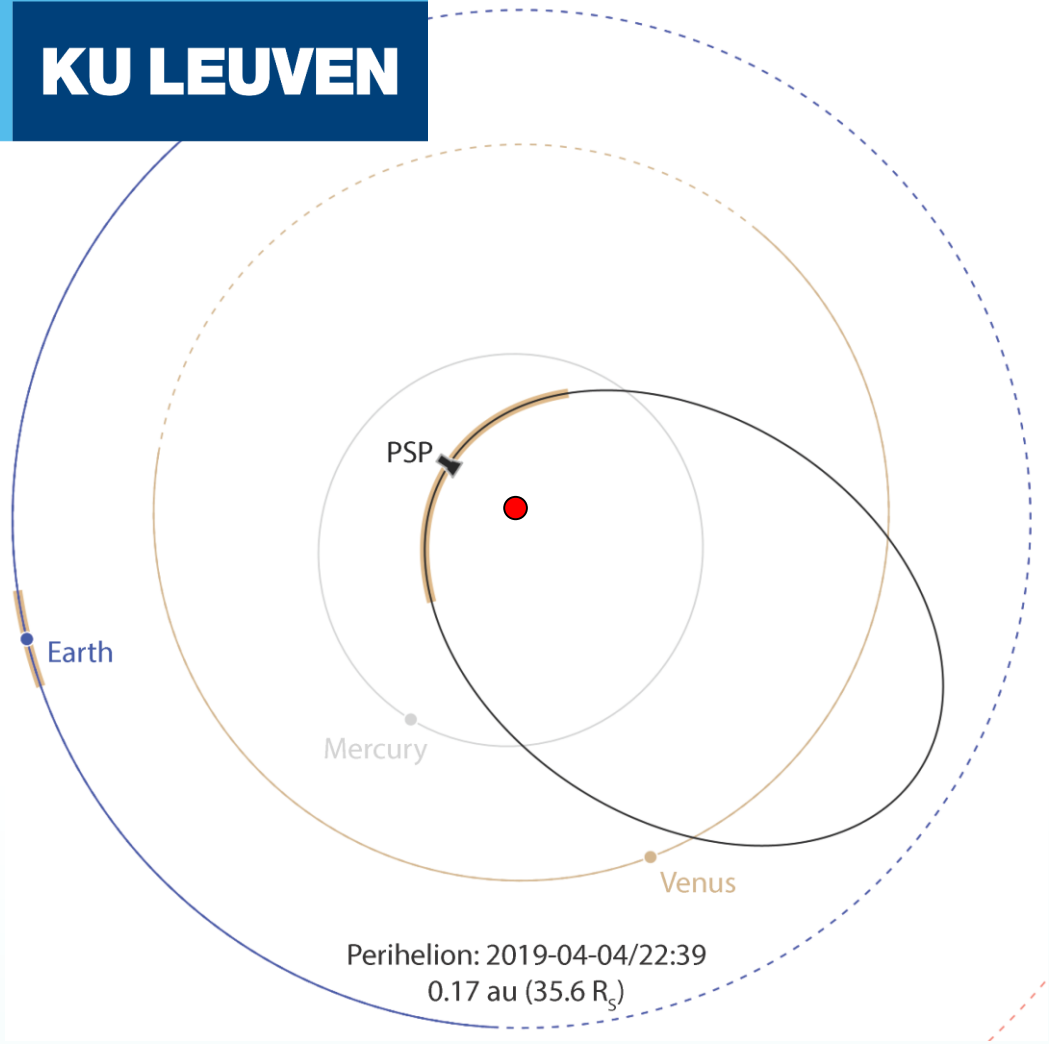
KU LEUVEN

ROYAL OBSERVATORY OF BELGIUM



Type III radio burst on April 03, 2019

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