RESULTS FROM BUSY WEEK 18

Emanuela Orru‘ (Astron) on behalf of:
Adam Deller, Aleksander Shulevski, Andra Stroe, Anna Kapinska, Annalisa Bonafede, Bas van der Tol, Francesco De Gasperin, George Heald, Maijke Mevius, Neal Jackson, Reinout van Weeren, Roberto Pizzo, Sarod Yatawatta, Soobash Daiboo, Wendy Williams, Rocco Coppejans

* Took place at Astron 17-21 June involving experienced commissioners

4 Working Groups:

* Ionosphere (Maaijke) Long baselines (Adam) Awimager (Bas) Others (Manu)

Program:

Monday
11.15-11.45 Status of Clock TEC separation (Maaijke Mevius)
11.45-12.15 Python implementation of awimager (Bas van der Tol)
12.15-12.45 Deep LOFAR imaging for surveys (Reinut van Weeren)
14.00 Working groups (Emanuela Orru')

Tuesday
11.00 Element beam discussion (report next LSM).

Every day
16.00 Progress reports

Ionosphere (Maaijke)

Clock-TEC separation:

New code: combines all baselines in the fitting process. With this code it is not necessary to fit for an additional third parameter. **Only clock and TEC are fitted.** The solutions of one timestamp are propagated to the next one.

* Apply new Clock/TEC fitting procedure on LBA data **(Annalisa)**

* Analyze two beam LBA data (3C196/3C295): - look for systematic differences/similarities between Clock/TEC solutions **(Annalisa,Fransesco)**

* Analyze 3C47 HBA data (BBS fit with best possible model), compare residuals to those of 3C196 HBA data (with imperfect sky model) **(Reinout,Maaijke)**

* Check Clock/TEC fitting procedure for HBA interleaved calibrator/Target data **(Aleksandar)**

* Check Clock/TEC separation on BBS solutions if weak field with known skymodel **(Sarod,Maaijke)**

* Apply new Clock/TEC fitting procedure on LBA data: The resulting Clock/TEC values are noisy, fit is slow. To do: The code needs to be optimized for LBA data,especially in speed and stability.

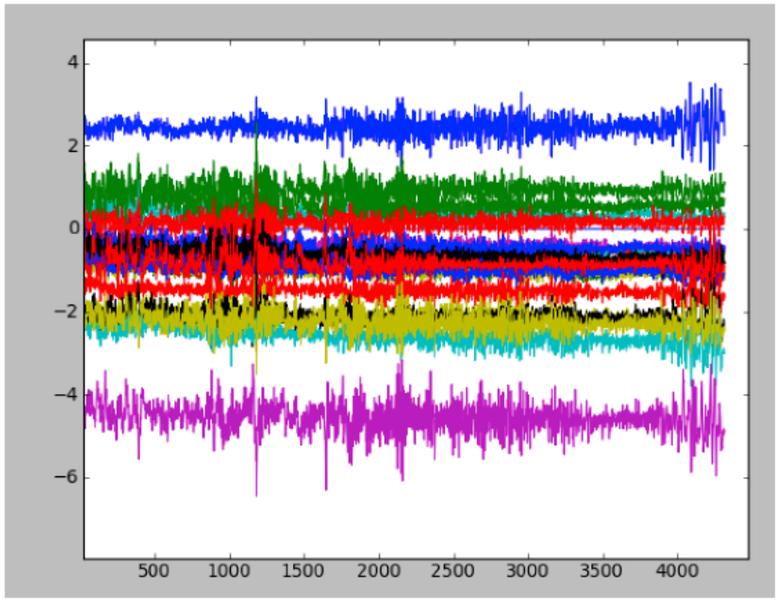


Illustration 1: Fitted Clock values for LBA CS

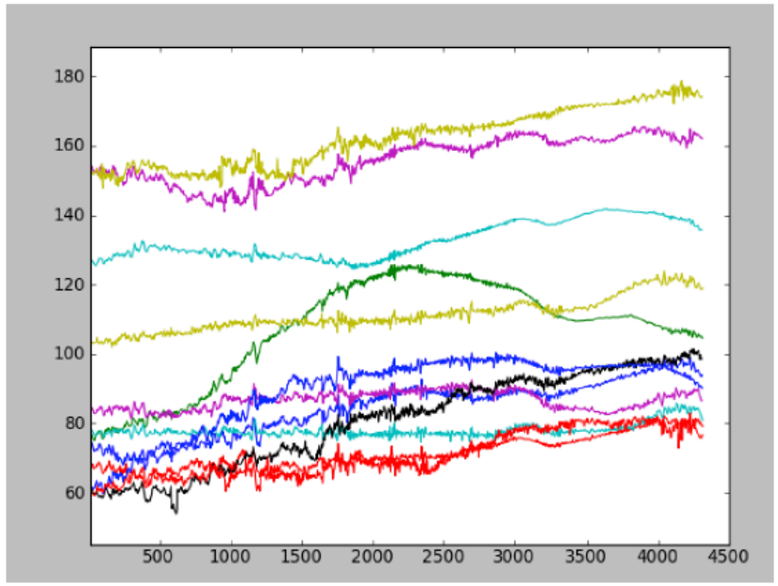


Illustration 2: Fitted Clock values for LBA RS

* Analyze two beam LBA data (3C196/3C295): look for systematic differences/similarities between Clock/TEC solutions: The solutions are unstable, but very similar for both directions. They need further investigation.

