update Busy Week 15

Emanuela Orru'

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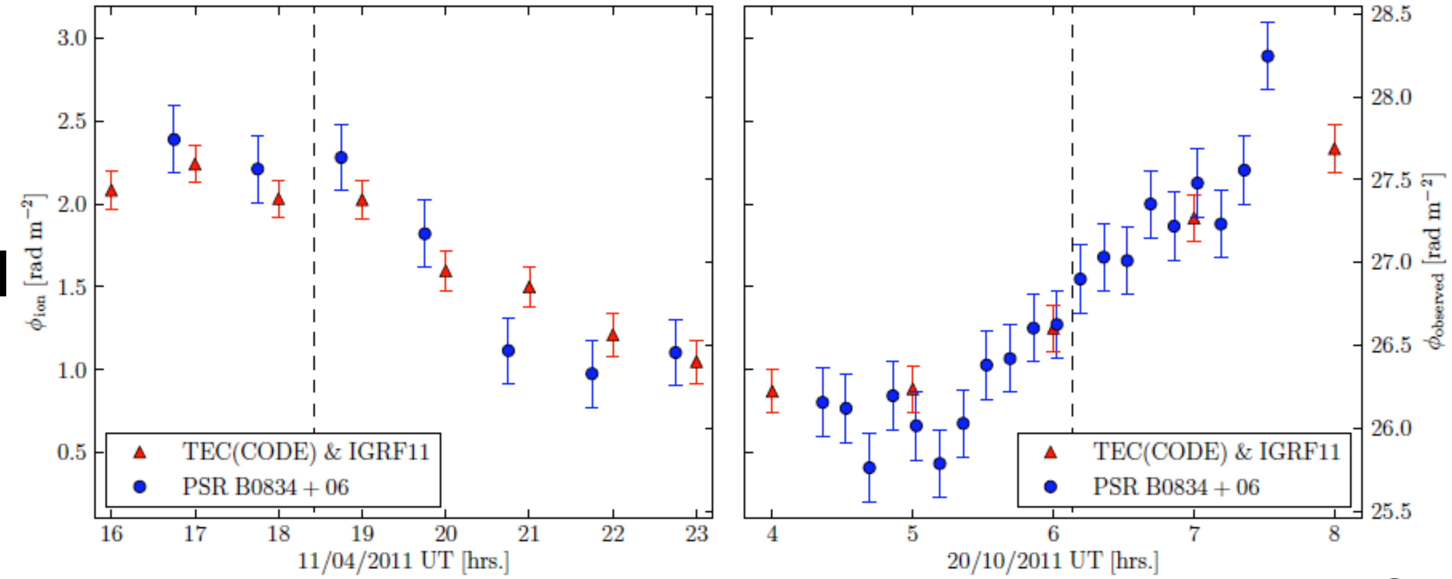
F. de Gasperin,,R.van Weeren, I. van Bemmel, S. Yatawatta, V. Jelic, S. Daiboo,
S. van der Tol, J. Zwietenl, G. van Diepen
M.Mevius,G. de Bruyn, R. Pizzo, G. Heald, H. Rottgering

overview

- 15 participants + 8 during discussion (experts from all KSPs and WGs)
- 2 Topics: new awimager + ionosphere
- tasks discussed/prepared/assigned
- results preliminary

Ionosphere



TEST 1: Apply time dependent ionRM

Assigned to: Andreas, Vibor, Ilse, Ger.

(at some point will be part of the imaging or BBS)

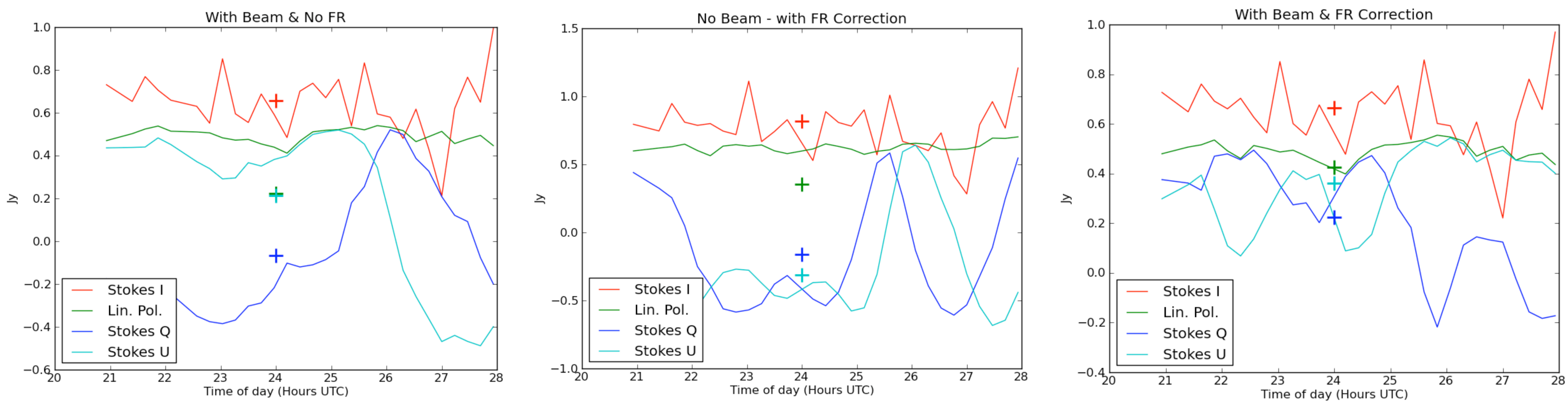
Ilse: To test the separation of dTEC and dFR, simulations are needed. The simulations need to track the dFR and dTEC over a significant amount of time and bandwidth. Collecting requirements and finding the best approach.

TEST

1) Script (by M. Mevius) to extract the gridding in the MS

2) fill in the parmdb with variable values of RM. RM values will be taken from IGRF and Ionex data (e.g Carlos' paper).

3) The new generated parmdb used as additional input in BBS in the cases in which corrected for the FR.



- lines values every 11 min + crosses total values

courtesy of A. Horneffer

TEST 2: Long baseline calibration using calibrator (multi beam)

Assigned to: Adam

1) The phasing of the whole core into a very sensitive super station
2) The calculation of clock and ionospheric delays, and their correction using BBS
3) The automation of all steps so that they can be run by the observatory

Step 1 has been accomplished - standard calibration using BBS seems to work adequately, and a couple of minor problems with the NDPPP phasing-up have been identified and corrected.

