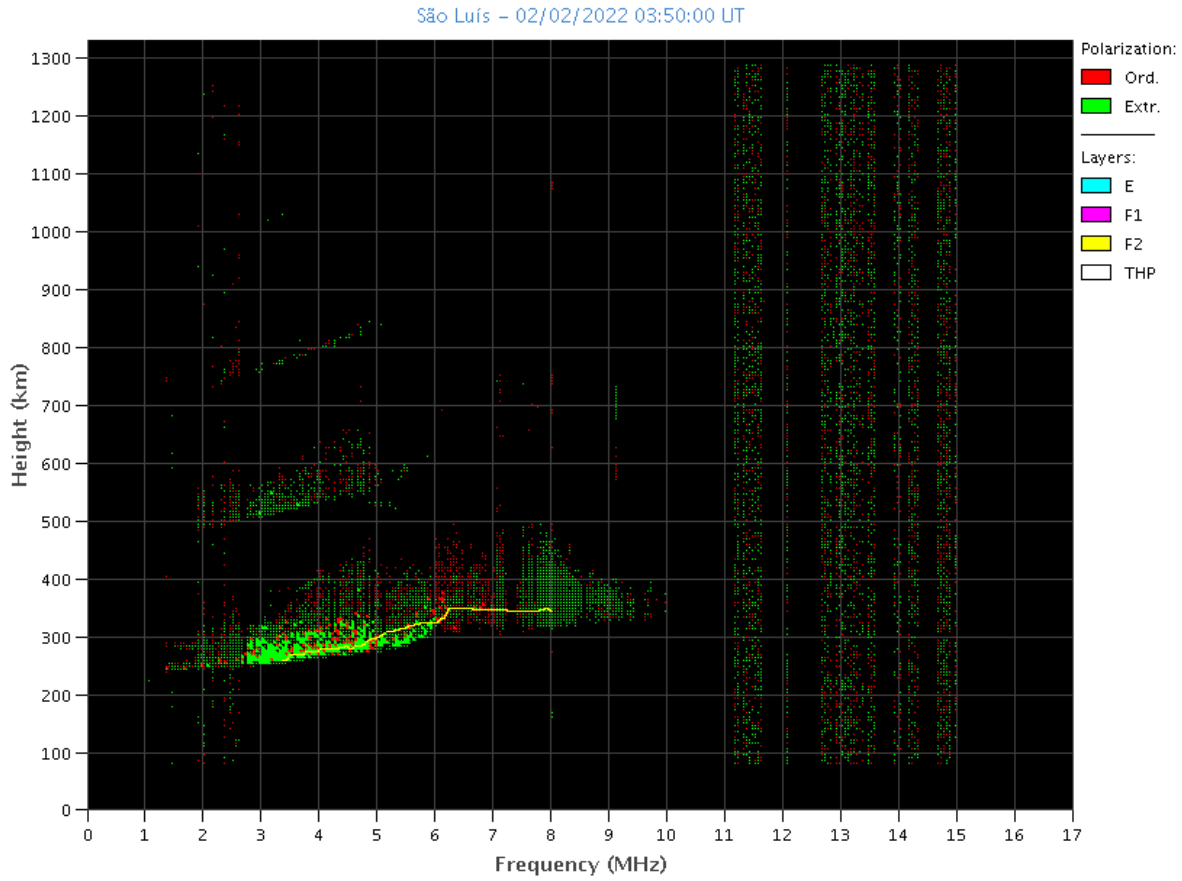
Cachoeira Paulista:

- There were spread F on days 02, 03, and 04.
- The Es layers reached scale 3 on days 31, 01, and 06.



São Luís:

- here were spread F during all days in this week.
- The Es layers reached scale 3 on days 01, and 06.



Scintillation S4

Responsible: Siomel Savio Odriozola

In this report on the S4 scintillation index, data from the STNT station in Natal/RN, PALM in Palmas/TO, UFBA, in Bahía / BA and 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.

This week data was acquired at the PALM station between January 24th and 26th. At the UFBA station, the available data appear between the 26th and 29th of January. S4 index values for STSN stations show scintillation effects every day after sunset. The same happened for PALM and UFBA In the case of the SJCE station, scintillation events were detected in the early hours of the 24th and after dusk on the 28th and 29th of January (Figure 1). Figure 2 shows the satellites that contributed the highest S4 values to the STNT and SJCE stations during 01/29-30/2022