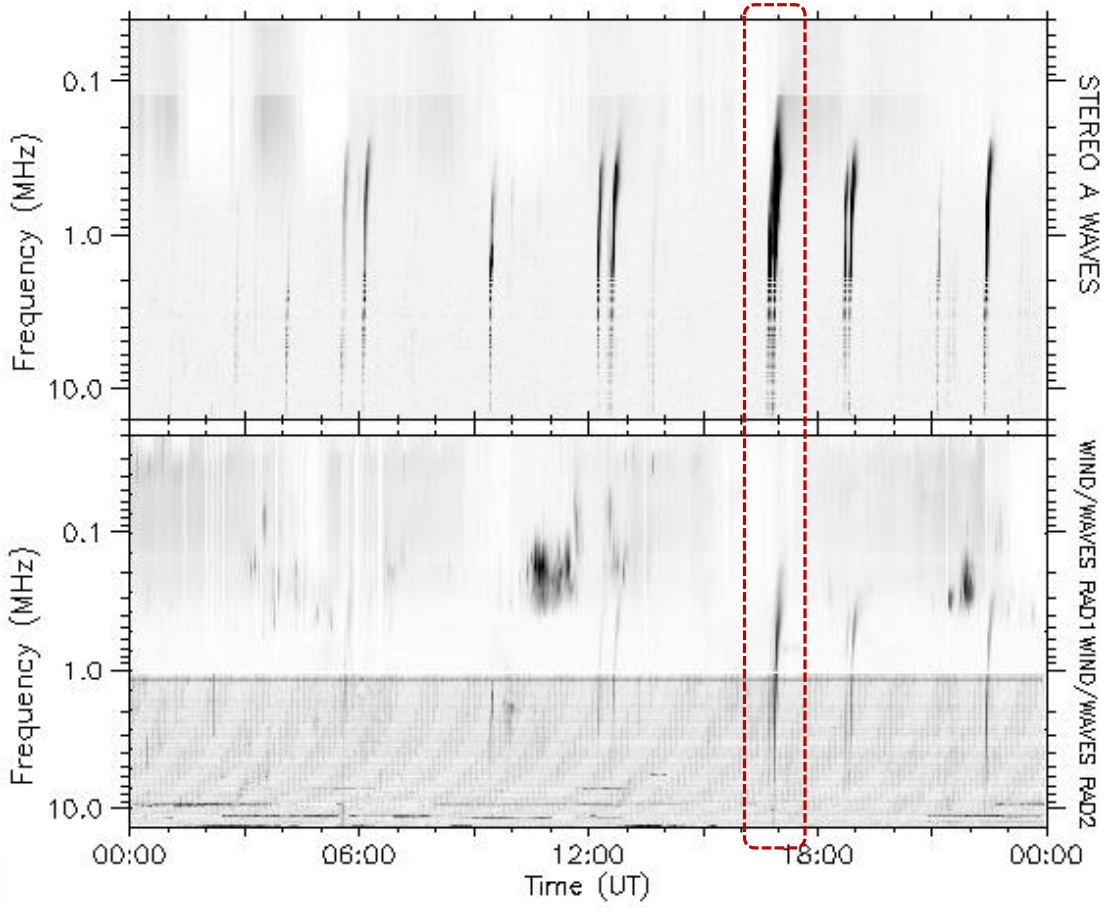
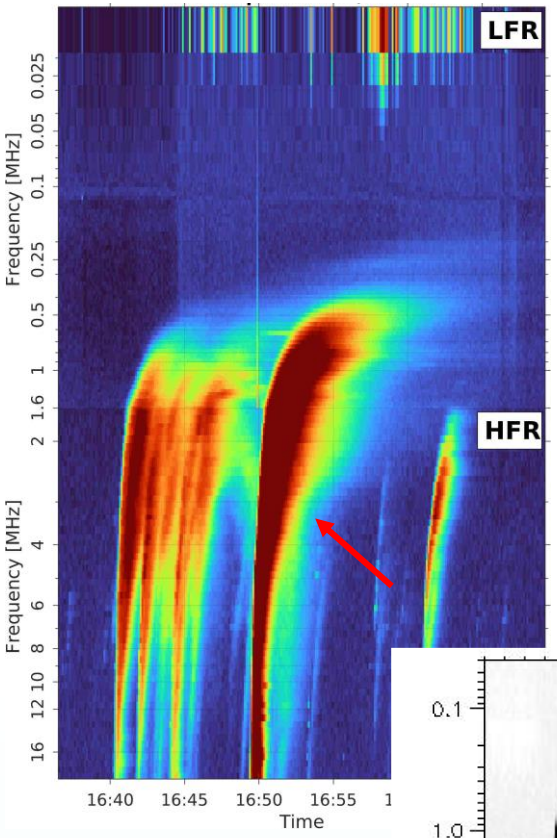
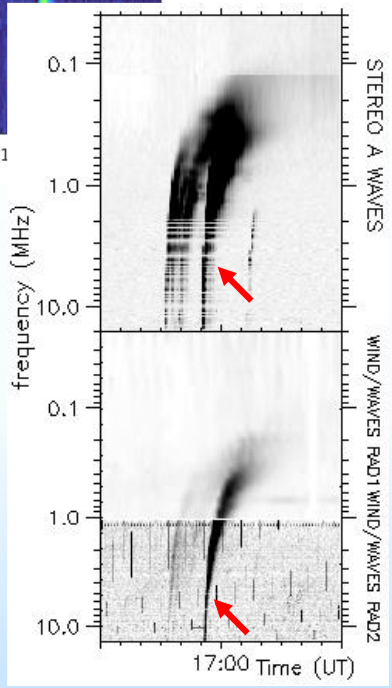
Radio event on April 03, 2019



