LSM Status update from the LOFAR polarisation busy week

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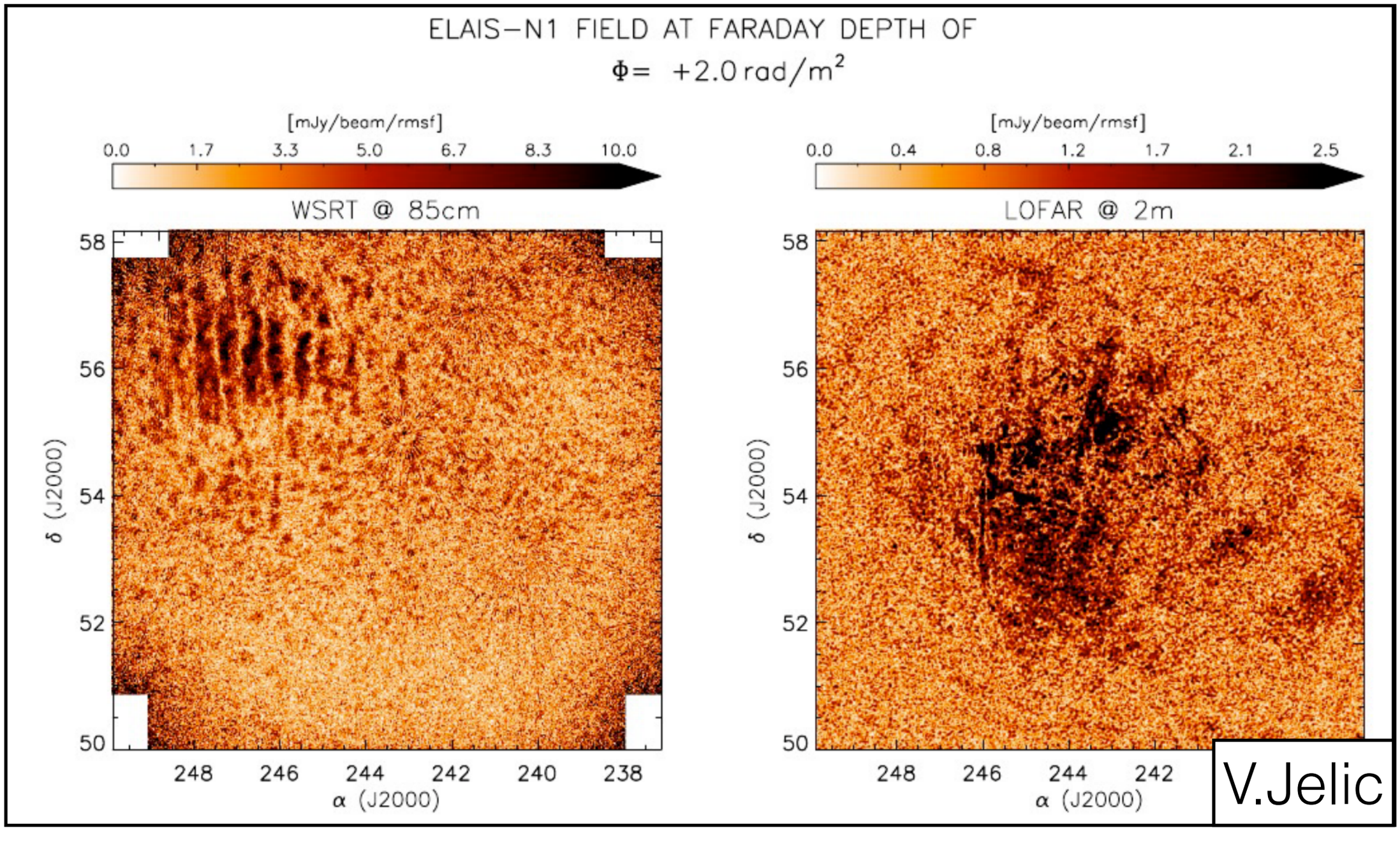
University of Manchester

