



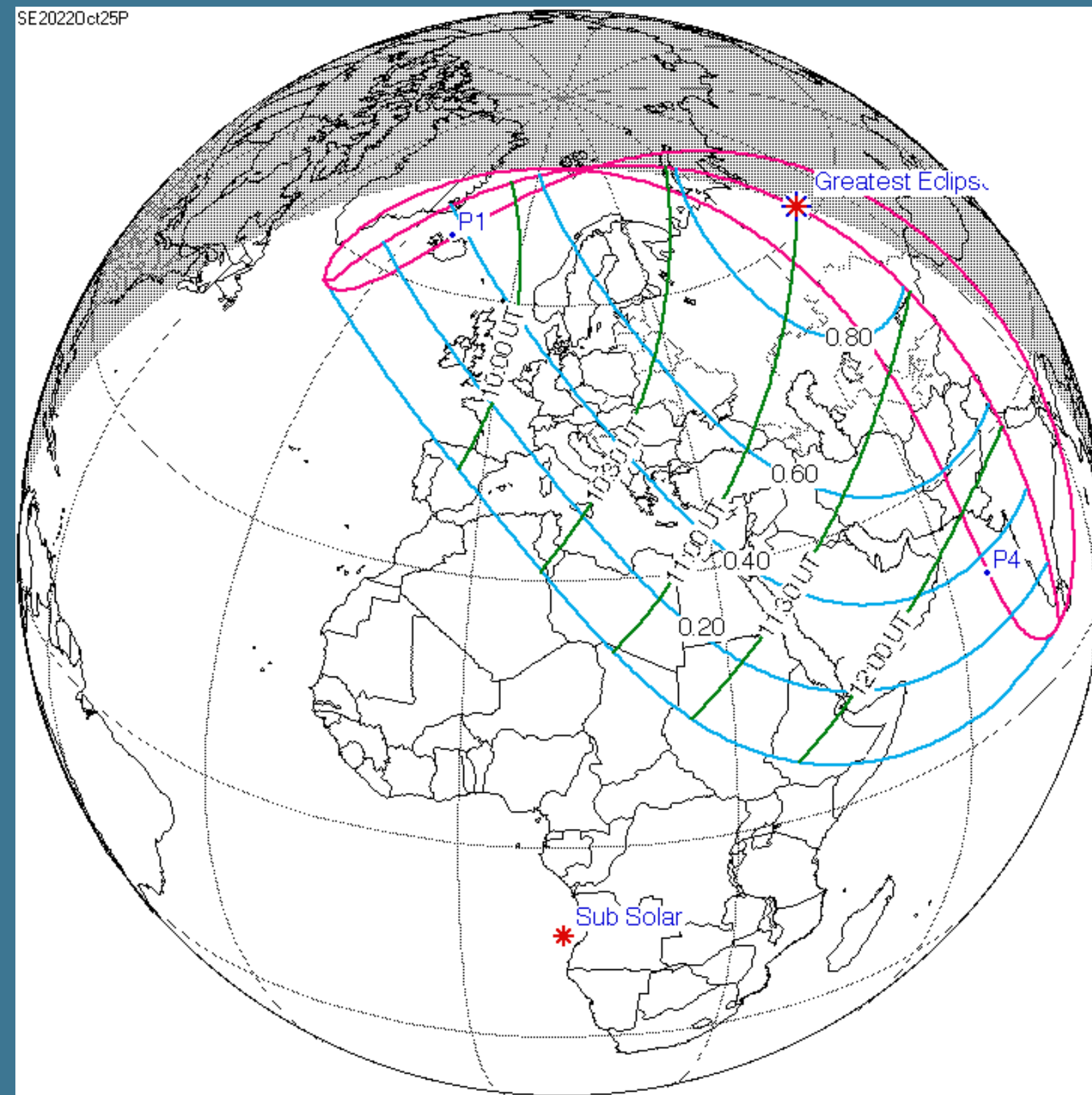
PARTIAL SOLAR ECLIPSE OBSERVATION WITH LOFAR PL610 STATION IN A LOCAL MODE

MARIUSZ POŻOGA, HELENA CIECHOWSKA, BARBARA MATYJASIAK, THI PHUNG, HANNA ROTHKAEHL

LOFAR Family Meeting, 12–16 June 2023, Olsztyn, Poland

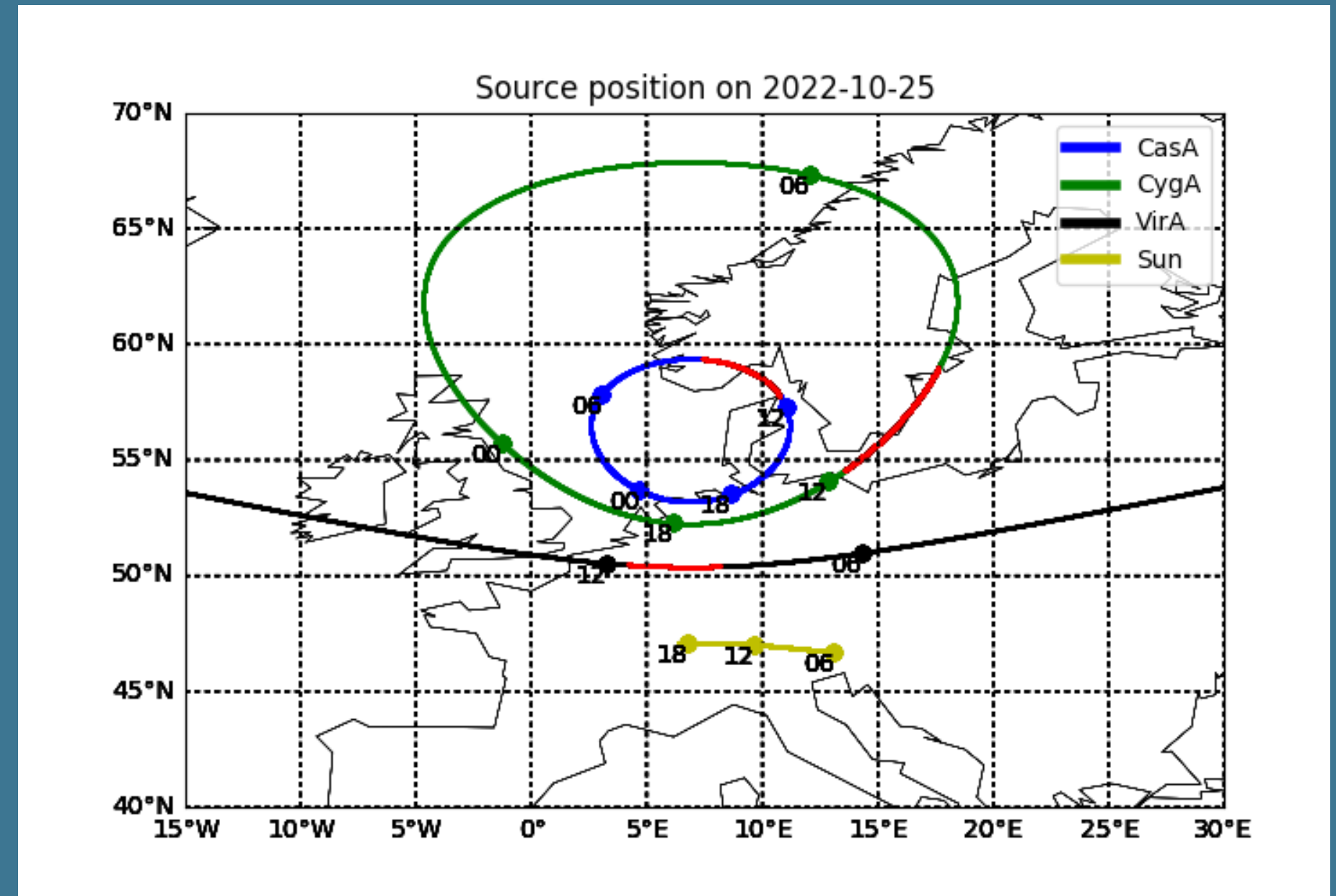
Solar eclipse 25-10-2022

The solar eclipse of October 25, 2022, was a partial solar eclipse visible from Europe, the Urals and Western Siberia, Central Asia, Western Asia, South Asia and from the north-east of Africa. The maximal phase of the partial eclipse occurred on the West Siberian Plain in Russia near Nizhnevartovsk, where more than 82% of the Sun was eclipsed by the Moon. (Wikipedia)