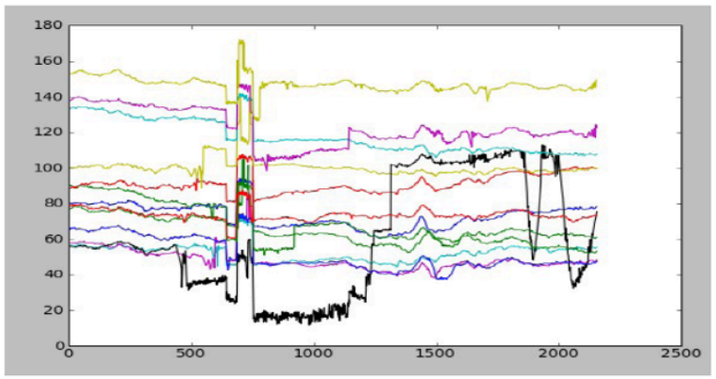


Illustration 3: fitted clock RS, 3C196

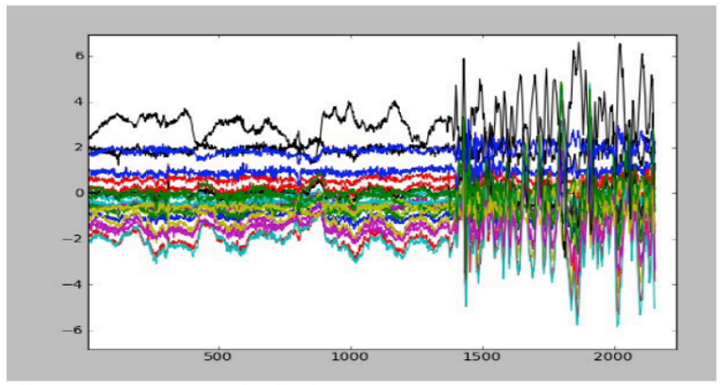


Illustration 4: Fitted Clock CS,3C196

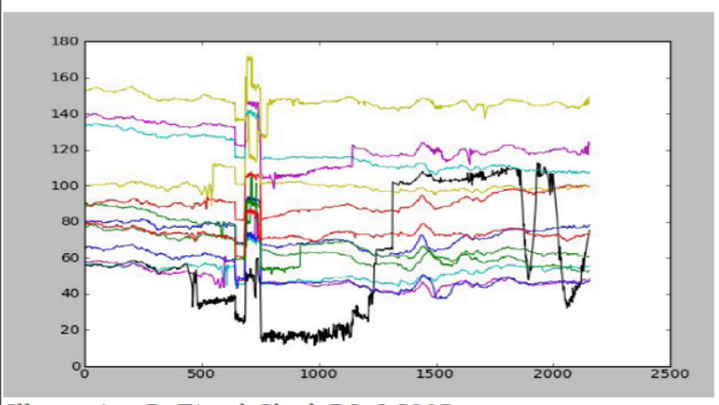


Illustration 5: Fitted Clock RS, 3C295

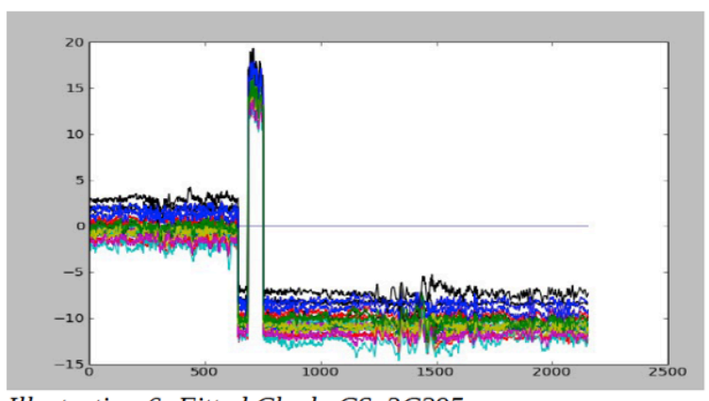


Illustration 6: Fitted Clock, CS, 3C295

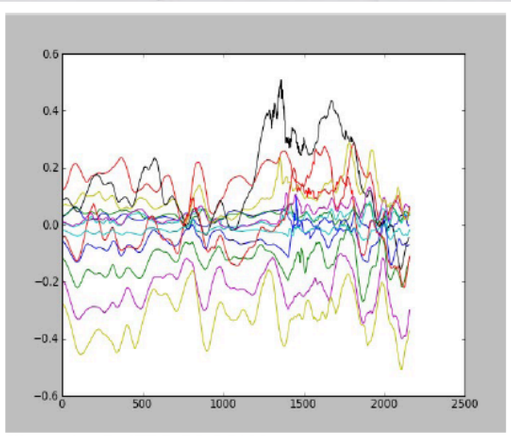


Illustration 7: dTEC, RS, 3C196

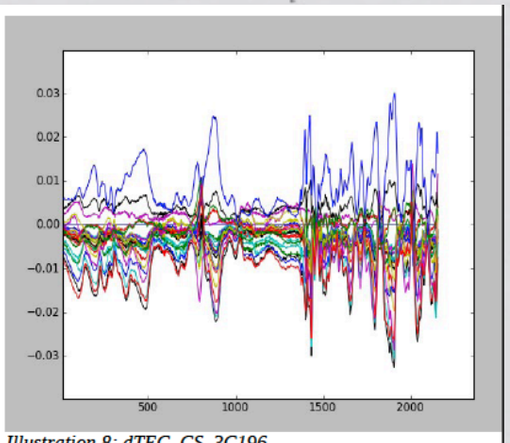


Illustration 8: dTEC, CS, 3C196

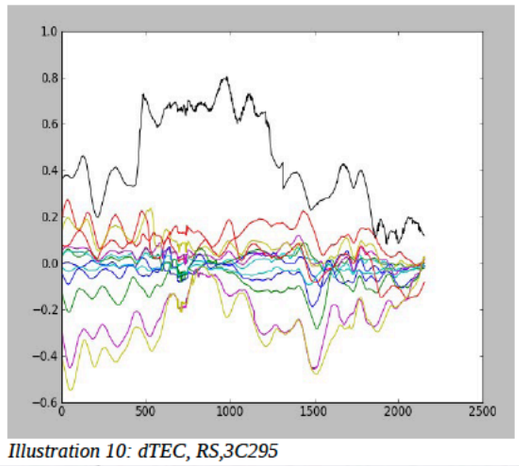


Illustration 10: dTEC, RS,3C295

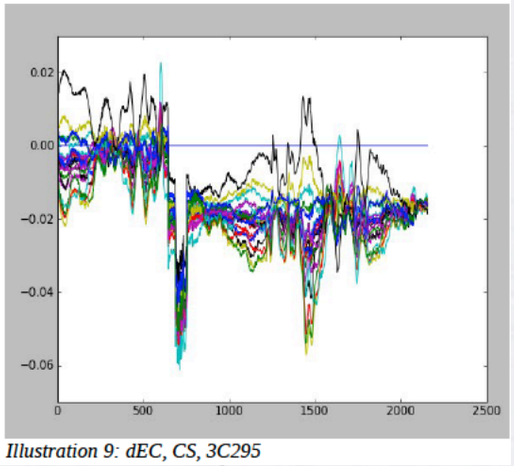


Illustration 9: dEC, CS, 3C295

* Analyze 3C47 HBA data (BBS fit with best possible model), compare residuals to those of 3C196 HBA data (with imperfect sky model): The average residuals (illustration 11,12, averaged over 100 timeslots) are of the same order of magnitude. Conclusion: Abetter model will probably not improve the fit. The wavelike structures in the residuals have a different origin (other reflections/beam model?)