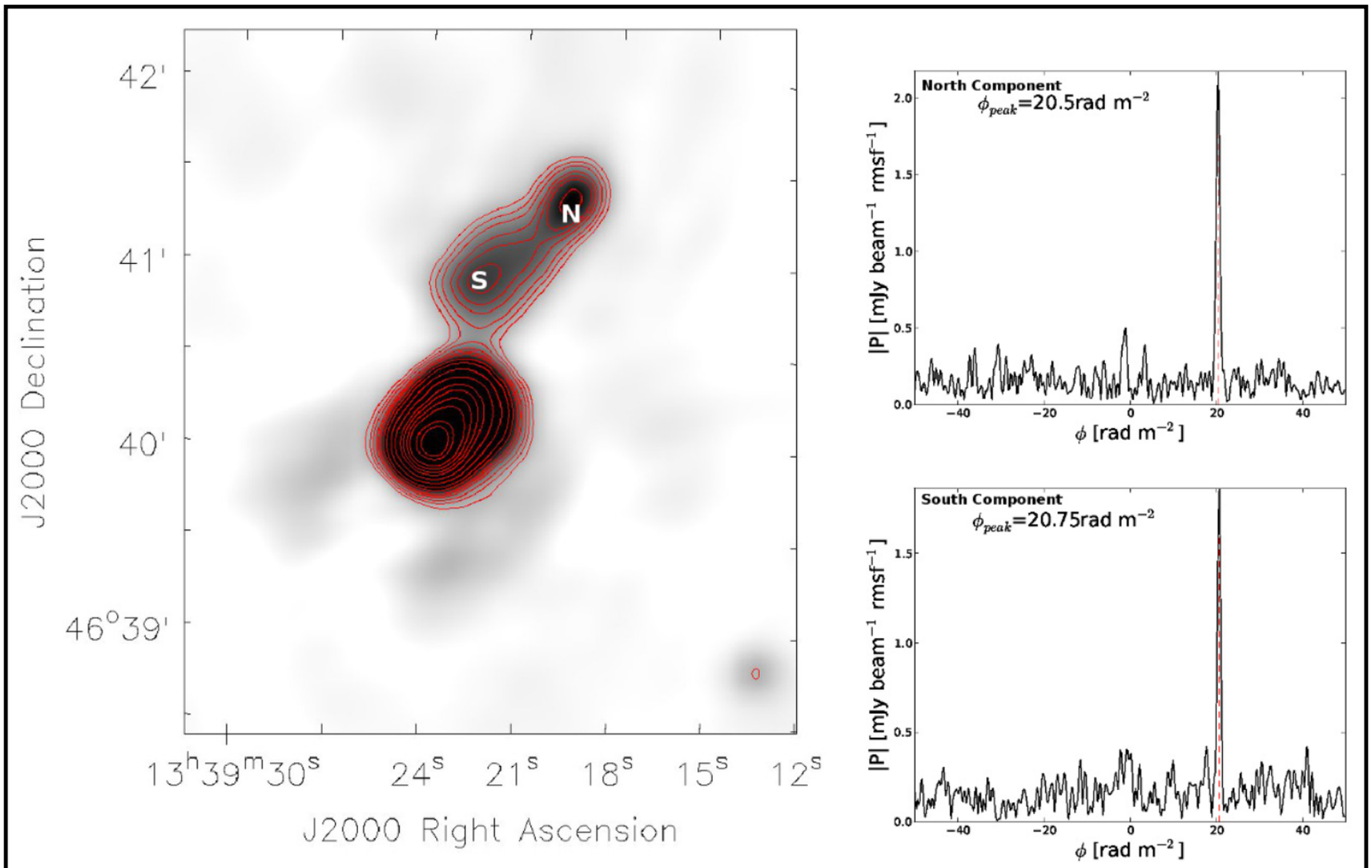
Observing Polarization with LOFAR

Polarized Foreground Observations observed in many observations already such Iacobelli (2014) and Jelic (2014)



Observing Polarization with LOFAR

Polarization has been observed for extragalactic sources, 6 polarized sources found in a single field.



Mulcahy et al. 2014

LOFAR Polarization Busy Weeks

There is a need to properly calibrate and understand LOFAR polarization data.

Restarting polarization busy weeks

- polarization calibration workshop
  take place in Manchester (next in August)

- polarization analysis workshop
  take place in ASTRON (next in June)

Occurs alternatively every 2 months

1st Polarization calibration busy week

Took place from the 22-24th April at the University of Manchester.

10 participants with several more online for discussions

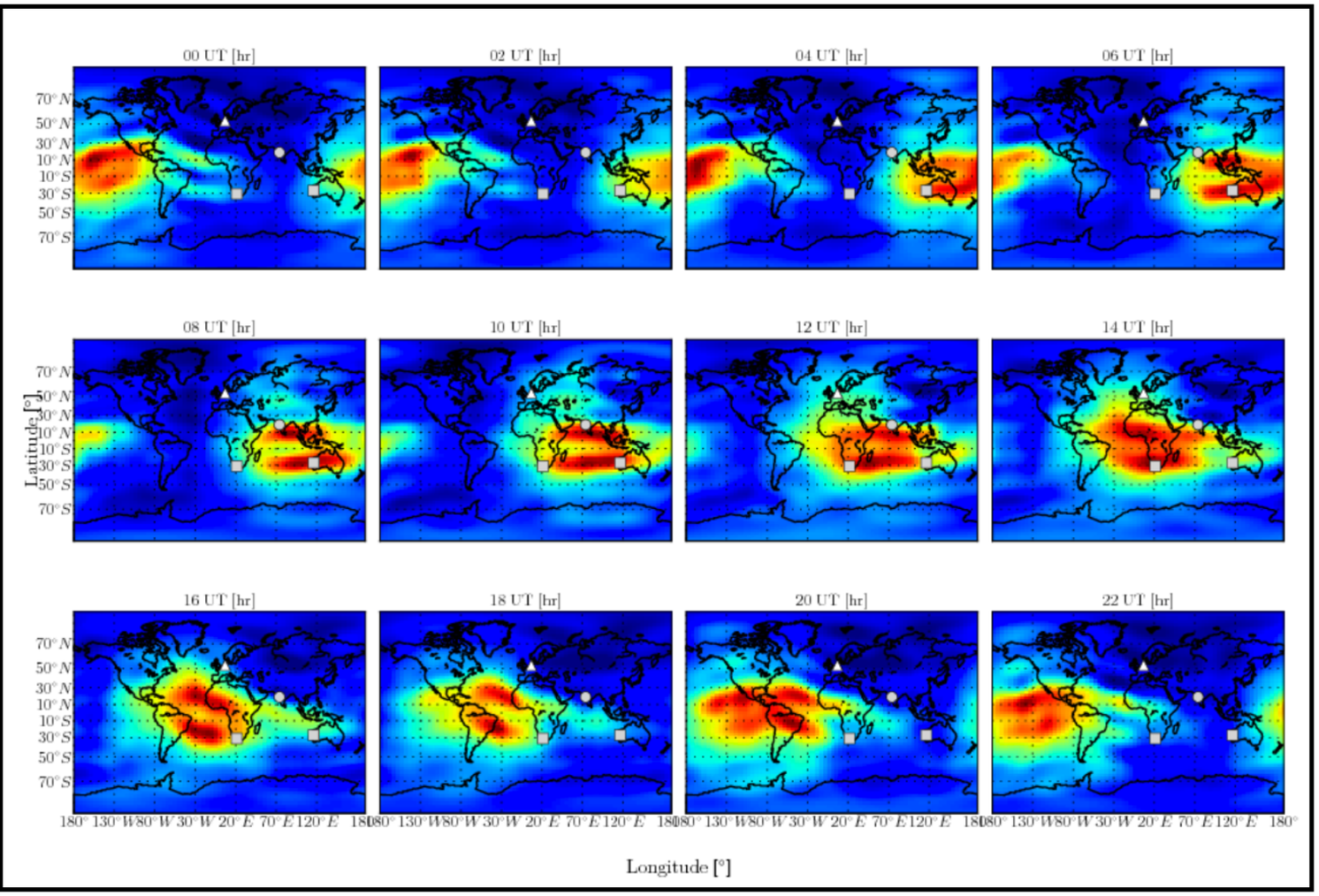
Alex Clarke (University of Manchester)
Henrik Junklewitz (University of Bonn)
Valentina Vacca (MPA)
Volker Heeren (University of Southampton)
Cameron Van Eck (University of Nijmegen)
Manu Orru (ASTRON)
Marco Iacobelli (ASTRON)
Therese Cantwell (University of Manchester)
Anna Scaife (University of Manchester)
David Mulcahy (University of Manchester)