Step 2 is partially complete - the calculation of delays has been automated. The corrected data had lower S/N and often a residual delay. Further investigation is needed.

Step 3 will be continued over the coming weeks, through coordination with the Observatory.

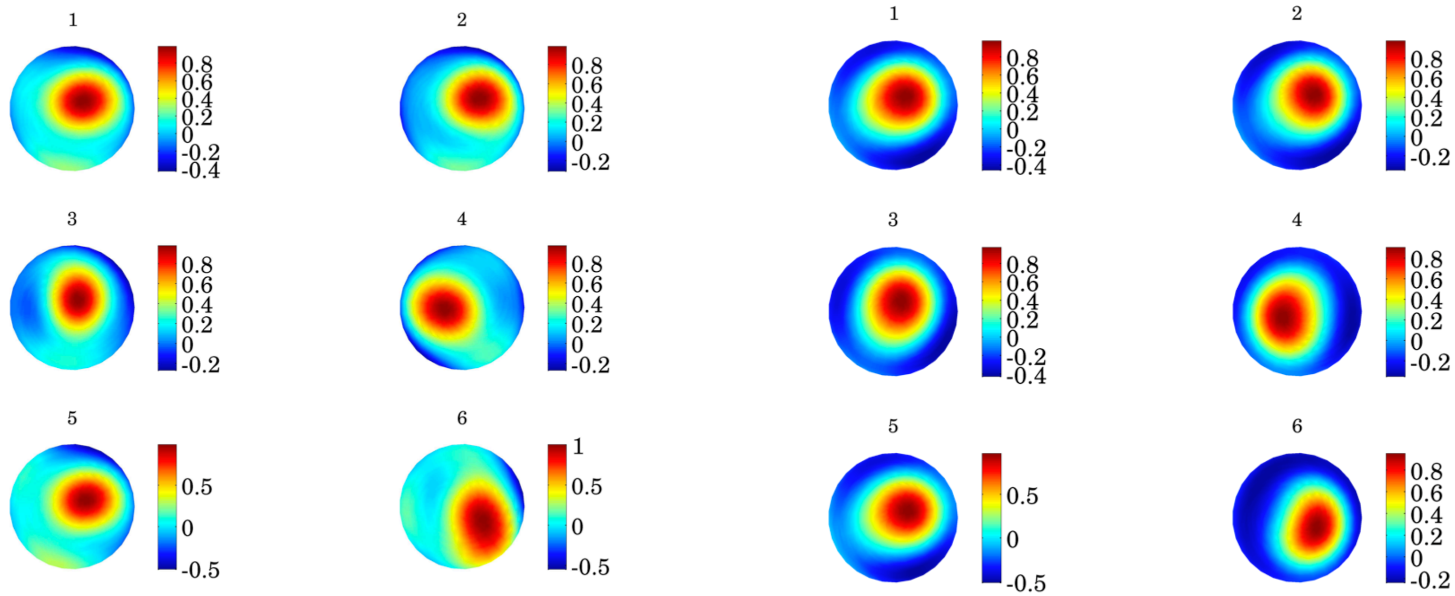
TEST 3: Fitting beam/ionosphere with SAGECAL solutions

Assigned to: Sarod, Manu.

unconstrained

constrained

real part



courtesy of S. Yatawatta

Ionosphere

TEST 4a: Fit a phase screen in multiple direction

Assigned to: Annalisa, Francesco, Soobash, Bas, Reinout.

(part of the EXPion module by S. van der Tol)