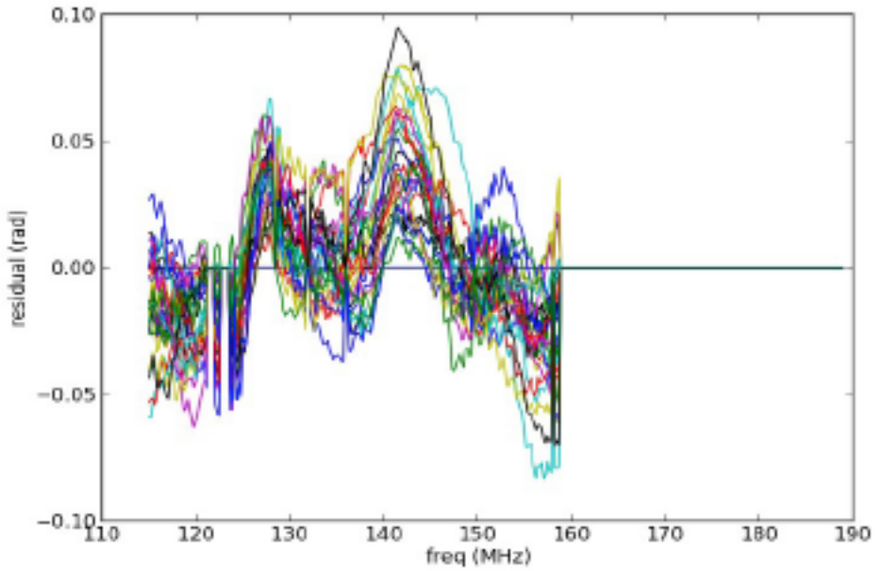


Illustration 11: 3C196 residuals for different CS

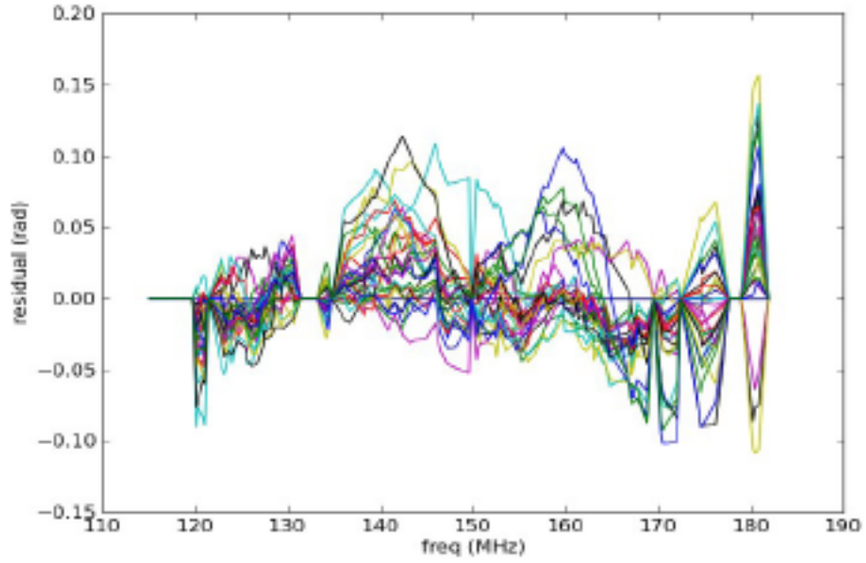
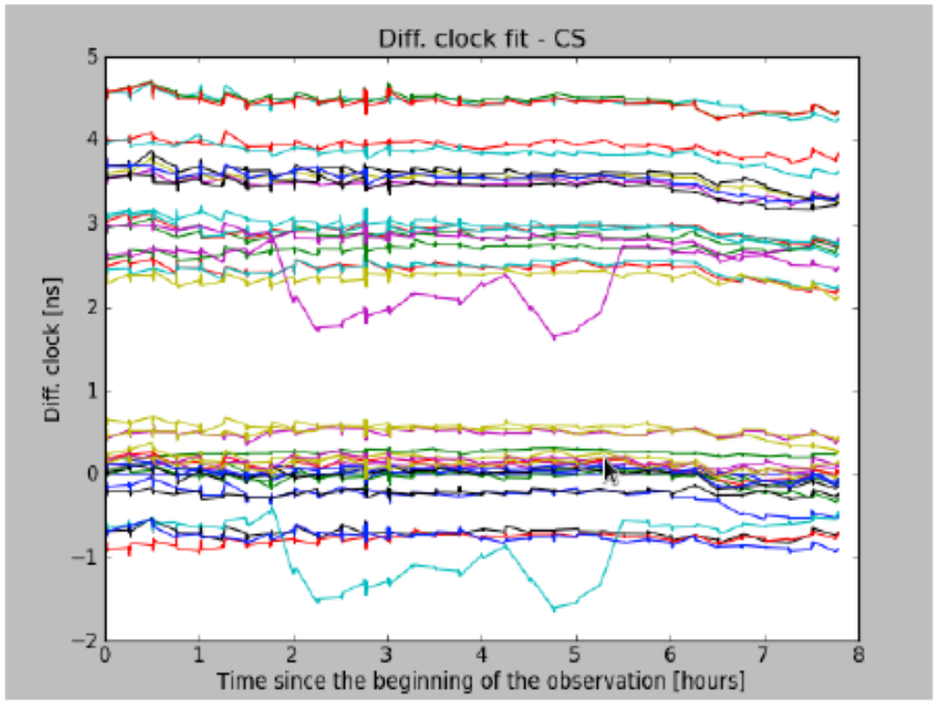
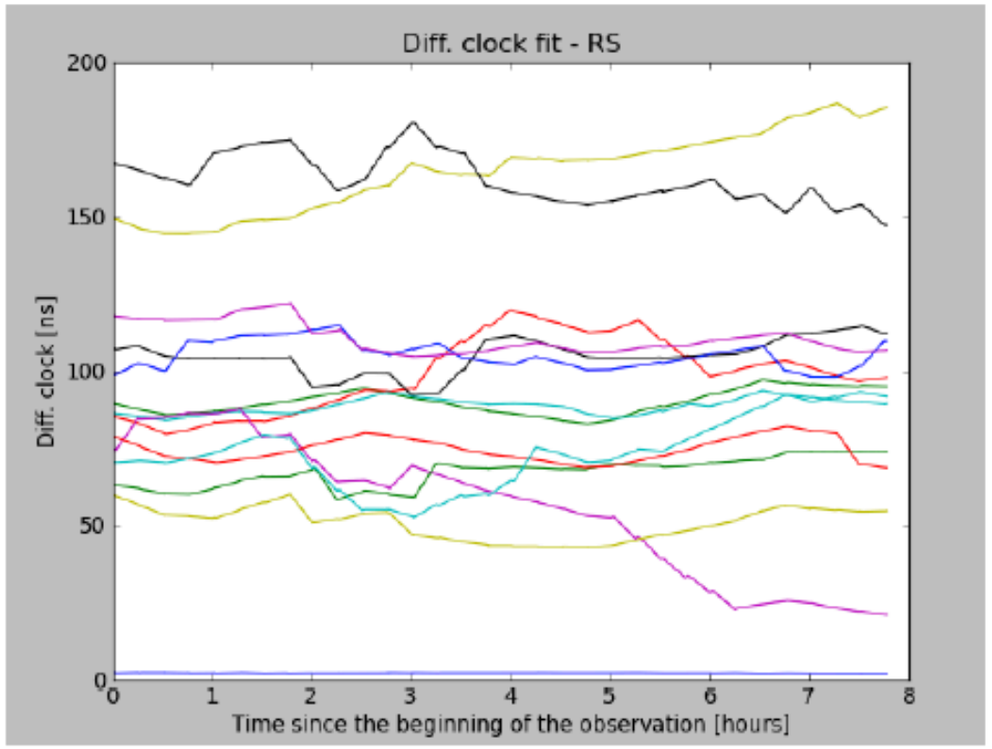


Illustration 12: 3C47 residuals for different CS (same as ik Illustration 3)

* Check Clock/TEC fitting procedure for HBA interleaved calibrator/Target data, both propagating the solution and solving independently. Next step is to remove it from the target fields (correct for it in calibration), as a step towards constructing a TEC screen



Differential clock fit on the core stations



Differential clock fit on the remote stations

* Check Clock/TEC separation on BBS solutions if weak field with known skymodel: First results show many jumps and noisy solutions. However, the structures in eg. the RS clock solution resemble what is expected from clock solutions of bright calibrators (illustration 13,14). The code was not optimized for these noisy data. To be done: As a test for Clock TEC separation in weak fields on could run BBS on a bright calibrator field, but with the calibrator subtracted. This way the expected Clock/TEC solutions are known fromthe calibrator solutions.