Correction for Faraday Rotation caused by the ionosphere

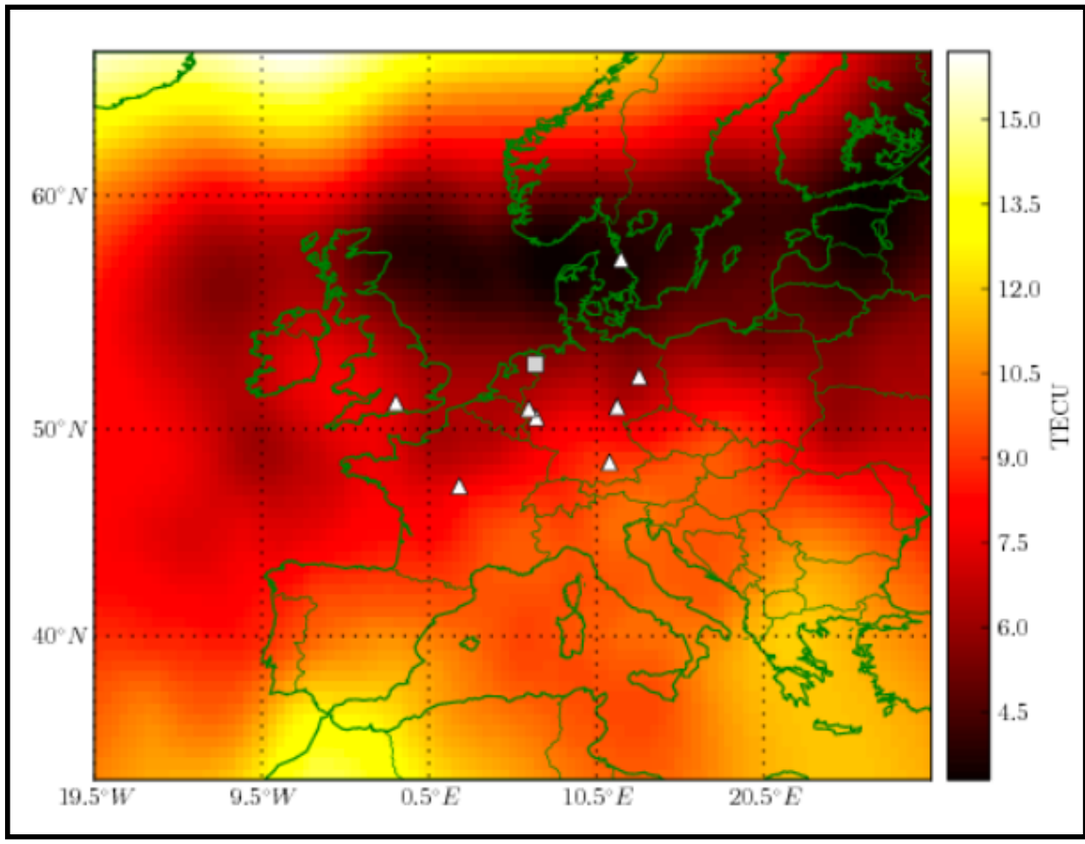
- Ionized plasma and Earth's Magnetic Field apply a rotation to polarized signal.
- Typical RM values is 1-3 rad/m^2
- RM can vary due to TEC (Total electron content) variation
- Variation in field of view