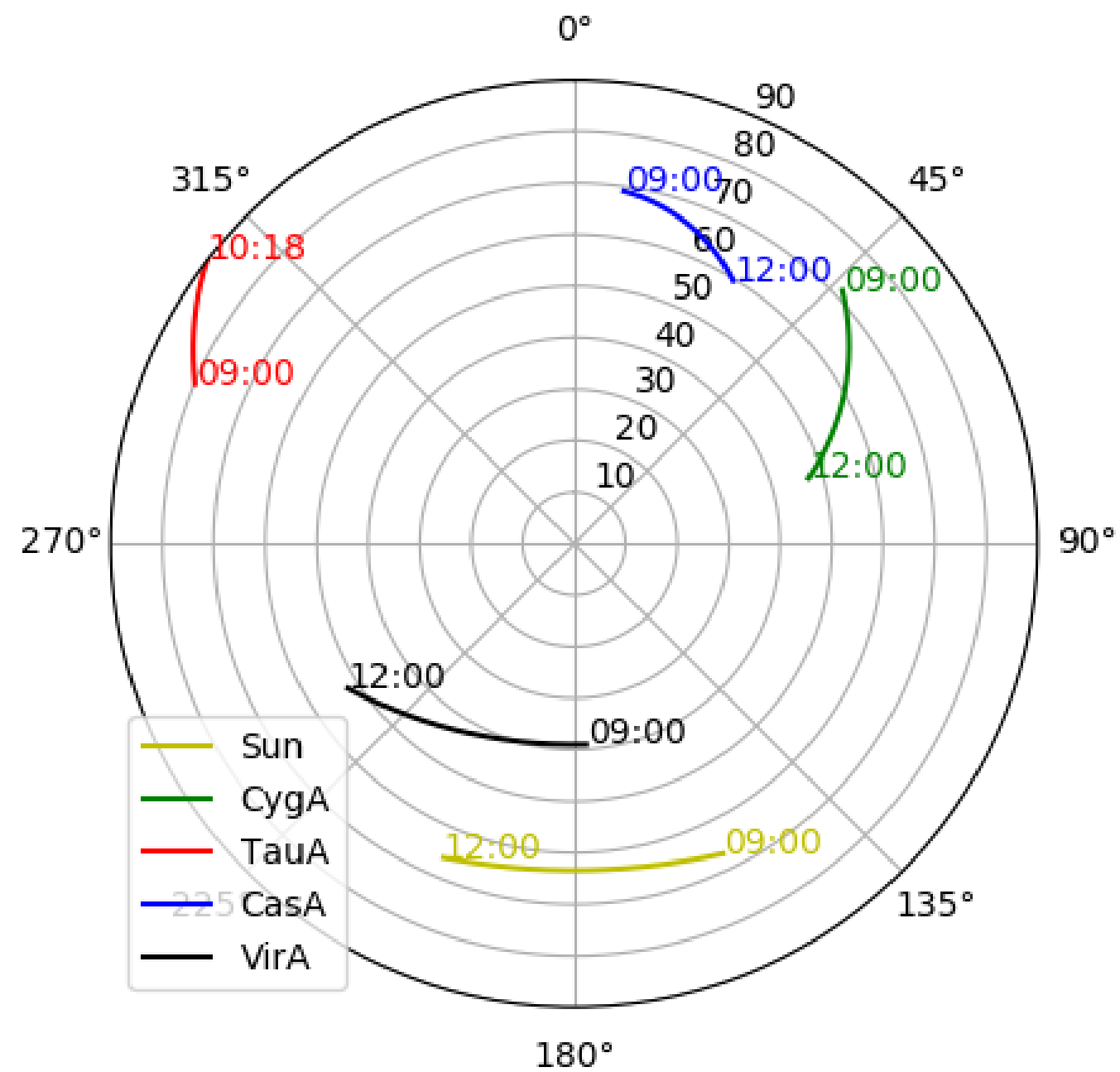
Observations

To observe the Sun eclipse, the LBA antenna field has been used. Due to the construction of the antennas and lack of analog beamforming, it allows for simultaneous observations in four different directions. During the event, the observation of strong radiosources - CasA, CygA, and VirA - has been carried out. Depending on their availability. We used bands in range 14-47 MHz. The Sun was observed in range 5-99MHz