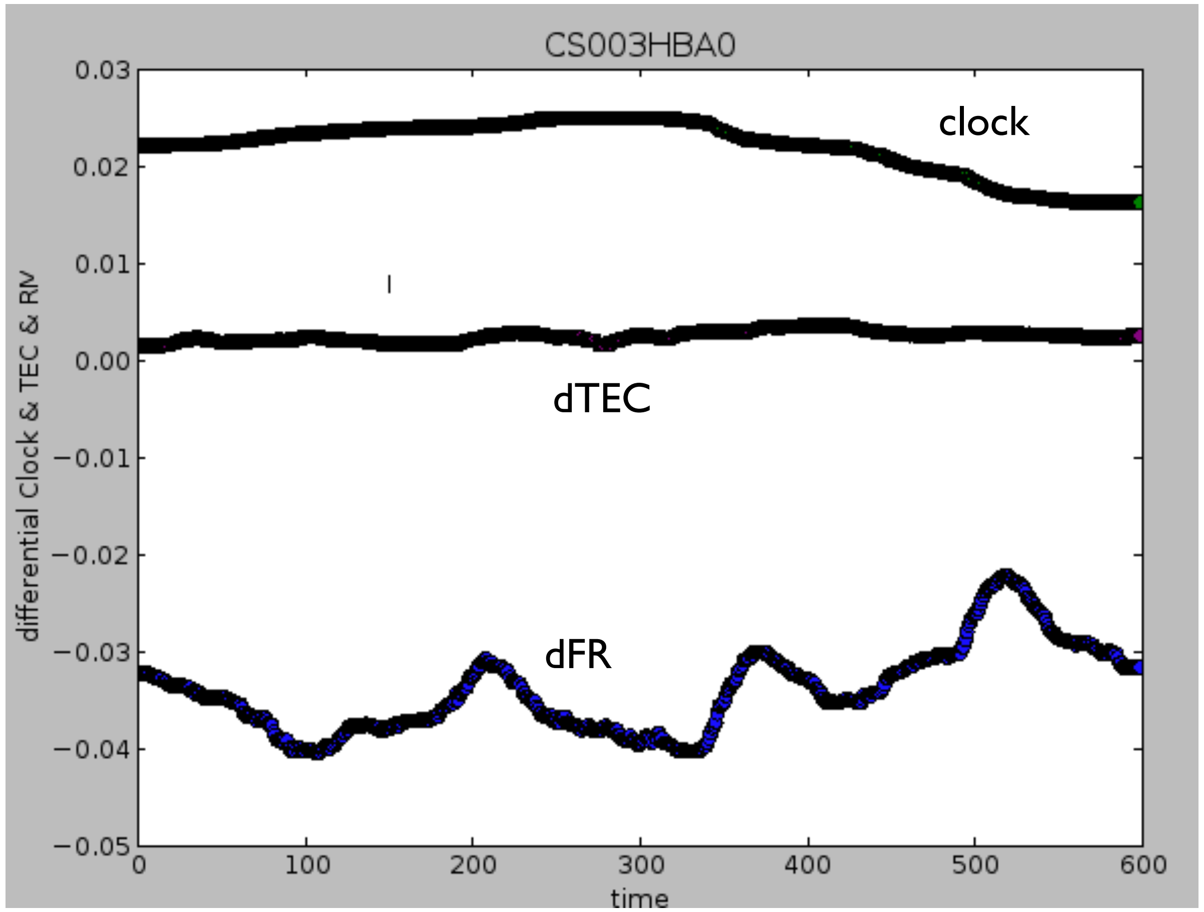
TEST

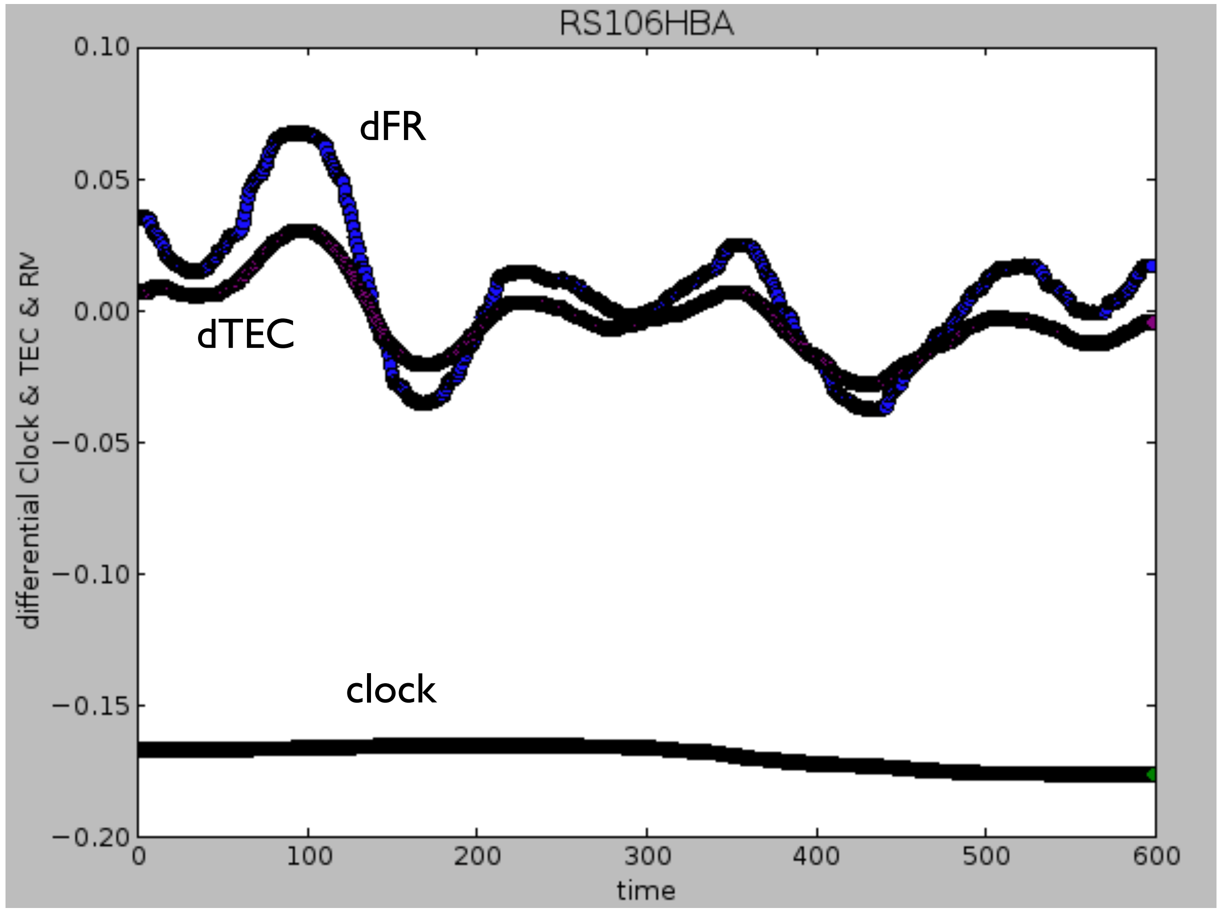
1) Separate the clock (using calibrator) and remove the values from the data.

1.5) Solve to the phase screen on TEC calibrator solutions.

2) The final goal is to fit a phase screen in multiple direction

In order to separate clock-TEC and Faraday rotation, we need to work with circular polarization products (LL,RR,LR,RL)