Vertical TEC maps

CODE
Time resolution 1-2 hr

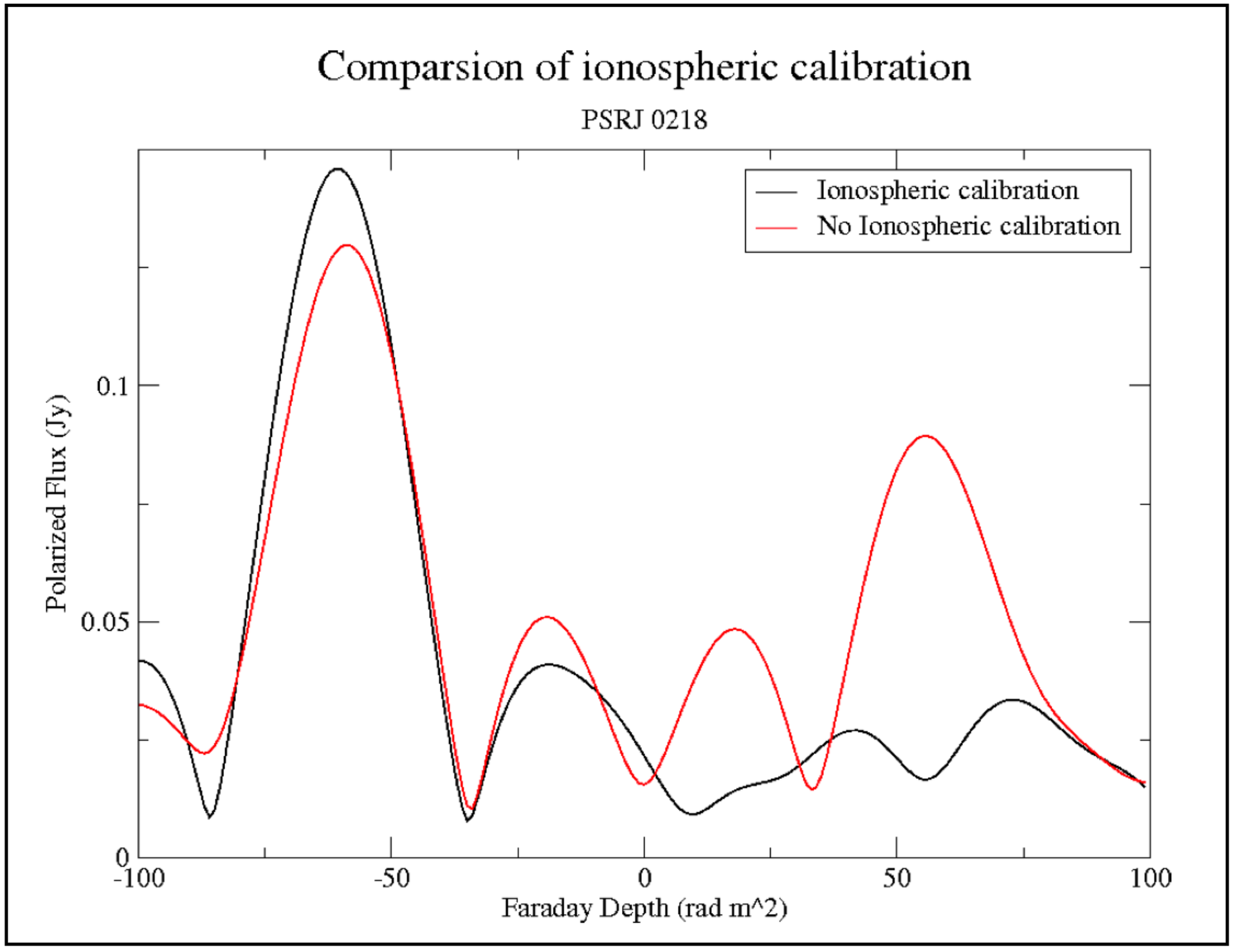


ROB
Time resolution 15 mins

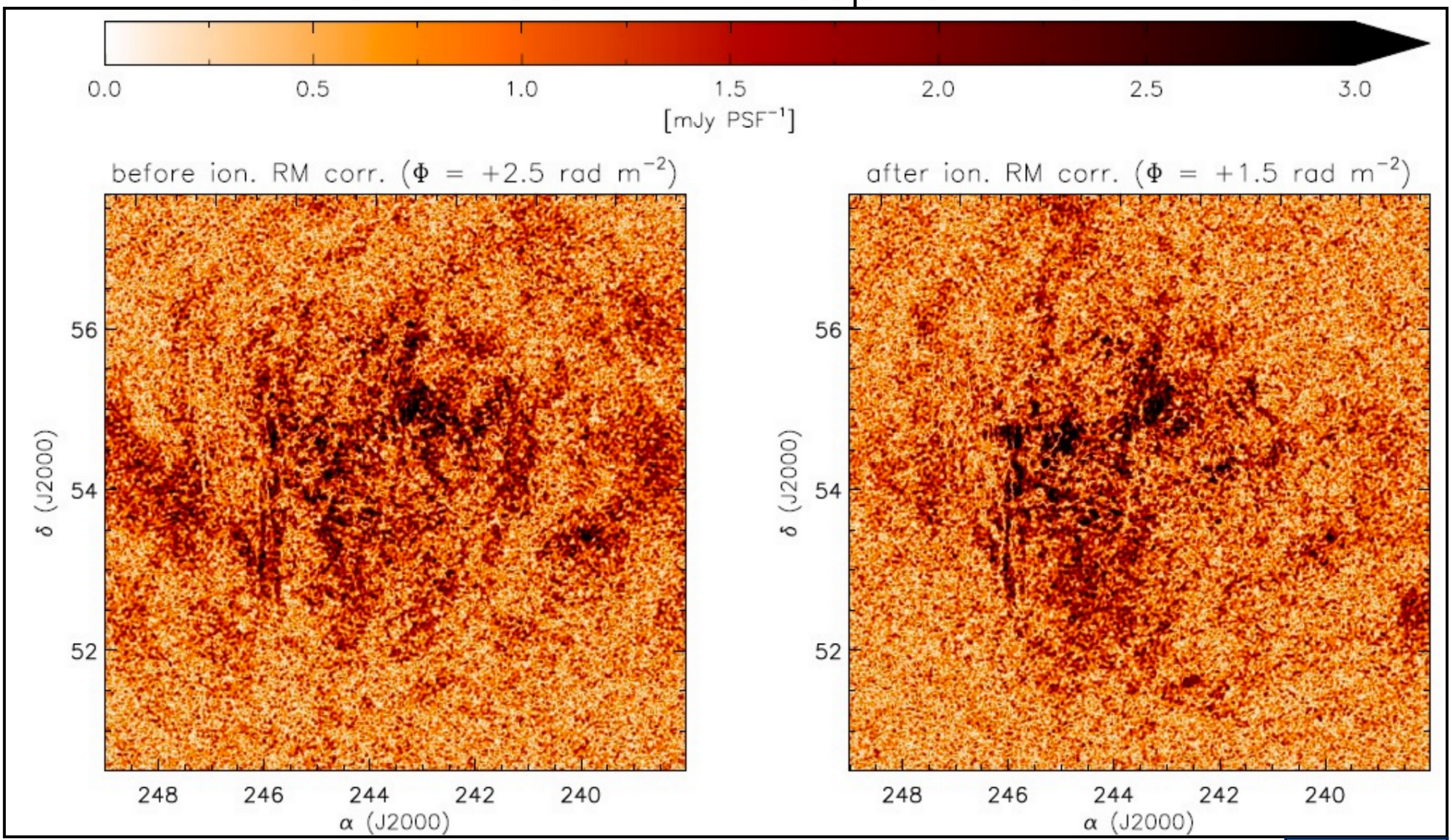


Effects of polarisation calibration

Shift of Faraday Depth



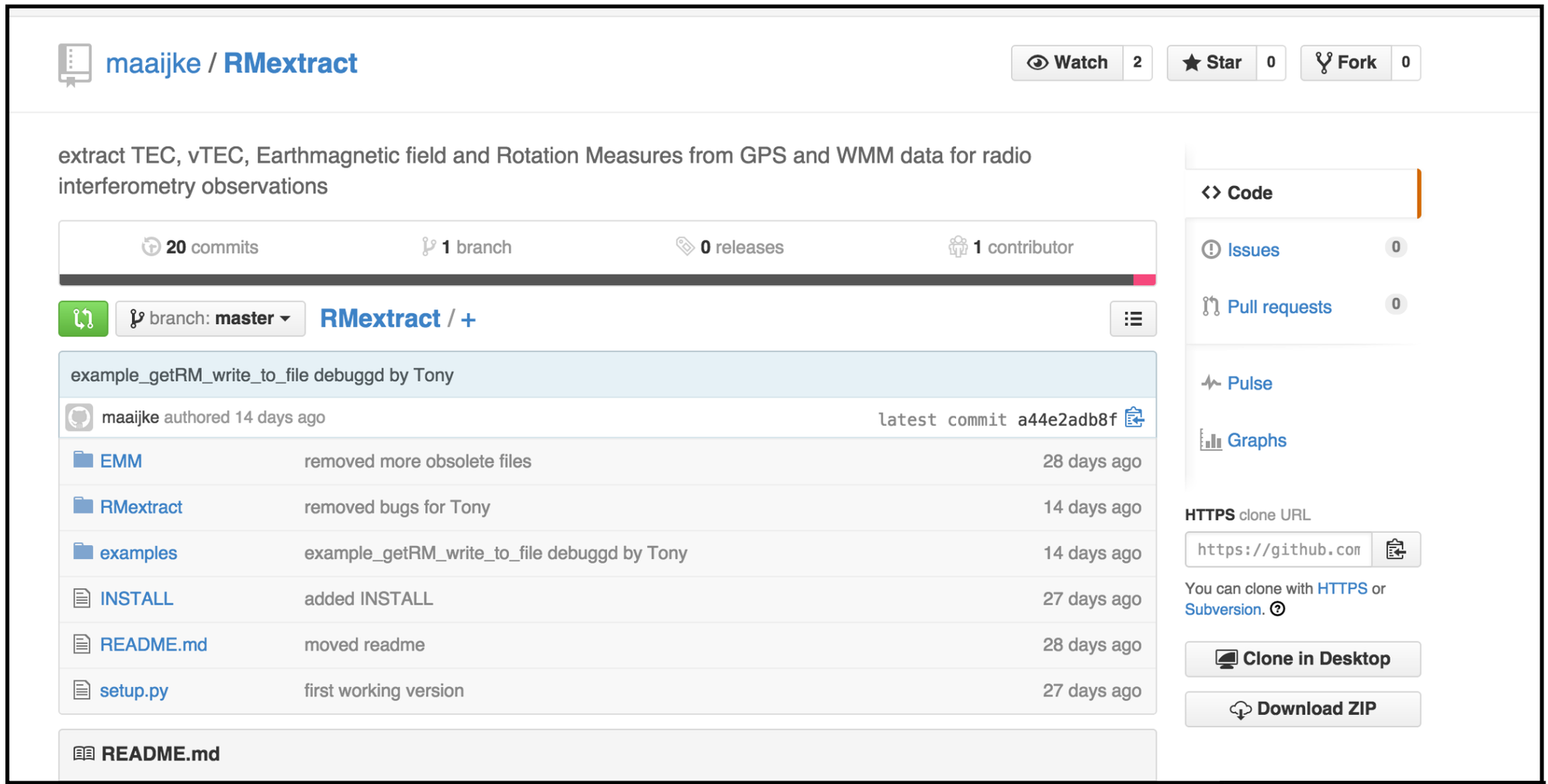
Effects of polarisation calibration
Decrease amount of depolarisation