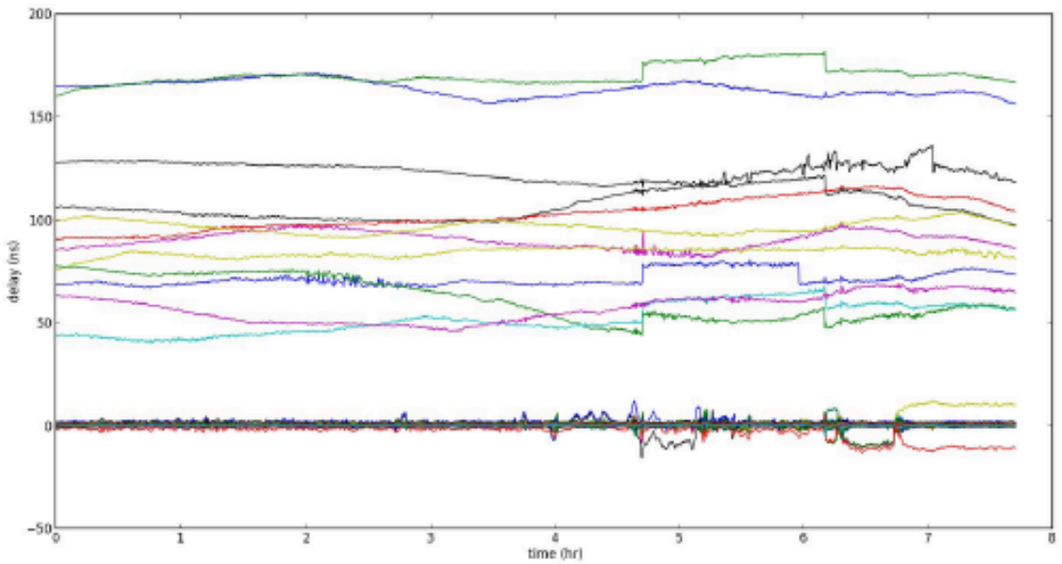


Illustration 13: Fitted Clock vs. time all stations, NCP

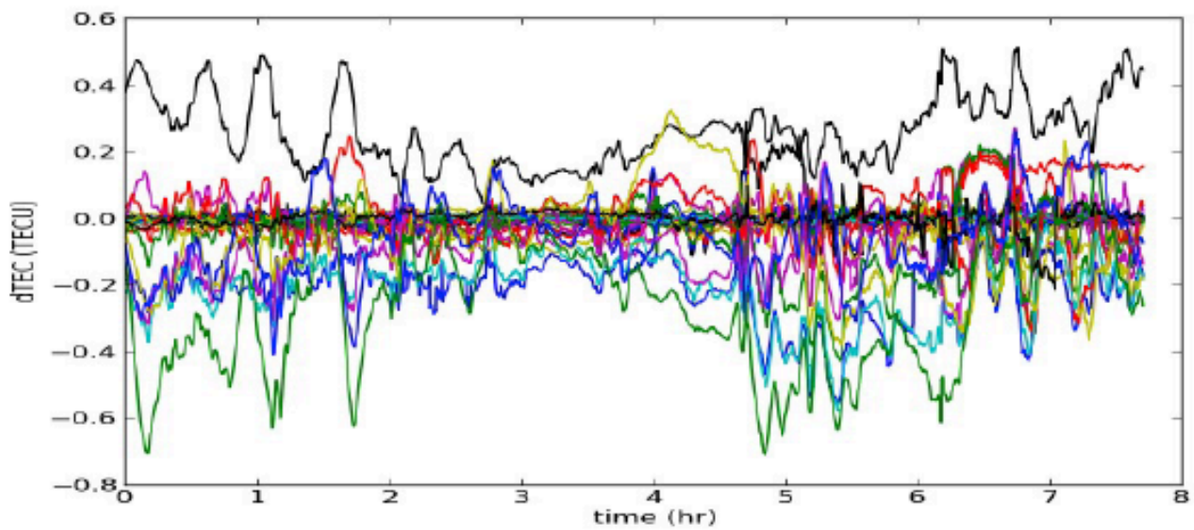


Illustration 14: fitted dTEC vs time, NCP

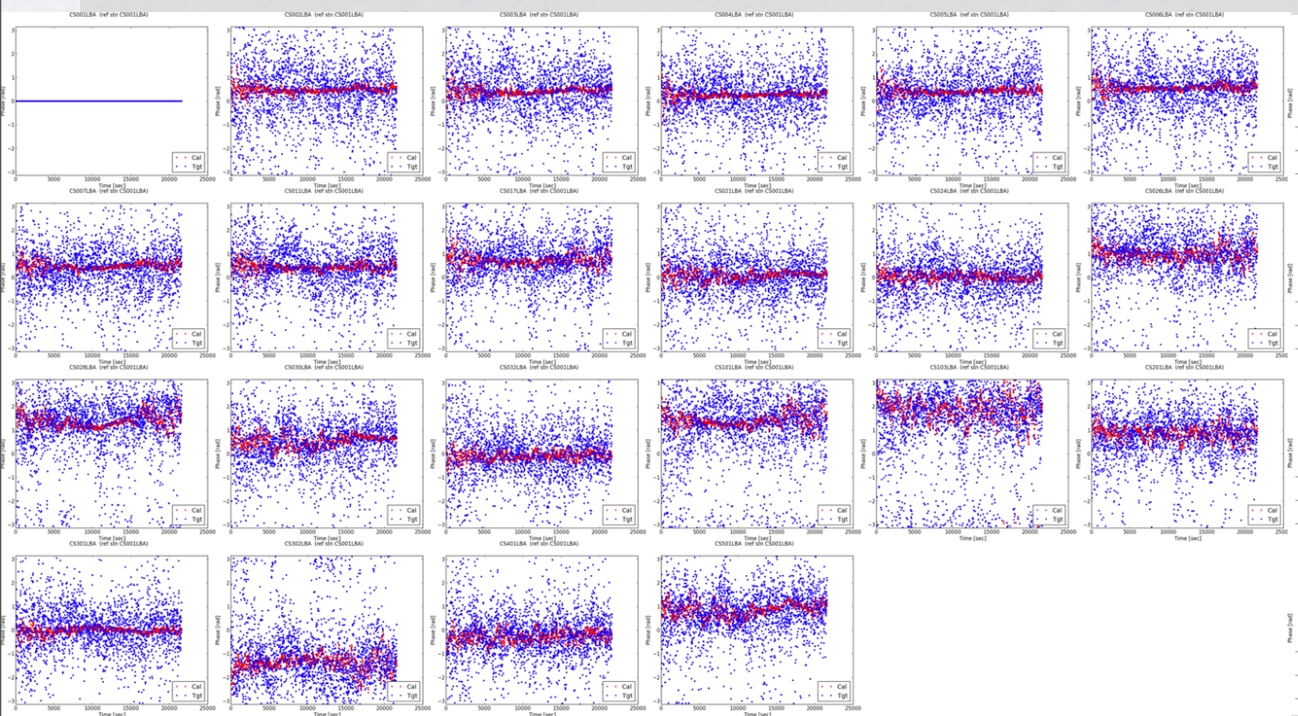
Long baselines (Adam)