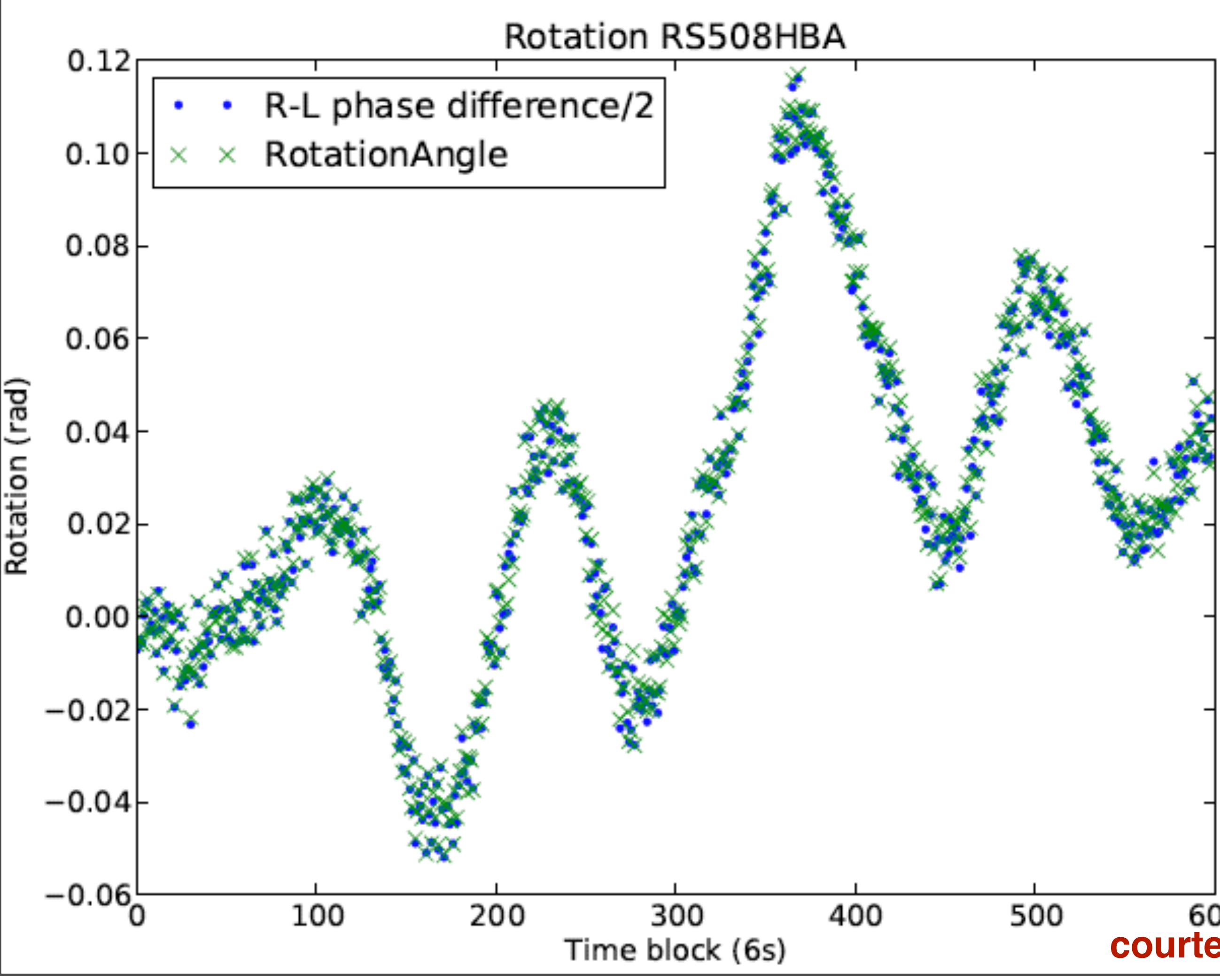
courtesy of A. Bonafede

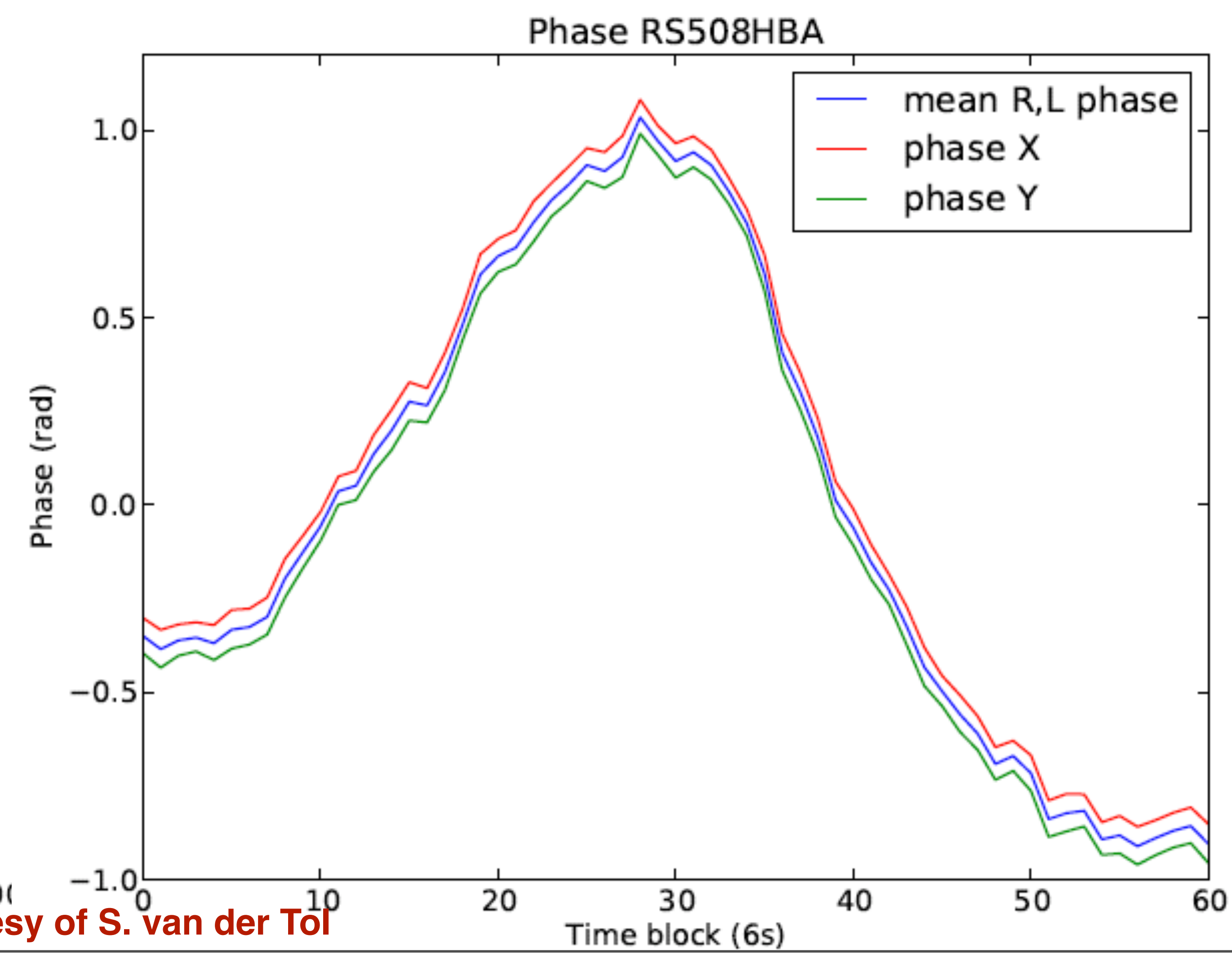
TEST 4b: Fit a phase screen in multiple direction

1. Correct for the beam; 2. Convert to circular polarization (~weeren/scripts/lin2circ.py -h); 3. Solve for the diagnal of the gain matrices; 4. Compute the rotation as the phase difference between R and L.