V.Jelic

Objective of Busy Week

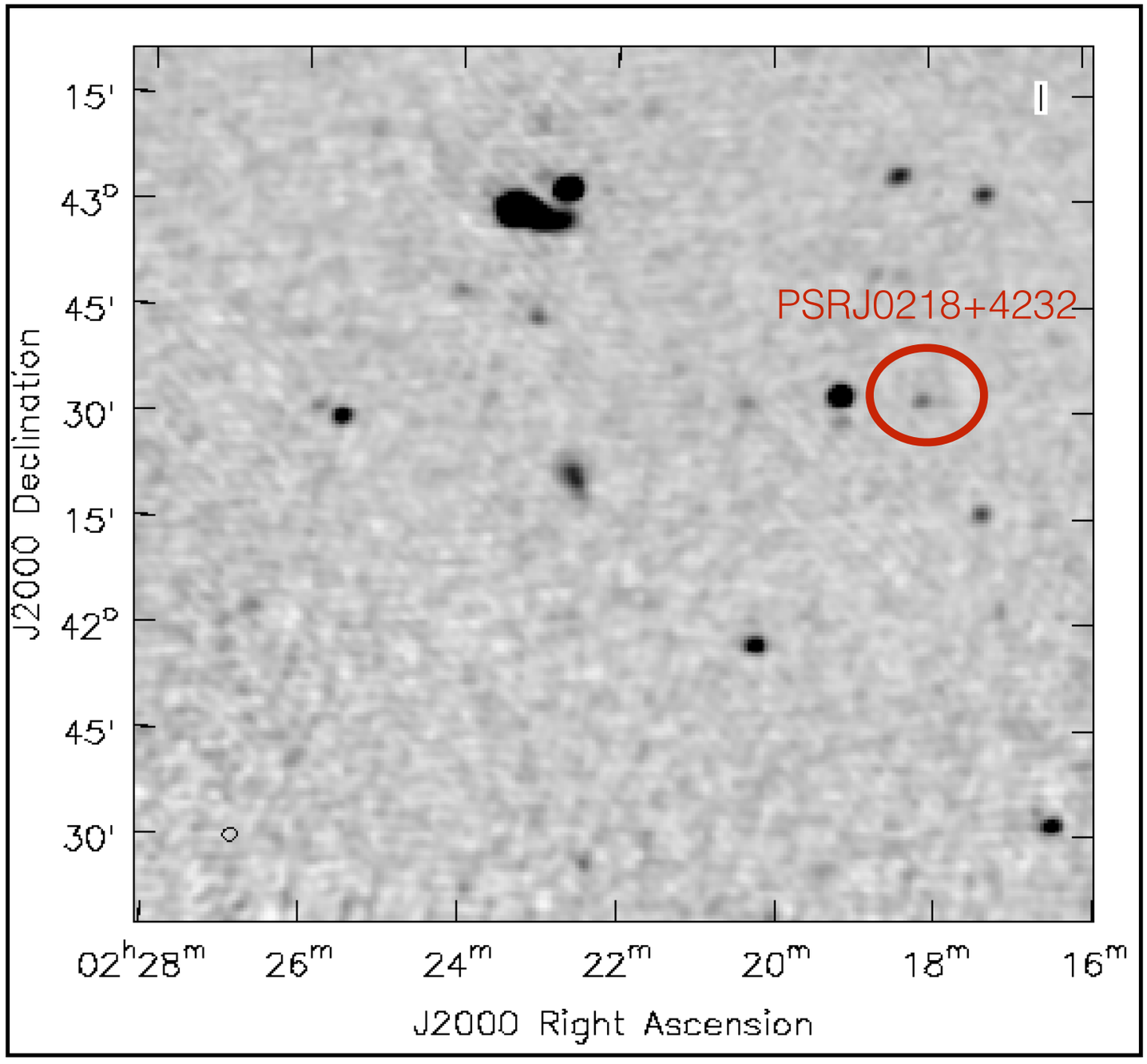
Test new distributed version of RMextract — predicts the ionospheric RM over each LOFAR station.