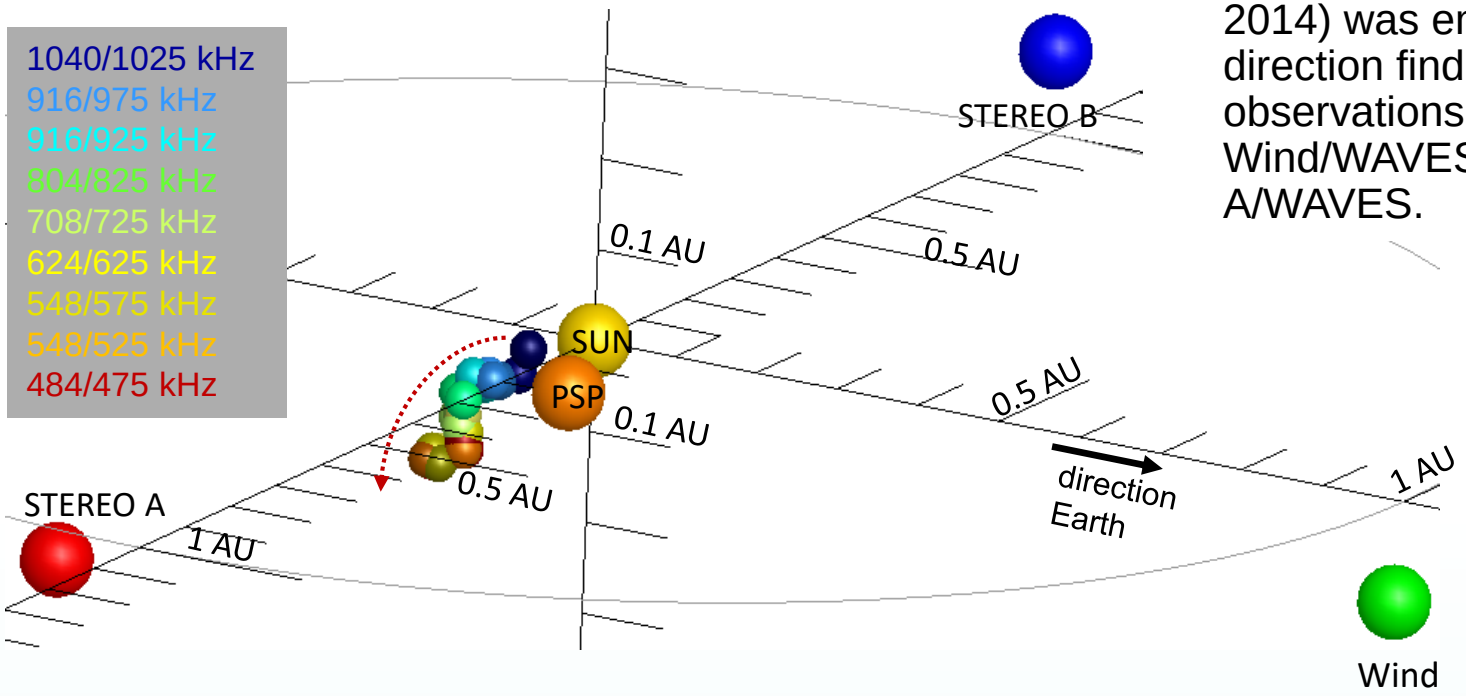
Dynamic Radio Spectra PSP/FIELDS





- Few groups of type III radio bursts observed on April 03, 2019.
- Focus is on one type III burst observed by number of instruments.