Ionospheric Pirce point on PL610 LOFAR station

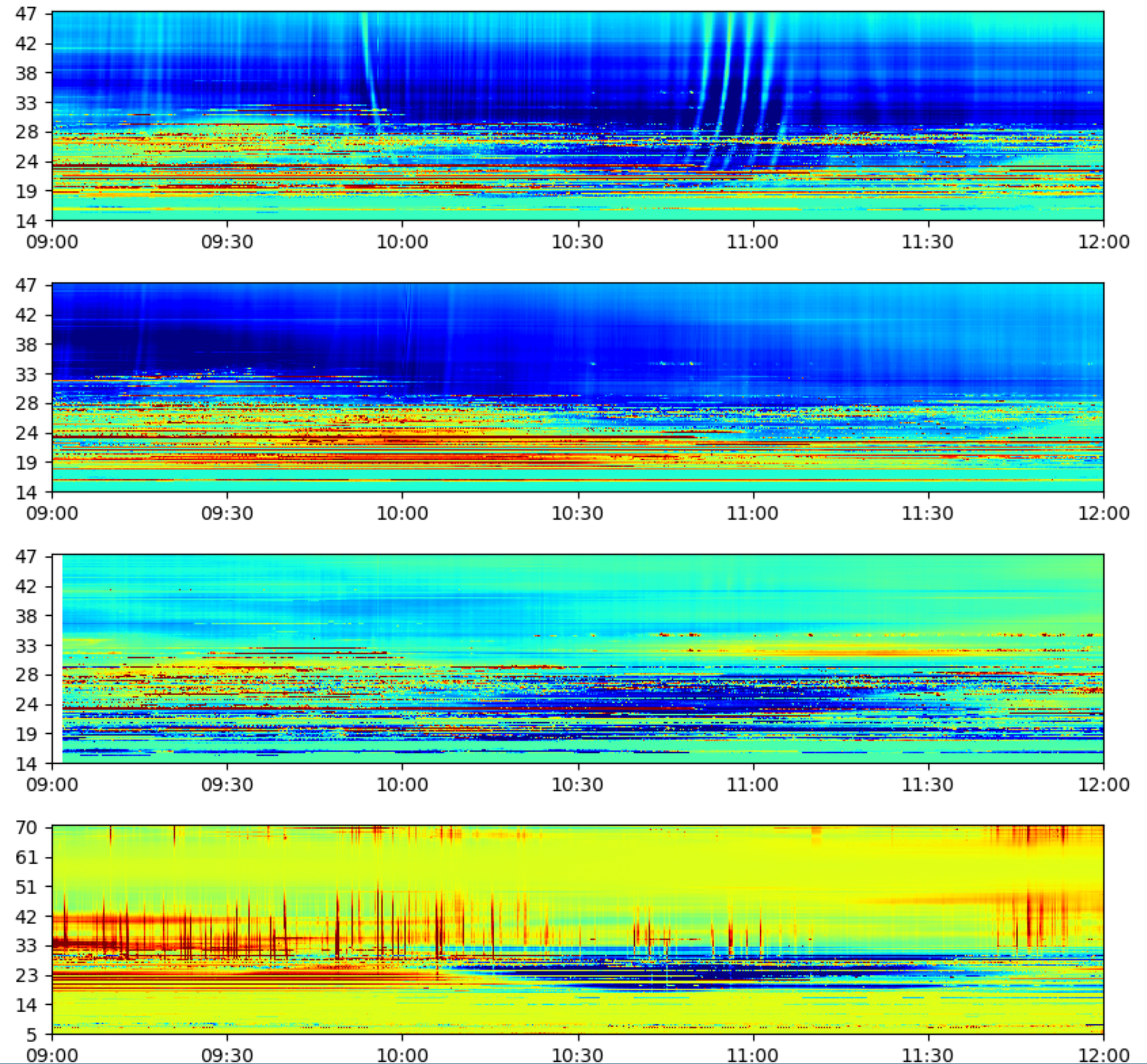
Sky view



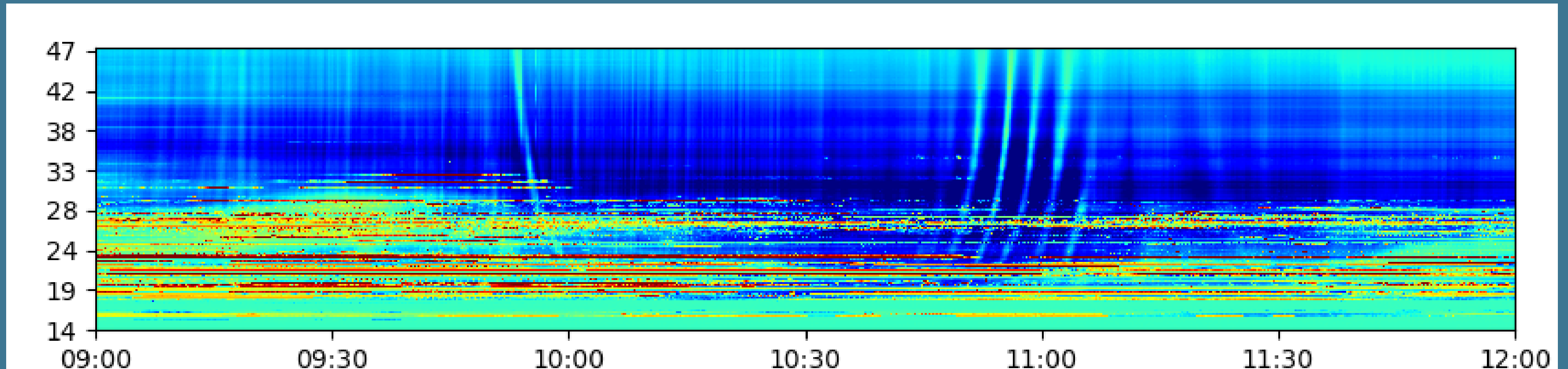
Azimuth and elevation observed objects

Signal Intensity

Signal intensity for CasA, CygA, VirA and SUN observed during solar eclipse. Data recorded on PL610 LOFAR station using LBA. Data are normalized by median value for each observed frequency