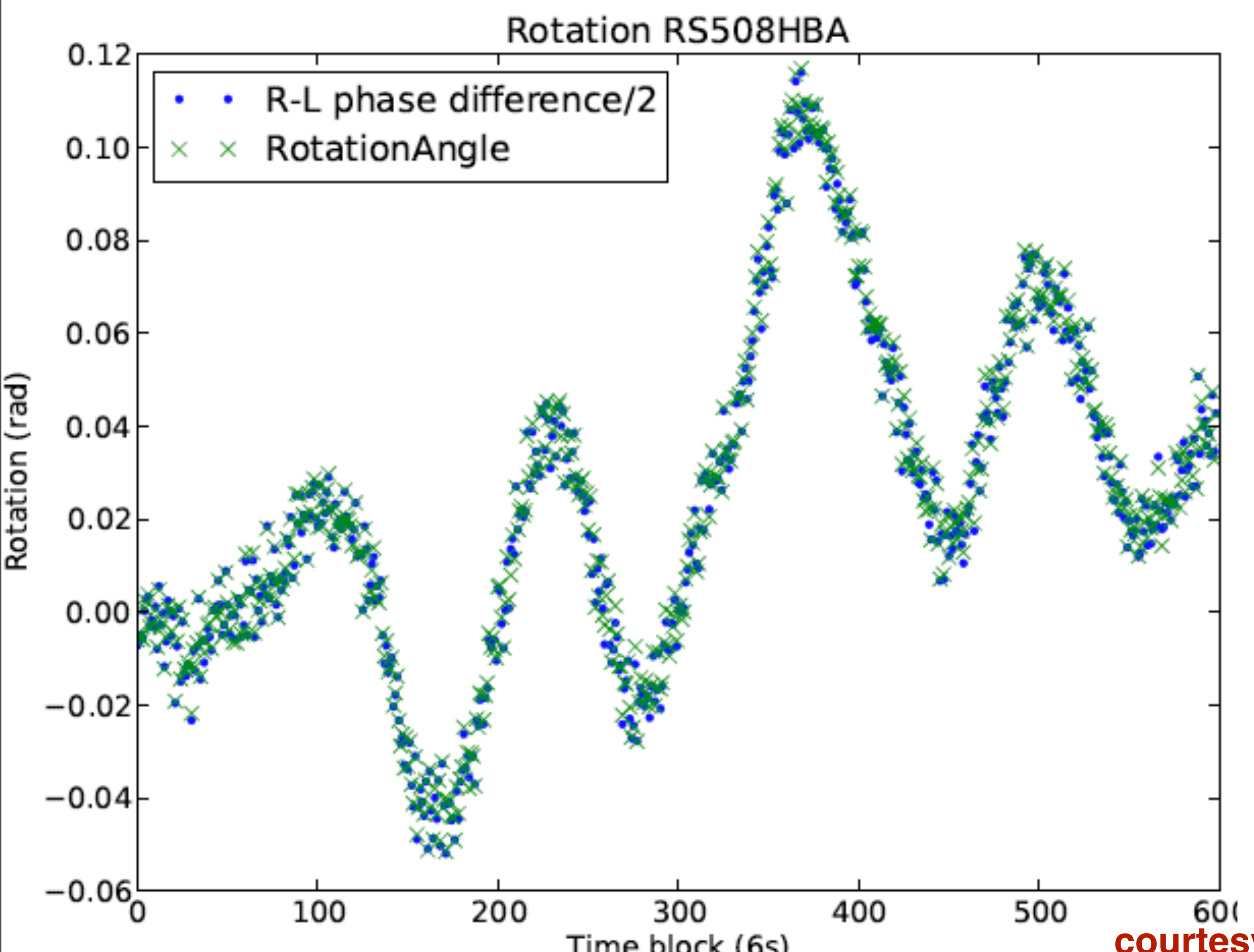
To remove the need for beam correction and polarization conversion a new model option has been added to BBS, called ’Rotation’, which allows direct fitting of a rotation angle to the data.

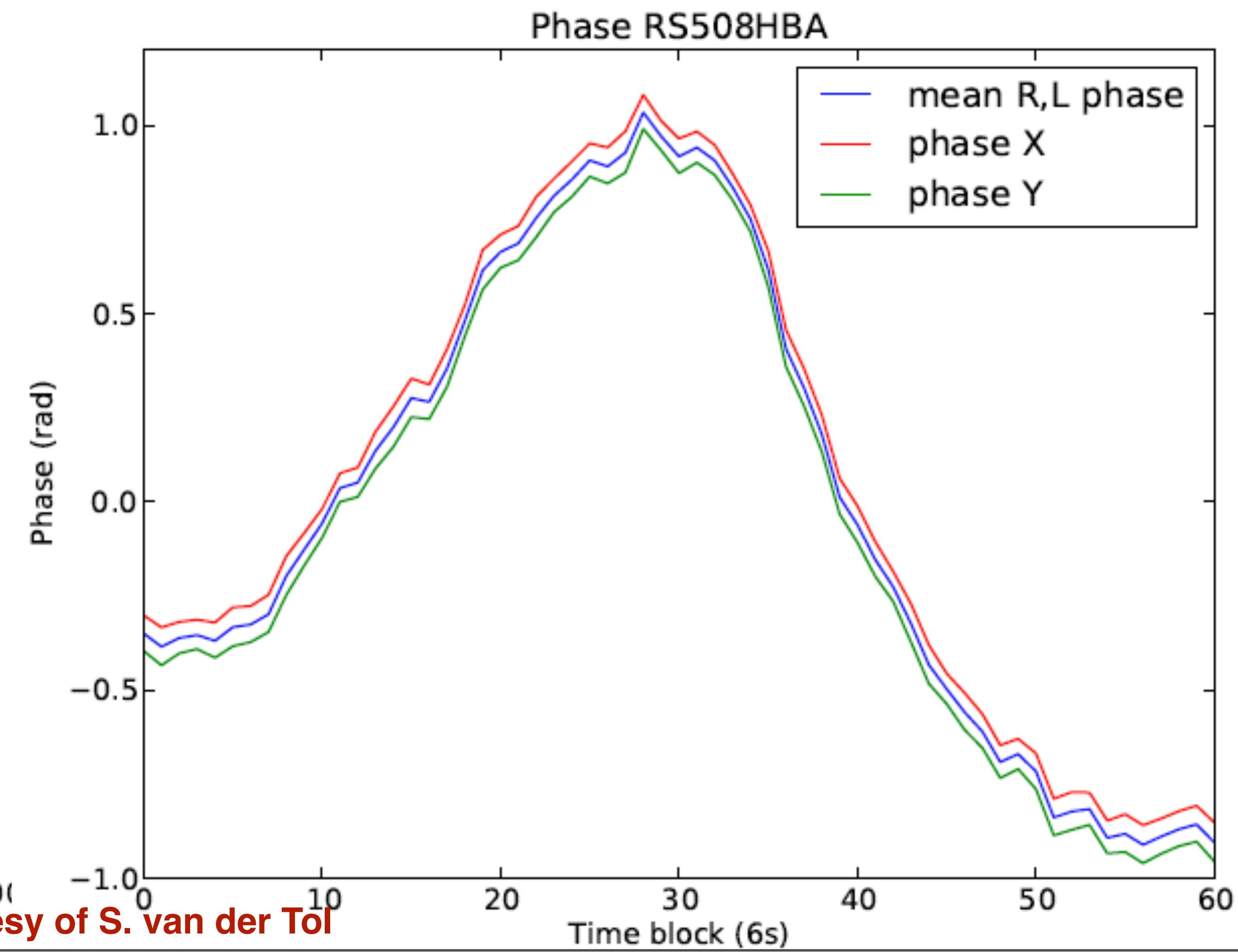
The BBS model Rotation can be used to calibrate for differential Faraday rotation. A conversion to circular polarization is no longer necessary. Using the BBS Rotation model allows to calibrate for gain and phase differences between the X and Y, where calibration on R and L could only recover the mean gain and phase of X and Y.