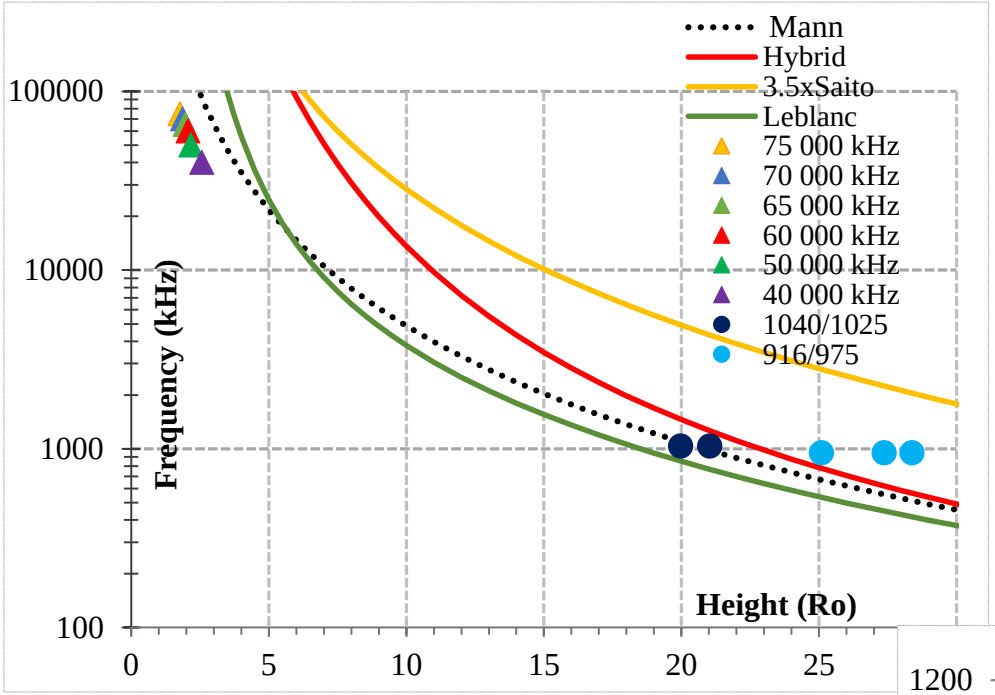
Radio triangulation of type III burst



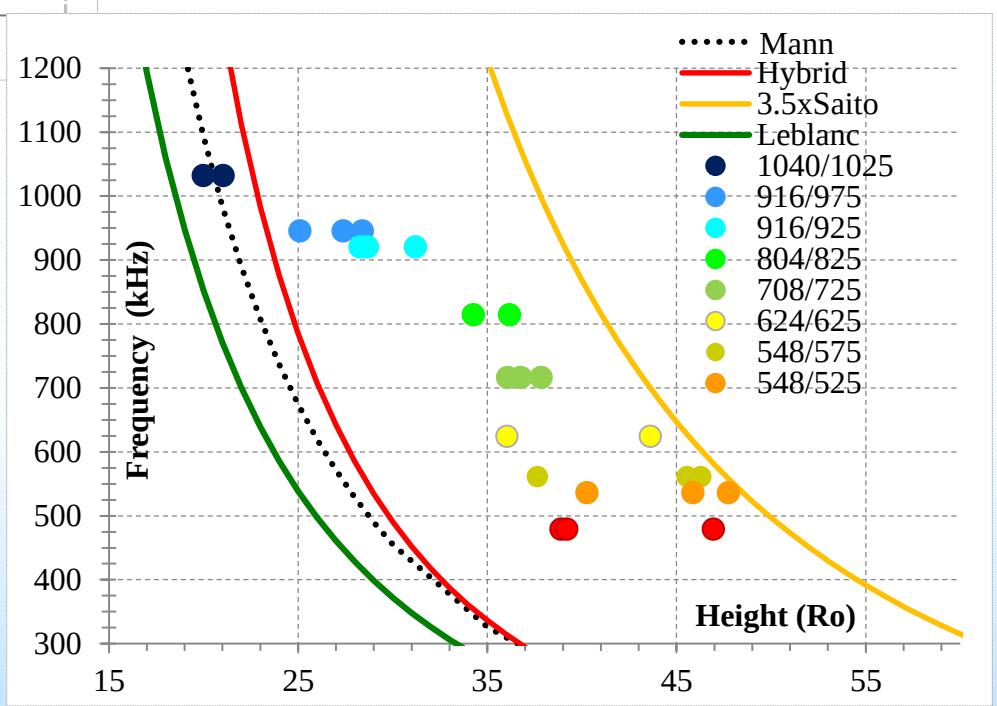
- Radio triangulation method (e.g. Magdalenic et al., 2014) was employed on direction finding observations by Wind/WAVES & STEREO A/WAVES.