M.Mevius

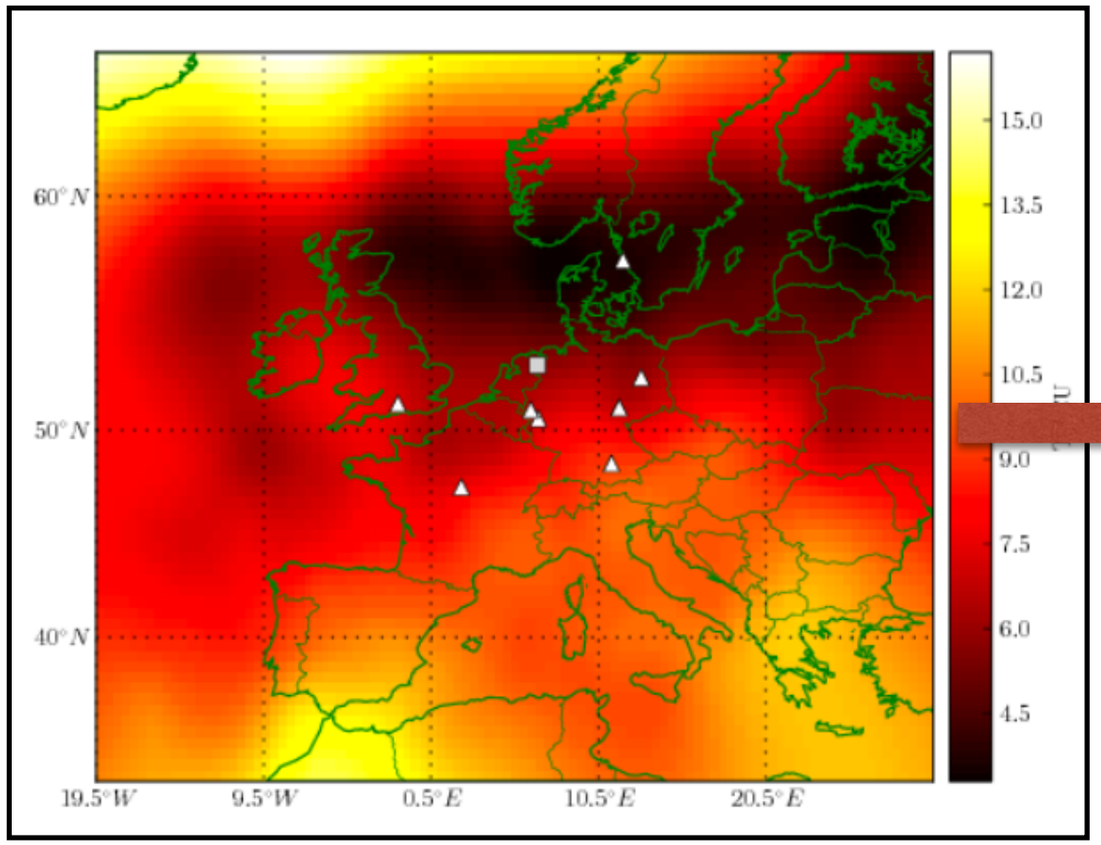
Dataset

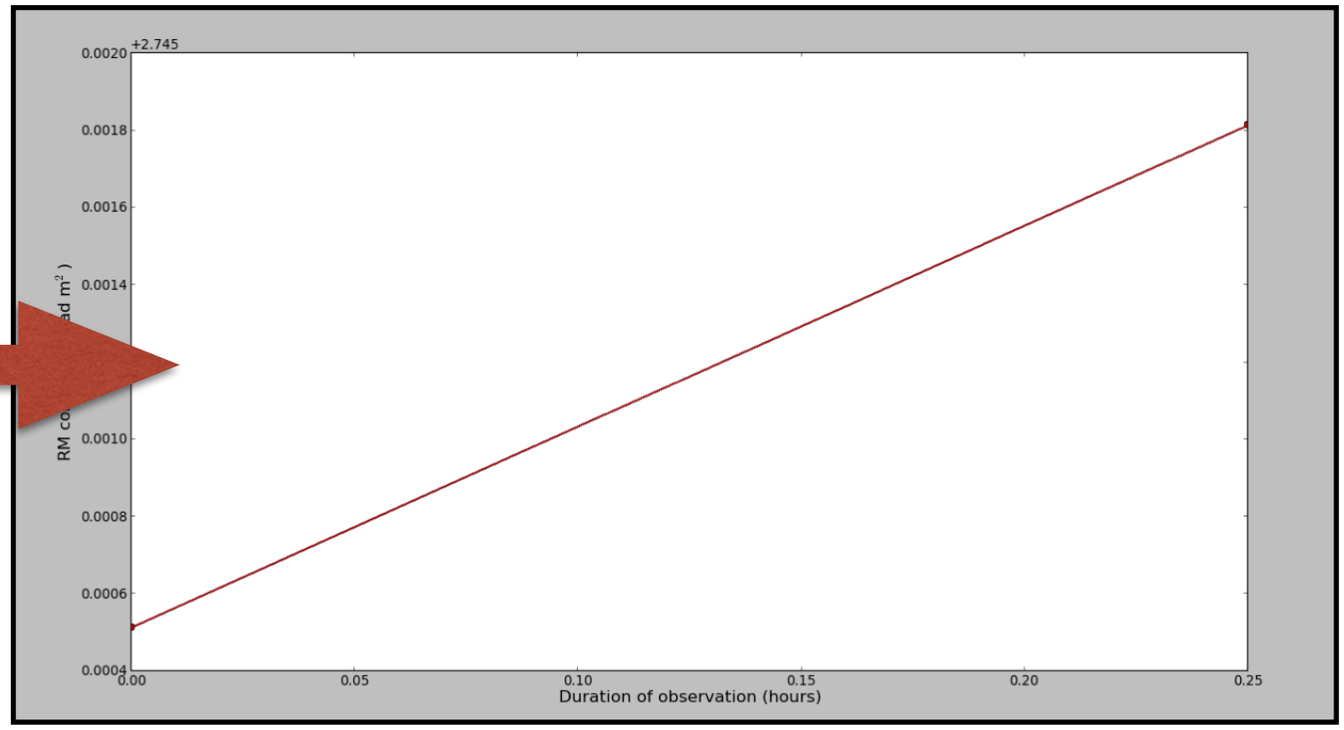
MSSS observation of field around PSRJ0218+4232
2 scans of 7 mins each
already processed — ready for polarisation calibration



Accomplishments

- ROB TEC maps can now be downloaded and read into RMExtract.