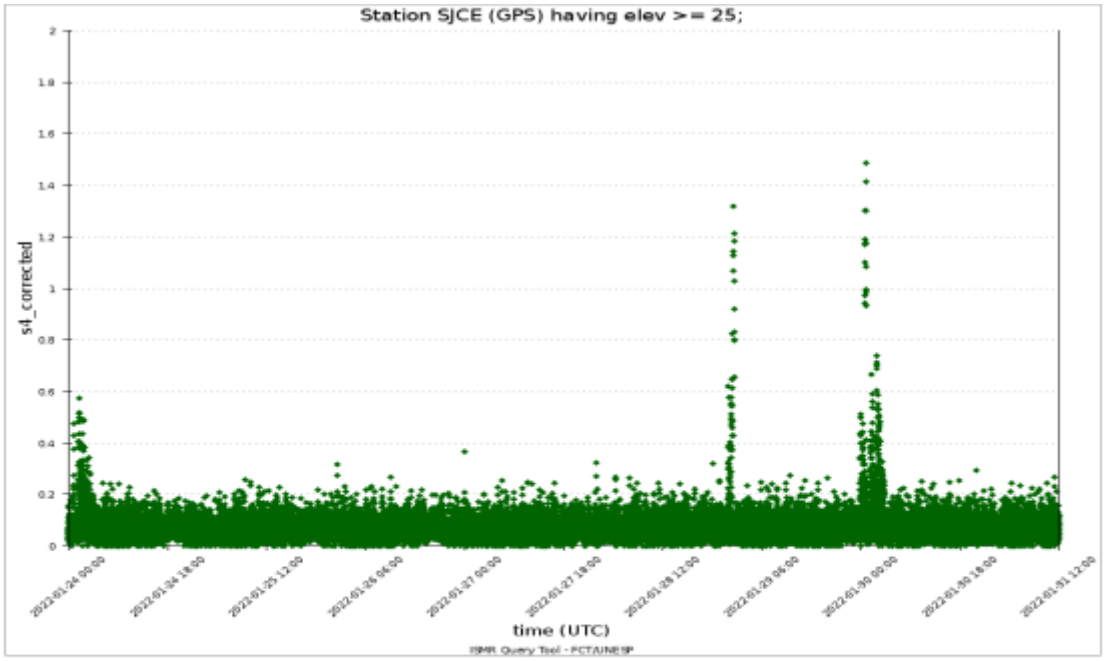


Figure 1: Values of the S4 index for the GPS constellation for SJCE station measured during the week 24/01—31/01/2022.

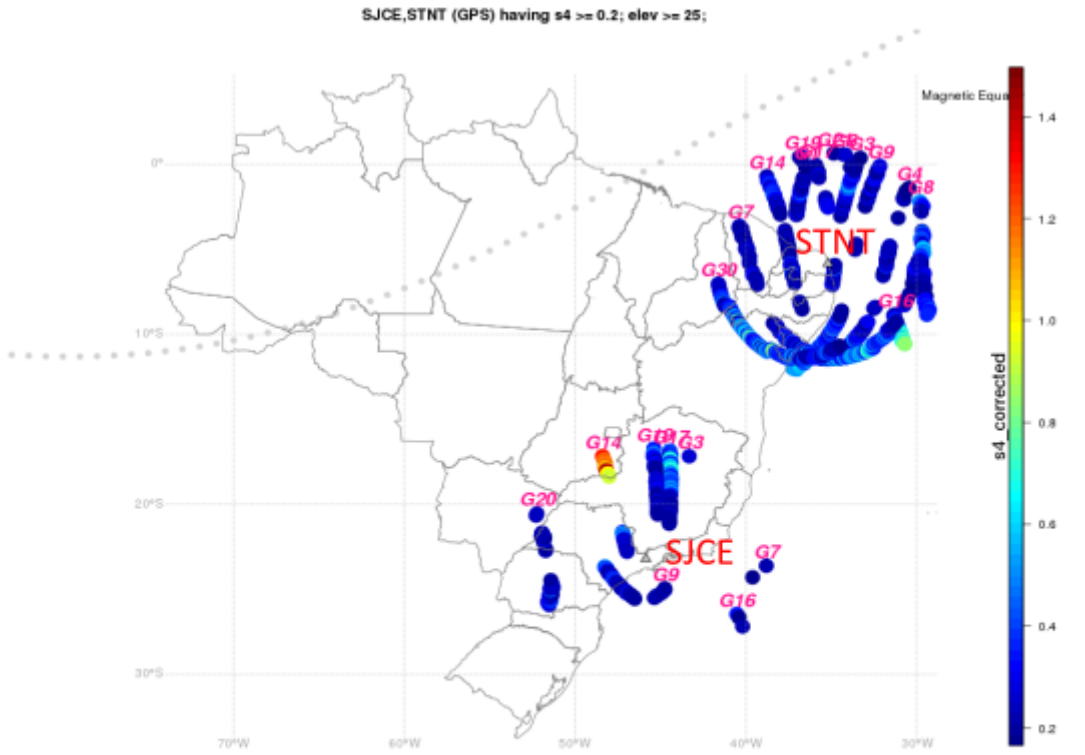


Figure 2: Map of S4 values > 0.2 for the GPS satellites with elevation > 25° in the receiver's field of view of STNT and SJCE stations between 2200 UT on 01/29 until 0500 UT on 01/30/2022.

Imager

Responsible: Prosper Nyassor