- The particular propagation path of type III burst is also strongly different from the Parker spiral.
- First results show that might be due to the passage of the weak CME that disturbed ambient coronal conditions (Kouloumvakos et al., 2020).

Density profiles from radio observations

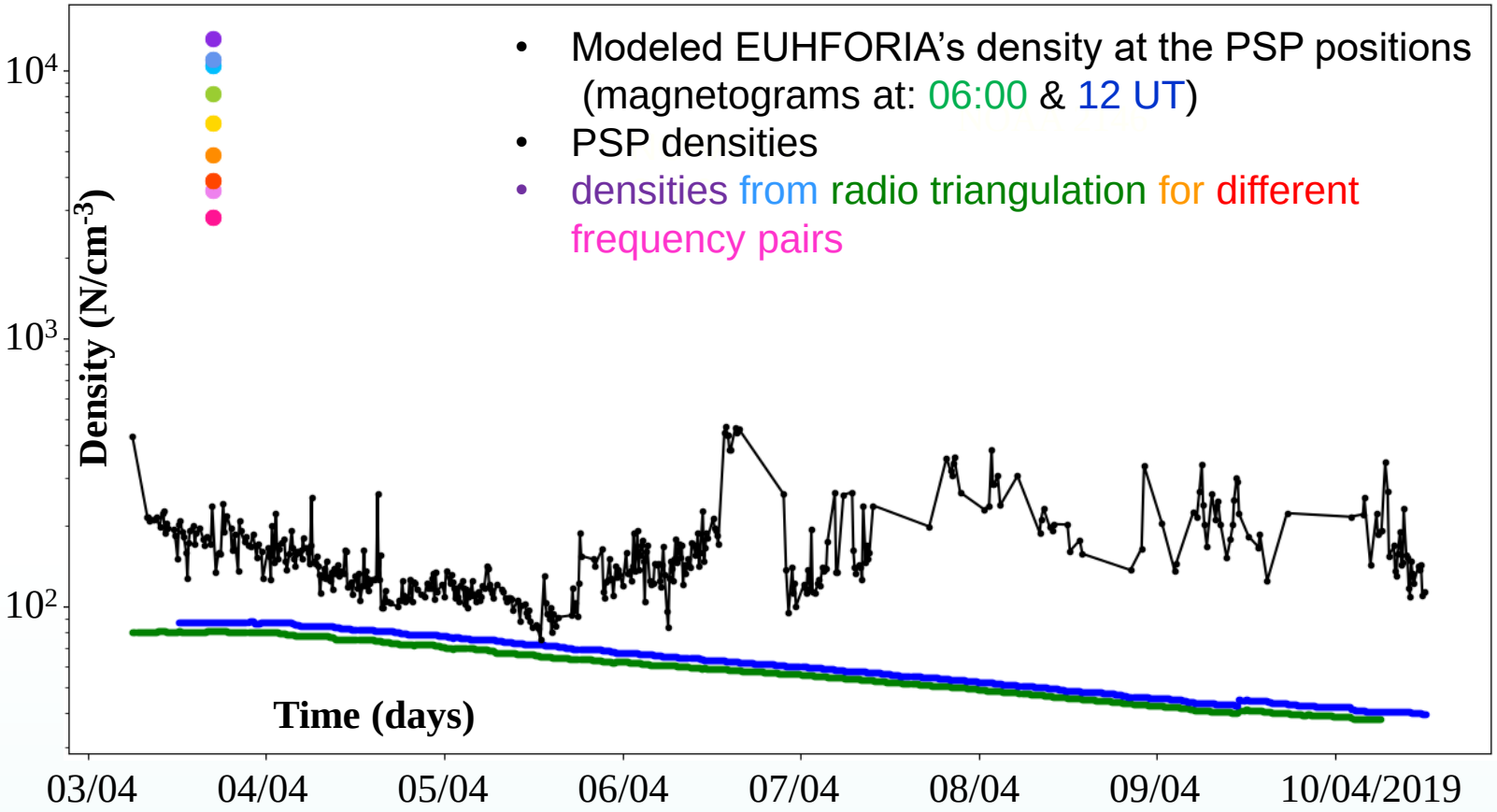


- As $f \propto \sqrt{n}$, from the radio observing frequency we can estimate density.
- In a case of close-to-the-limb-event projection effects are small so position of radio sources can provide their heights.