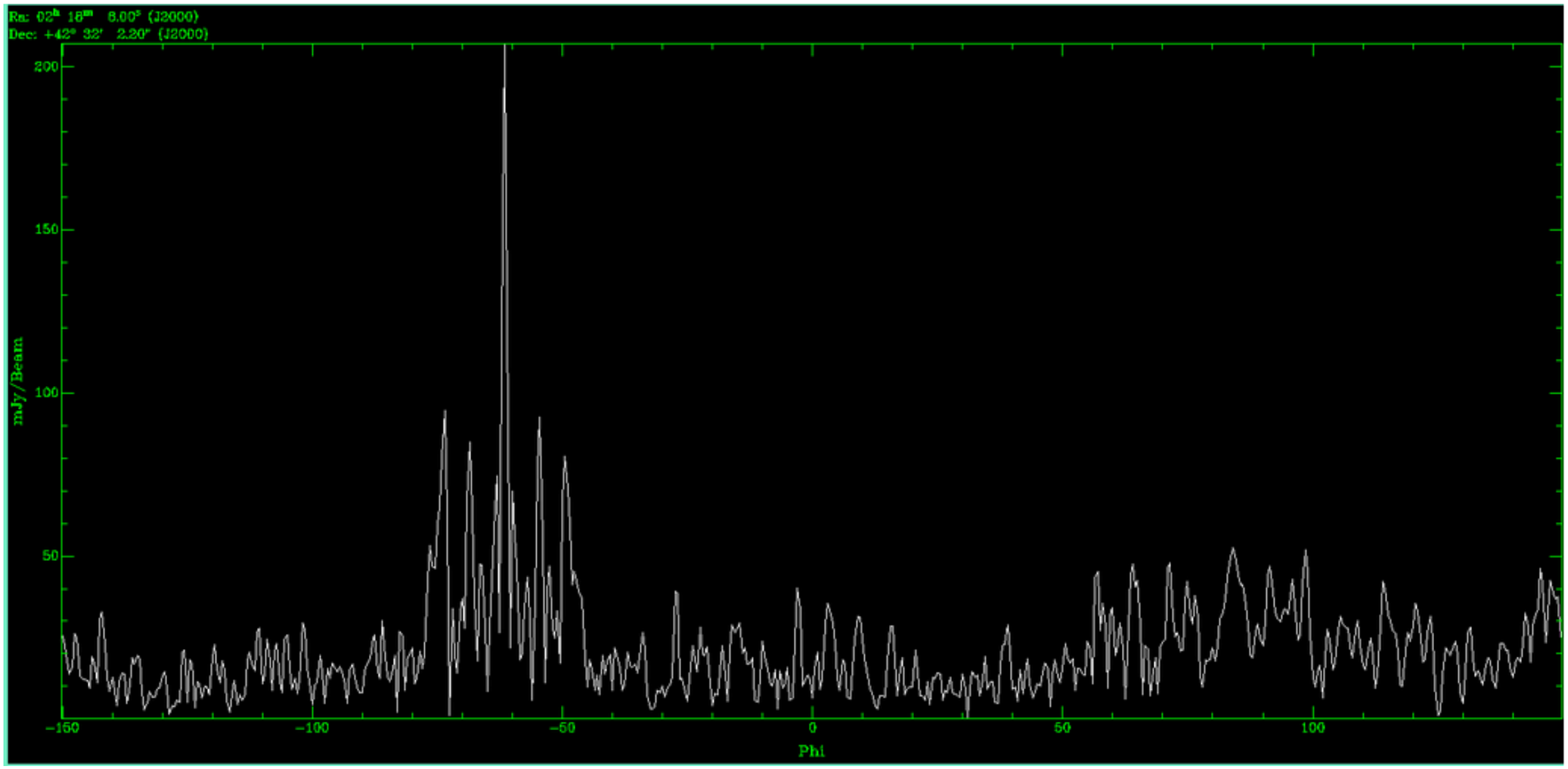
Accomplishments

- ROB TEC maps can now be downloaded and read into RMWriter.
- Both CODE and ROB TEC maps produce effectively identical results for our test data set: 2.73-2.77 rad/m2 for CODE, 2.74-2.75 for ROB. (across the 7 minutes of the data set)
- After applying the correction (either ROB or CODE), the resulting RM cubes show the correct known RM for the pulsar, within the accuracy of the known RM value and our Faraday depth sampling.
- Measured polarized flux is effectively unchanged before and after ionospheric correction, for either TEC source.

Pre correction —> -59 rad/m^-2

Using Code TEC values —> -61.5rad/m^-2

Using ROB TEC values —> -61.5rad/m^-2



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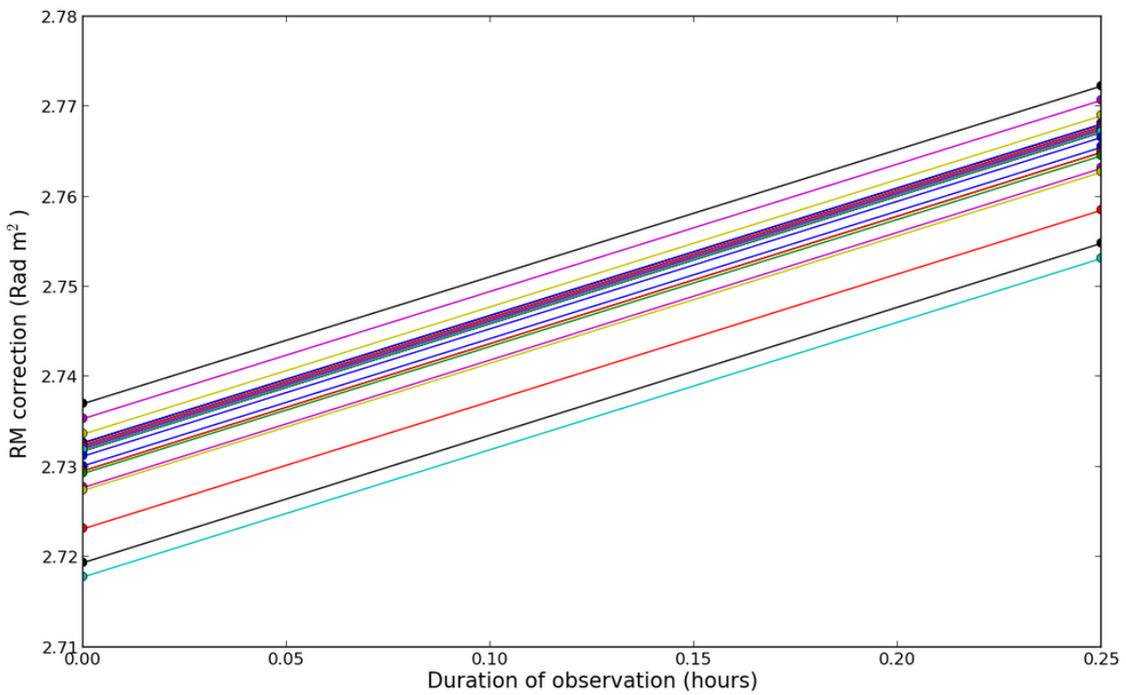
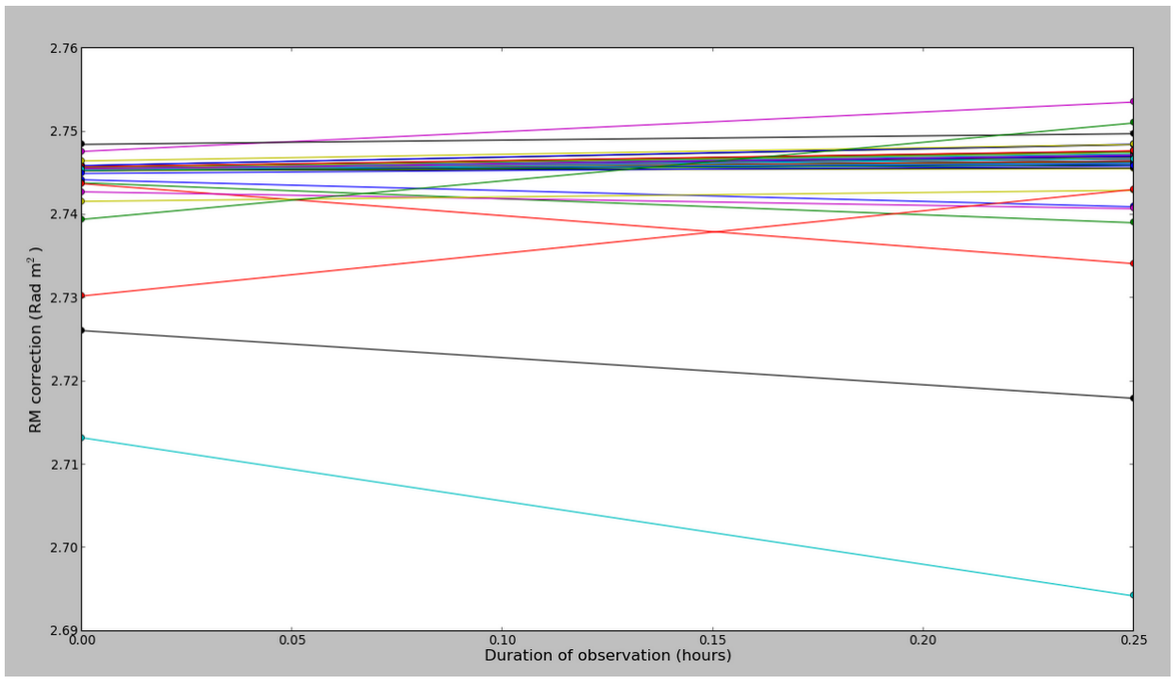
- Measured polarized flux is effectively unchanged before and after ionospheric correction, for either TEC source.
- All of the command line options for createRMparmdb should now be working properly.