* Objectives: try to improve detection of faint sources and work on getting phase to transfer properly on the long baselines. Commissioning or LC0 data **(Adam)**

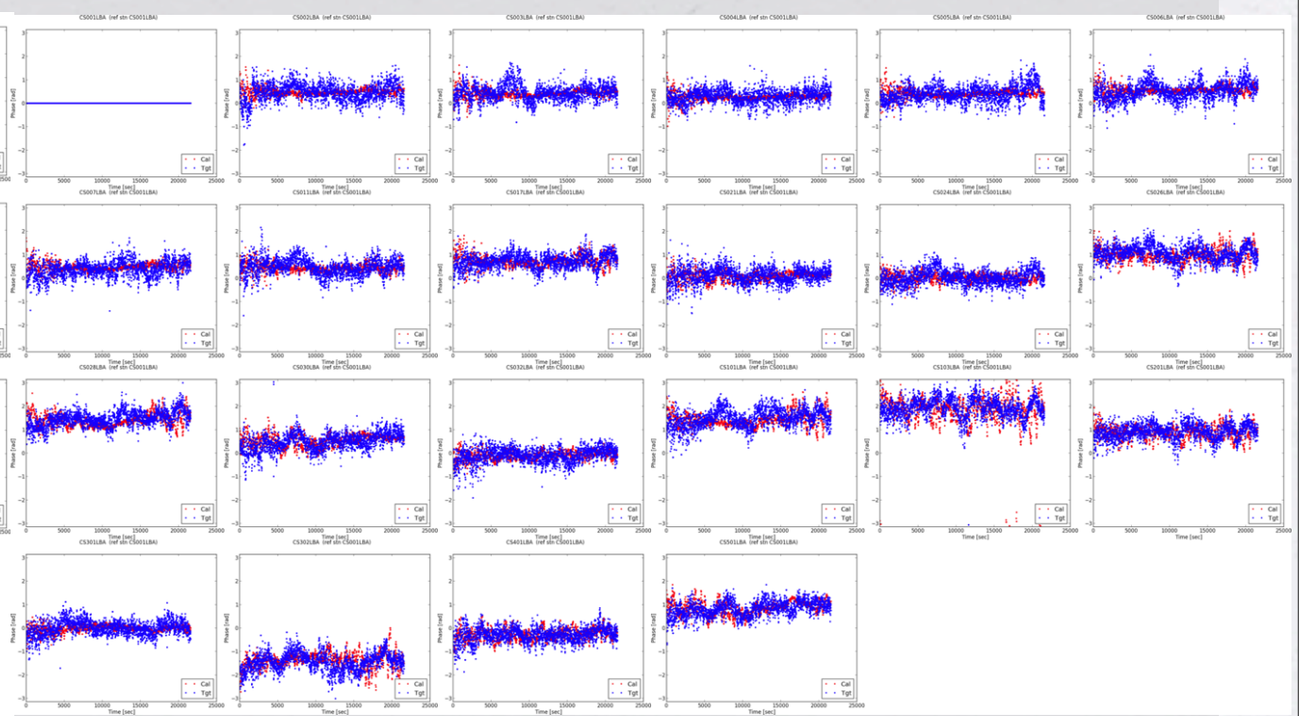
* Deep field **(Anna)**

4C41.17 **(Leah):** Initial Target Phase Solutions for Core Stations: Long Baseline LBA Observations. **This project is the first attempt to try long baselines with LOFAR in the LBA**. The signal to noise ratio is much lower in the LBA the traditional method of transferring amplitude only solutions to the target and performing a phase-only solve which is not good enough to phase up the core stations.
It has been investigated (a) combining subbands to increase the signal-to-noise ratio on the target, (b) global sky models of 2 and 5 degrees around the target, and (c) the possibility of transferring the calibrator phase solutions to the target.