- Density obtained employing LOFAR (van Haarlem et al., 2013) observations is close to the 1D coronal electron density model by Mann et al., (1999).



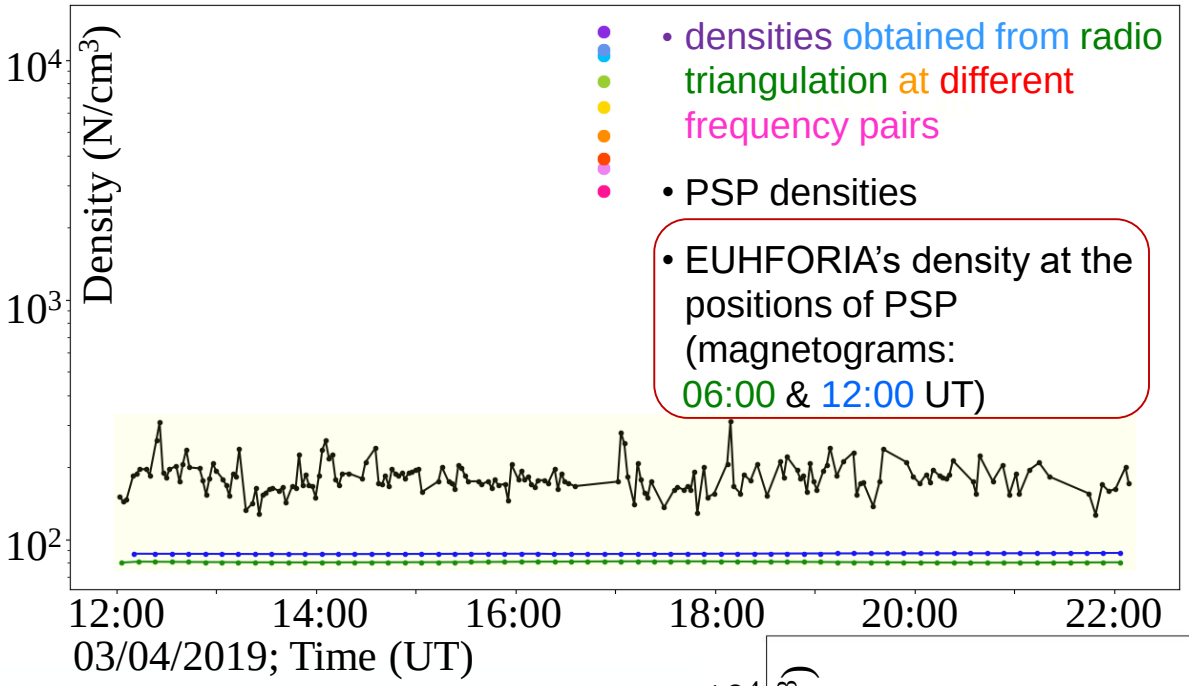
- 3D positions of radio sources obtained by radio triangulation can be scaled for comparison with 1D coronal electron density models.
- Obtained range of densities is between Mann & 3.5x Saito models (Mann et al., 1999; Saito et al.,1970, respectively).