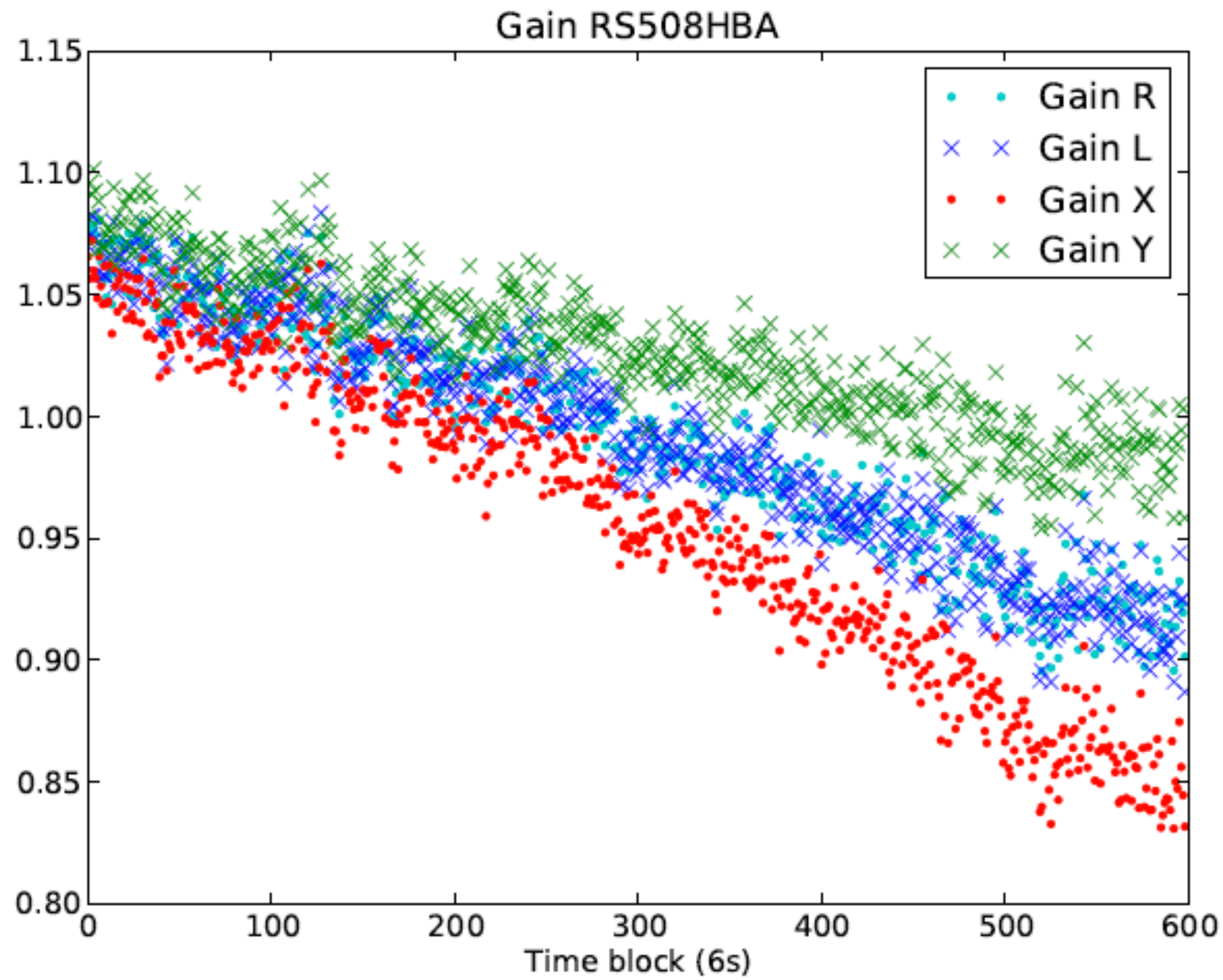


courtesy of S. van der Tol





courtesy of S. van der Tol