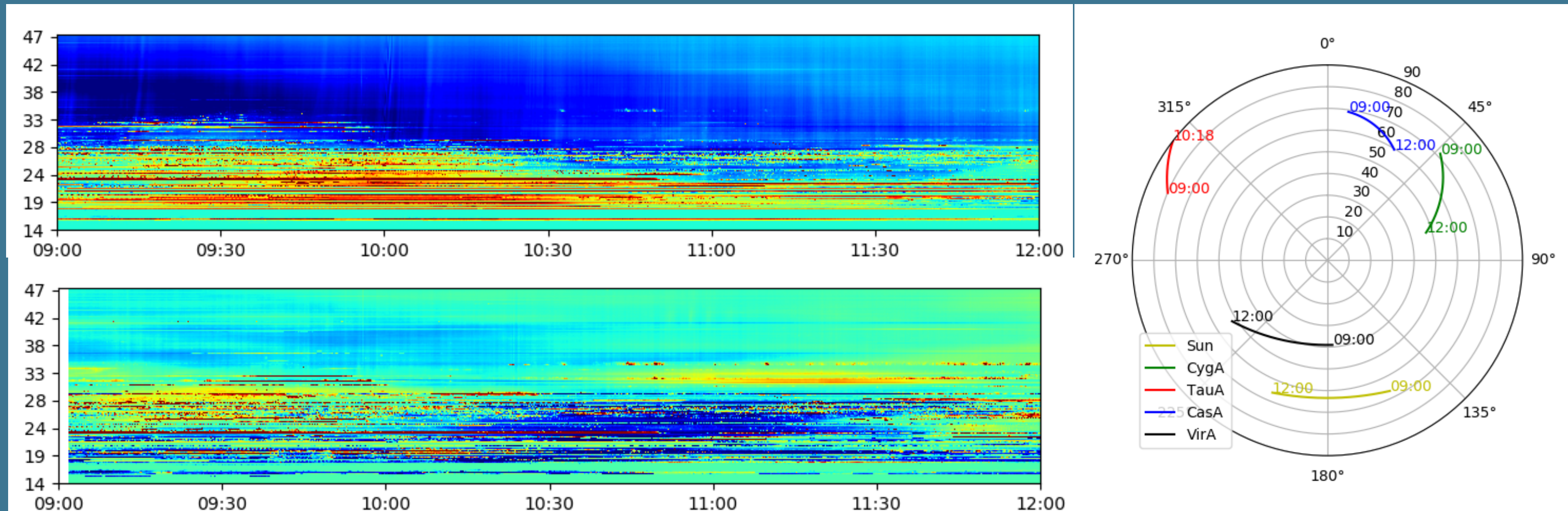


Observed structures



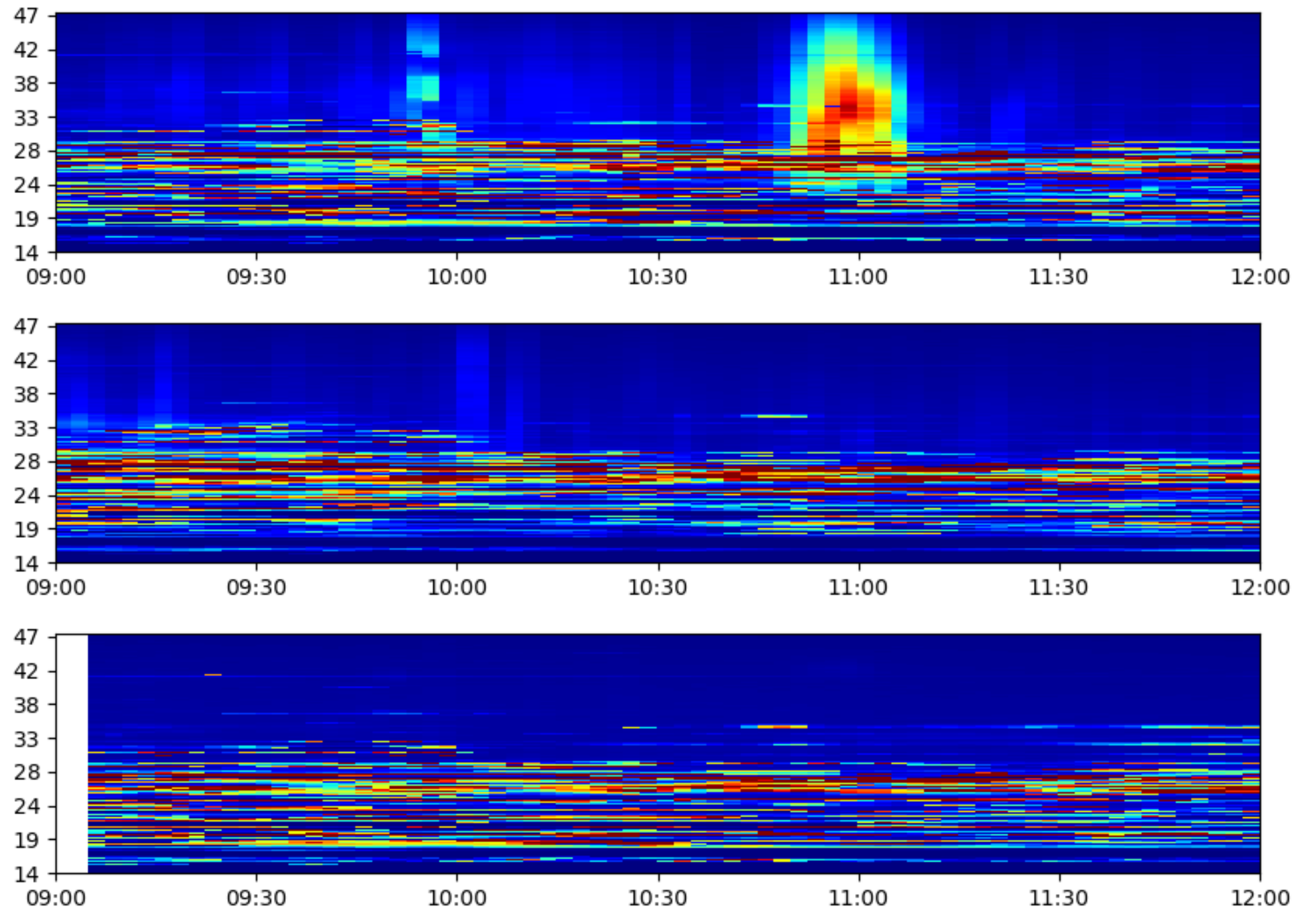
Intensity of CasA, the diffraction structure is clearly visible. The pattern is caused by a small-scale structure passing through the ionosphere. It is possible to see the dispersion and the difference in the time of its transition.

RFI signatures



Scintillation Index *S4*

Scintillation index for
CasA, CygA, and VirA,
computed separately
for each subband with
5 minutes resolution



Conclusions

- The eclipse effects are well visible in direct measurements performed using a single LOFAR station
- there is no direct connection between the eclipse and ionospheric scintillation
- Information in LOFAR single station is limited but is an opportunity to get additional information and should be used with other data