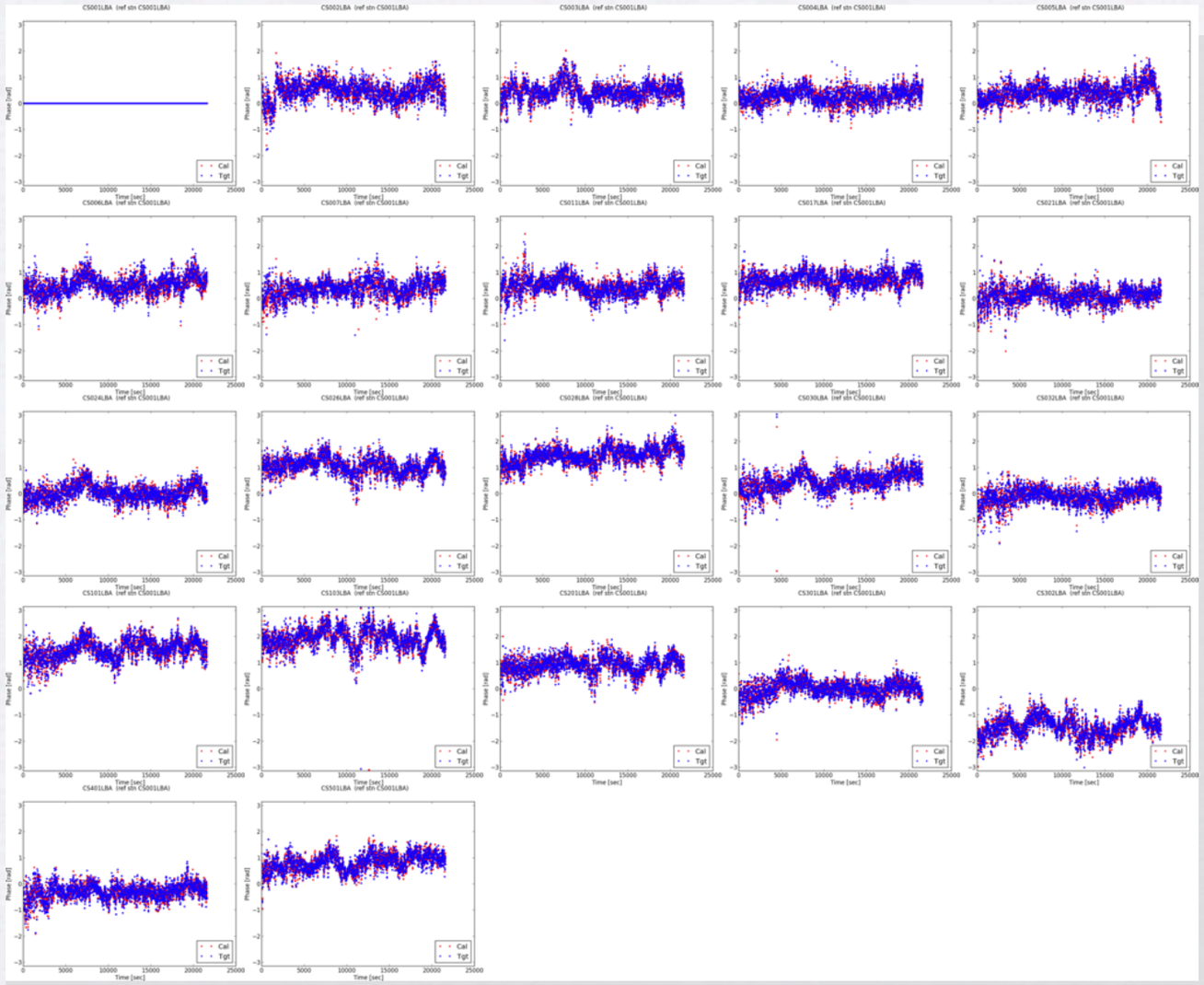
1SB



10SBs

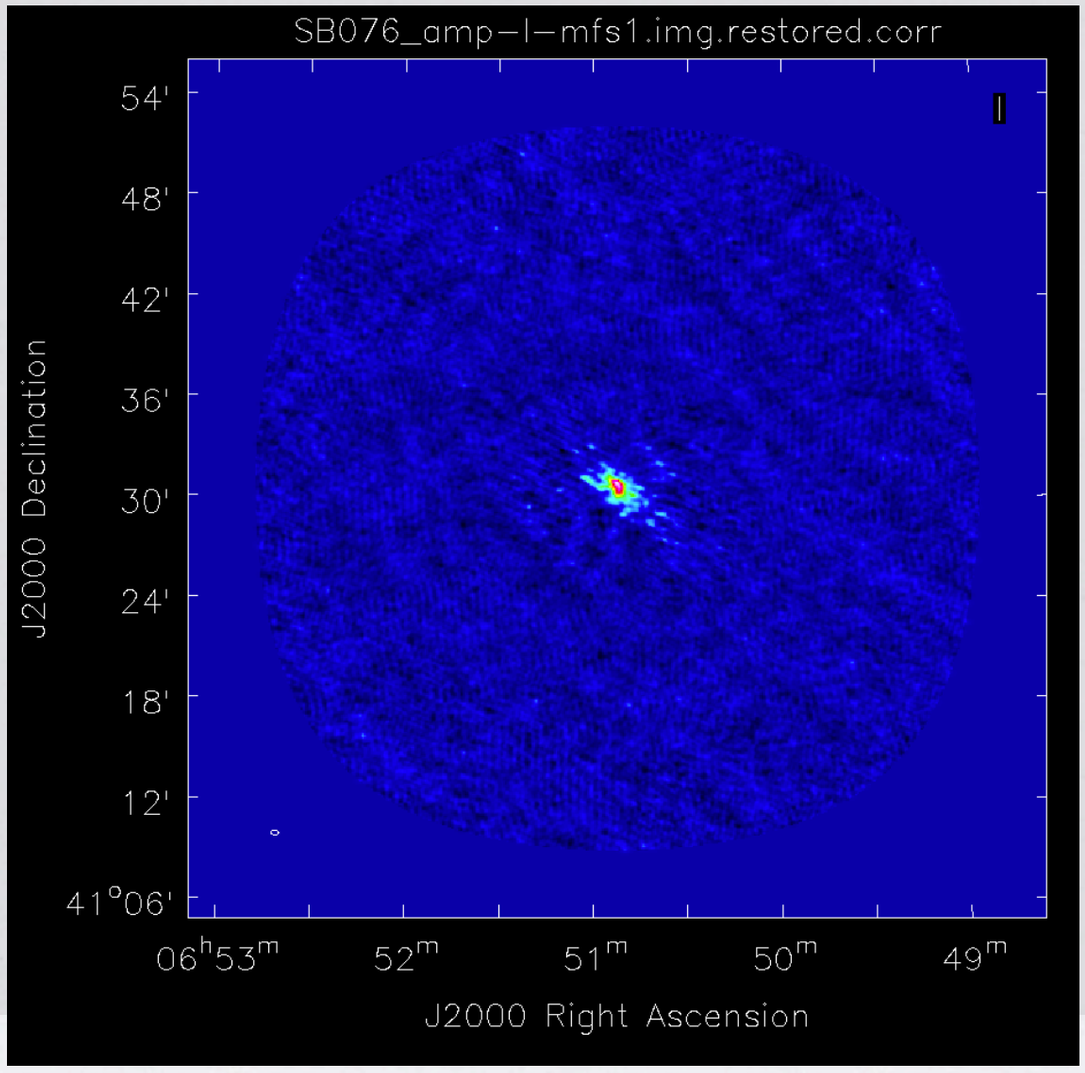


calibrator red / target blue



model 2 deg: blue

model 5 deg: red



Phase Transfer from Calibrator: It appears (by eye) that the phase solutions are largely correlated between the calibrator and the target. The overall correlation means that it should be possible to transfer the phase solutions from the calibrator to the target and then perform another phase-only calibration to improve the phase solutions.