Density profiles in time: EUHFORIA, PSP & radio observations



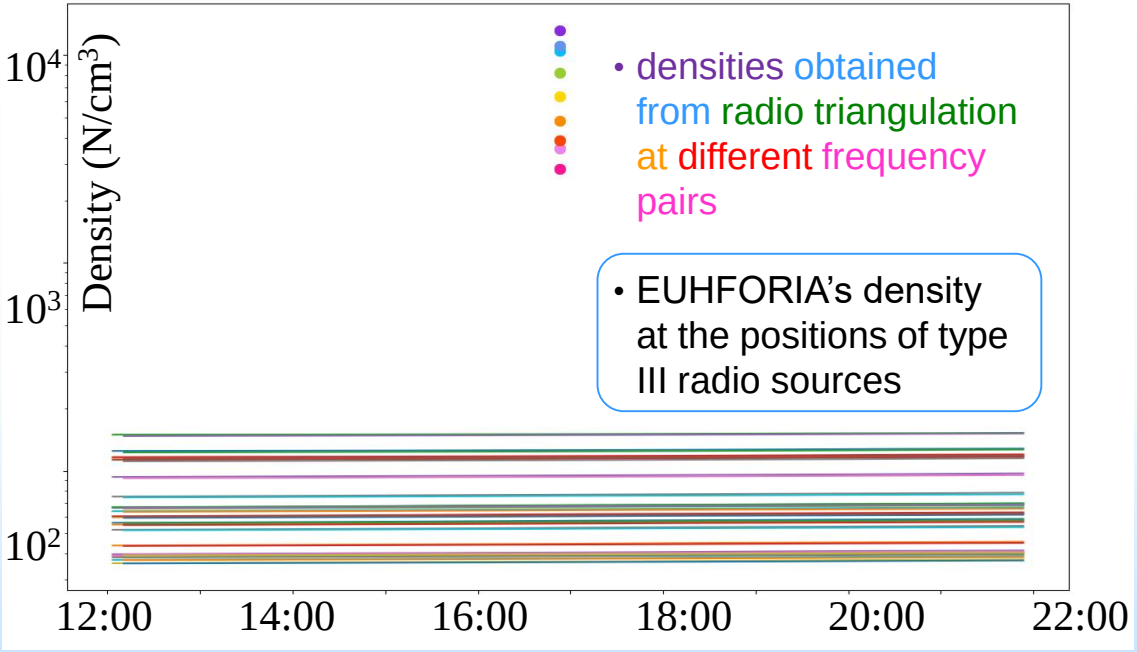
- EUHFORIA space weather forecasting-targeted inner heliosphere model (European heliospheric forecasting information asset; Pomoell & Poedts, 2018).
- Modeling with EUHFORIA was done employing its default set up values and version 1.0.4 (see e.g. Hinterreiter et al., 2019).