Finding RM correction per station found to be working

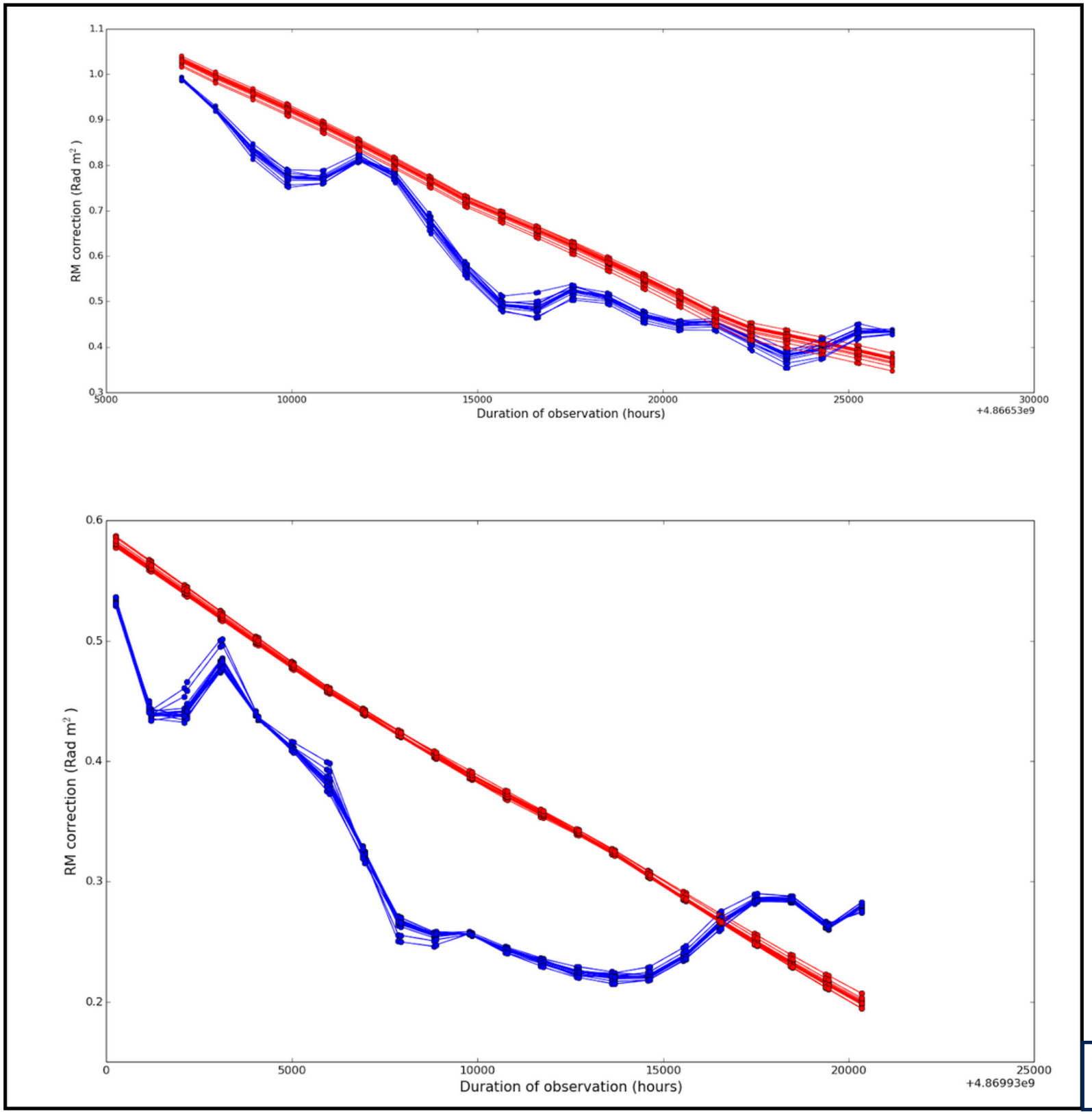
CODE



ROB



Comparison between CODE and ROB for a longer observation



Van Eck

Further work

Need longer observation of pulsar with accurately known FD.
Commissioning proposal is being worked on.

Future work will focus on calibrate on-axis leakage, calibrating cross correlation phases

These will continue at the next busy week in August.

In the meantime, a polarisation analysis meeting will take place in June at ASTRON
Anyone who is interested in helping out at these busy weeks send me a mail.

Many thanks to Maaijke and to all participants!