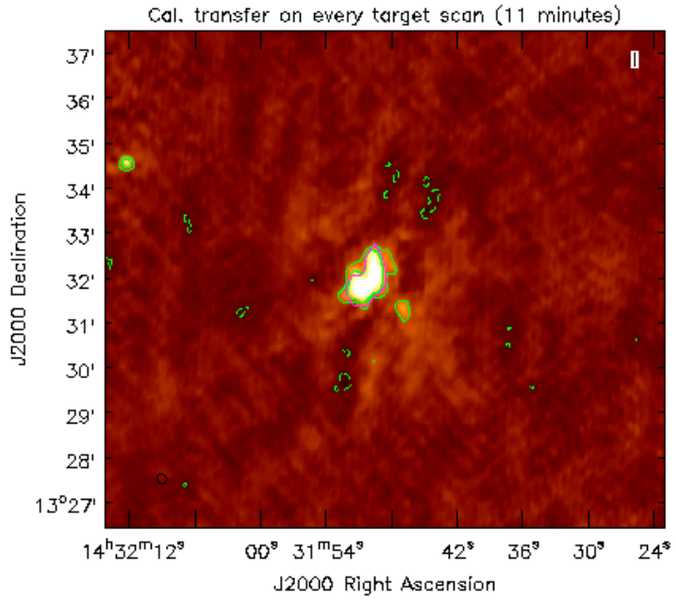
awimager python (Bas)

* Test the python version of awimager **(Bas, Wendy, Rocco)**
* Test on the GPU cluster in Nijmegen, in a q-scheduler in Leiden

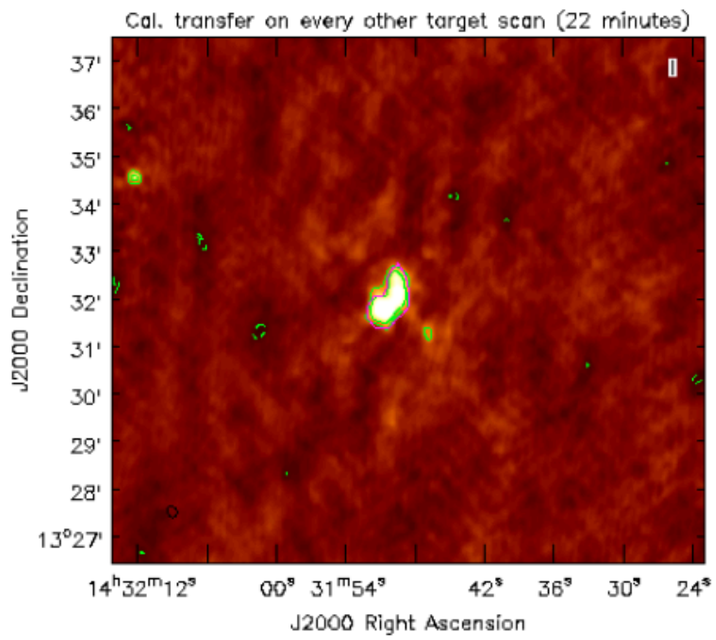
Other (Manu)

* A2255 remove residuals of Ateam after demix using sagecal **(Roberto, Manu*)**
* Software characterization **(Manu*, Maaijke)**
* New awimager as default **(Ger, Andra, Jeremy)**

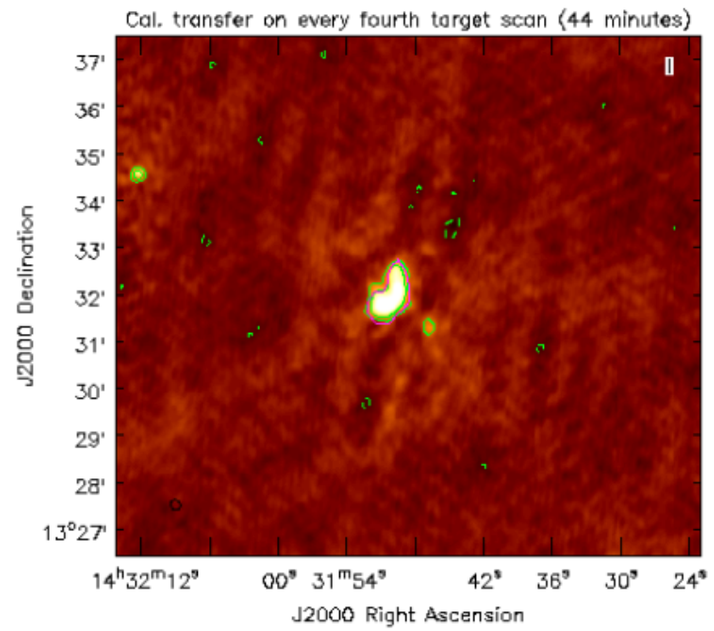
* Test for how long the HBA interleaved calibrator strategy is stable **(Aleksandar):** So, in the 1:1 scenario, we test the stability of the solutions on timescales of about a minute, in the 2:1 case the stability timescale is about 25 minutes, and in the 4:1 scenario about an hour.



noise: 11.24 mJy / beam



noise: 14.20 mJy / beam



noise: 12.28 mJy / beam

1 min | 25 min | 44 min

The solution stability seems good over one hour period, which suggests that we can gain better time coverage of the target by doing less frequent calibrator scans.

reports:

http://www.lofar.org/wiki/doku.php?id=commissioning:imag_busy_week_18