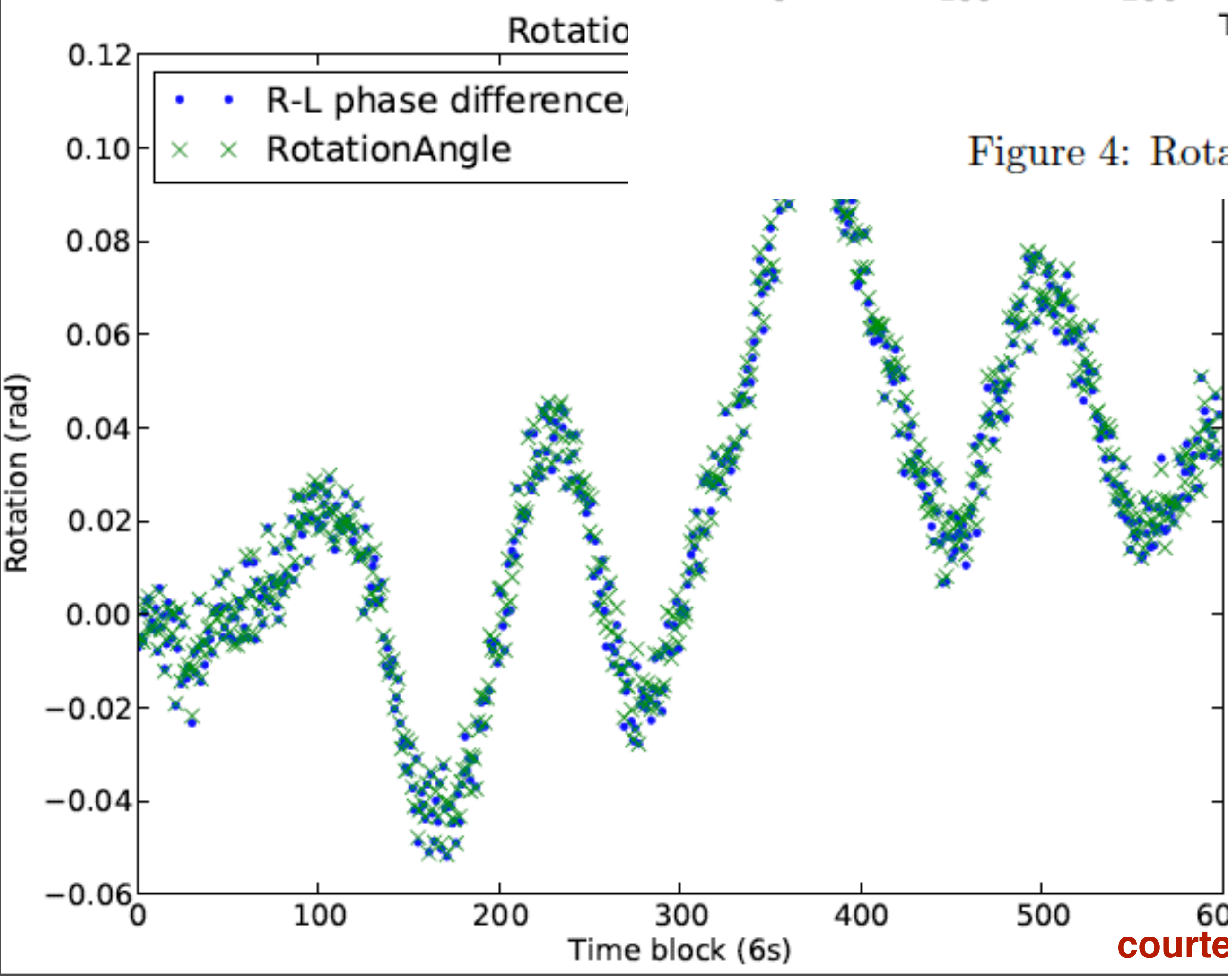
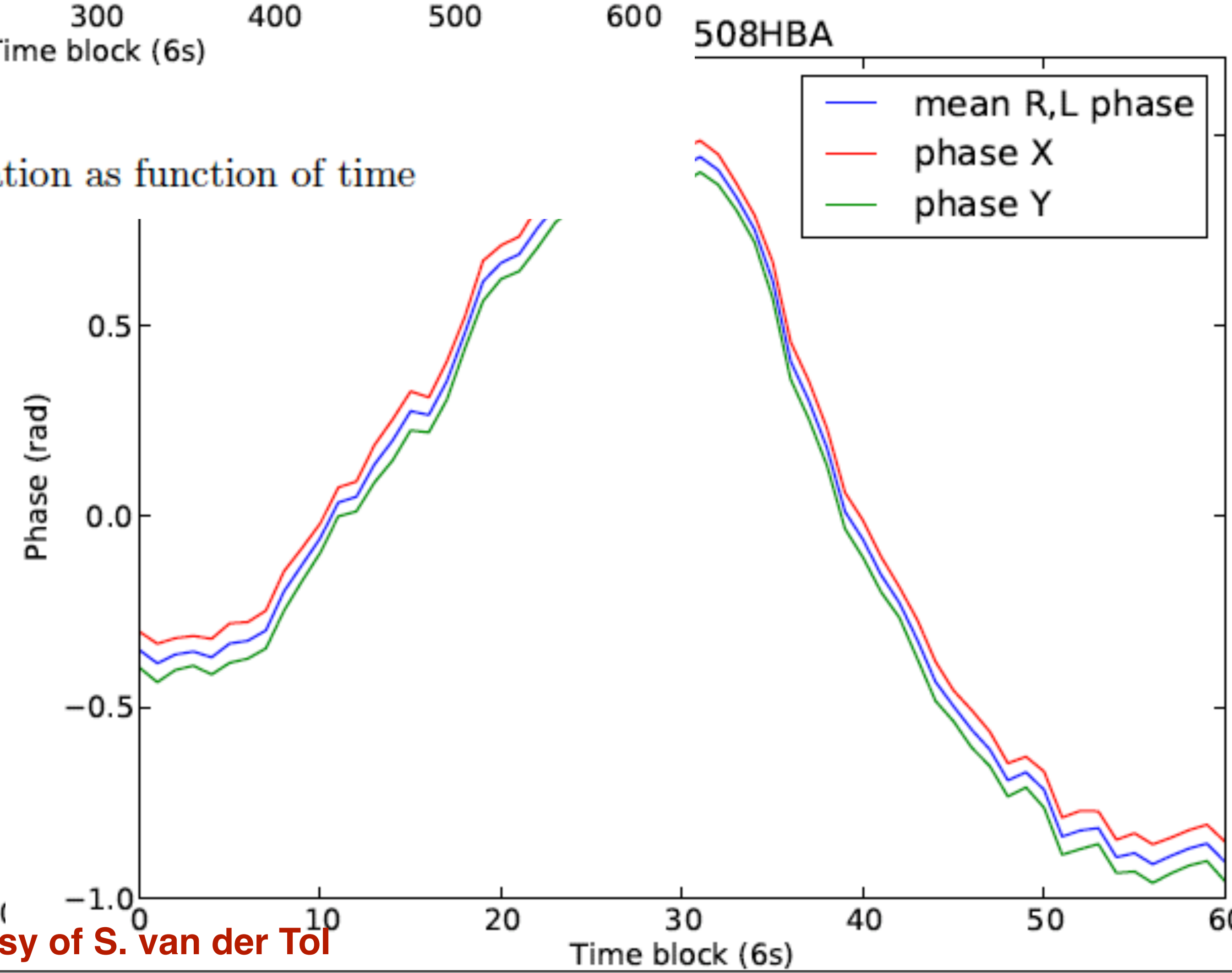