Density profiles in time: EUHFORIA, PSP & radio observations

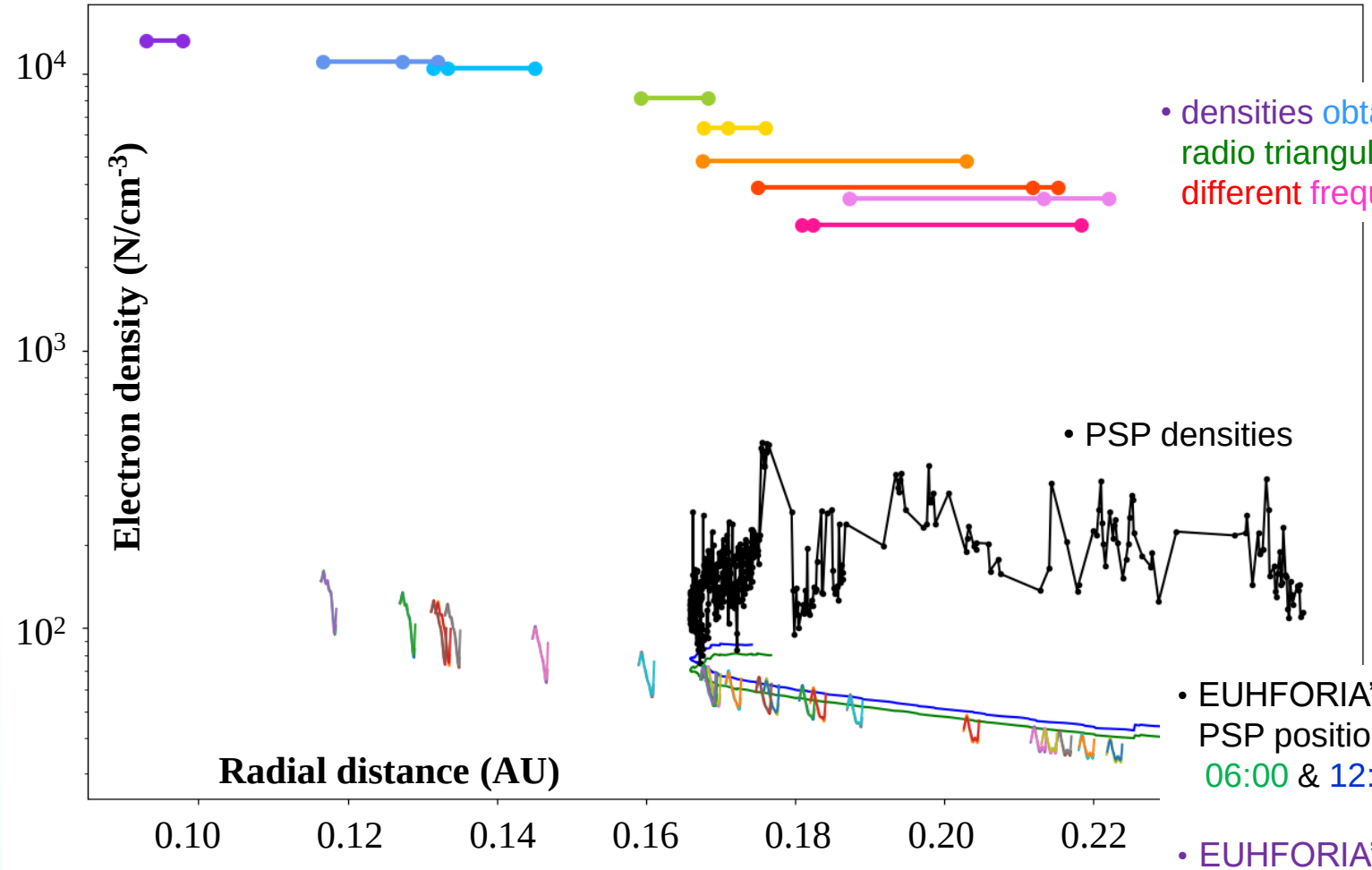


- Modeled EUHFORIA's density at the PSP positions: $n \approx 80$ - 90 N/cm^3.
- Modeled EUHFORIA's density & observed PSP density: $n \approx 60$ - 250 N/cm^3.

- EUHFORIA's density at the positions of type III radio sources have larger variations: $n \approx 35$ - 160 N/cm^3.



Density profiles as a function of radial distance



- It is probable that density obtained by radio observations are overestimated and the modeled density by EUHFORIA are underestimated (Hinterreiter et al., 2019)

Summary:

- During 2nd PSP perihelion number of type III radio bursts was observed. We studied one type III radio burst from a group of bursts observed on April 03, 2019.
- The radio triangulation results show particular propagation path of the type III radio burst, which is also strongly different from the Parker spiral.

  First results show that might be due to the earlier passage of the weak CME that disturbed ambient coronal conditions (Kouloumvakos et al., 2020).
- Radio sources observed by LOFAR combine well with sources obtained by radio triangulation. The obtained density profiles are in the range of by Mann & 3.5x Saito coronal electron density models (Mann et al., 1999 & Saito et al.,1970, respectively).
- Density profiles obtained from radio observations (LOFAR & Wind/WAVES, STEREO A/WAVES) are different from the PSP observations and density profiles obtained by EUHFORIA).

  There are a few possible reasons for the obtained discrepancy, such as:
  a) scattering processes that affect the obtained radio source positions;
  b) strongly different density along the coronal structures in which type III electron beams propagate and the once through which PSP passed? Or something else?

THANK YOU FOR YOUR ATTENTION.
There is more to come, so stay tuned ☺