Figure 4: Rotation as function of time



courtesy of S. van der Tol

awimager

TEST 1: All functionalities of the new awimager

Assigned to: Cyril, Reinout, Annalisa, Francesco Andreas, David M. (detailed reports next Busy Thursday 29th November)

Separate the w-term from the A-Term [w-term is not baseline dependent]:
- smaller CF time
- smaller gridding time
- efficient gridding with low memory use

N_{pix}	d ($''$)	D (deg)	N_{stokes}	w_{max} (km)	N_S	N_W	Δ_t, Δ_ν (s, MHz)	$\Delta_t^{el}, \Delta_\nu^{el}$ (h, MHz)	t_{CF} (%)	t_{grid} (%)	t_{el} (%)	t_W (%)	Memory (Gb)	t_{tot}^{grid} (sec.)
1024	40	11.4	IQUV	20	15	14	300, 0.78	3, 3.5	67.8	10.2	19.7	2.1	1	40.9
4096	10	11.4	IQUV	20	15	14	300, 0.78	3, 3.5	24.5	4.9	57.5	12.8	4.5	117.4
4096	10	11.4	I	20	15	14	300, 0.78	none	52.0	11.4	0.0	36.5	1.5	143.7
8192	5	11.4	I	20	15	14	300, 0.78	none	32.8	6.1	0.0	60.9	6.1	335.7

Typically, 2-3 hours for 11000x11000 pixel image, 12 hours, 12 subbands, 10 major cycles

TEST 2: convert part of the imager to python

Assigned to: Ger, Bas, Joris

TEST 3: Phase screen fitting on simulated dataset and aplly it with new awimager

Assigned to: Bas

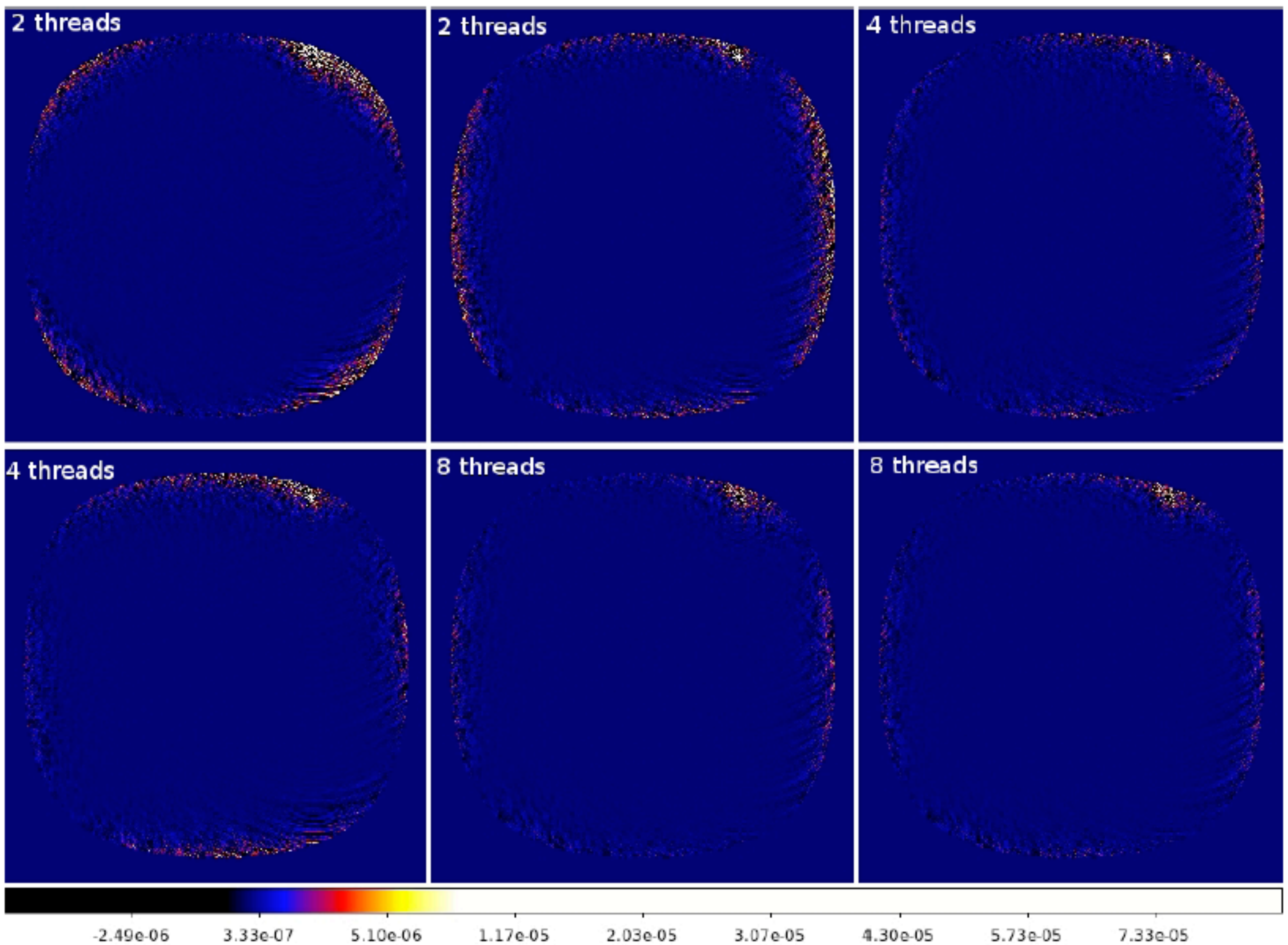
TEST 4: Numerical noise in awimager when using more than one thread

Assigned to: Andra, Wendy

The multi-thread capability of the AWimager allows us to measure the numerical noise in our images. Because operations are performed in a slightly different order when using multi-threads, images made with identical parameters on more than one thread should differ on the level of 10^{-9} the accuracy of single-precision floats.

Imaged a simulated data set provided by Cyril Tasse, of an empty field with single off-centre source at ~ 4 degrees from the phase centre.

The images with 1 thread were identical as expected. For 2, 4 and 8 threads the central RMS of the difference image is at the level of 10^{-9}, while at the edge, where the primary beam correction becomes apparent, the standard deviation goes up to 10^{-6}. The most artifacts can be found around the source where the noise is at the level of 10^{-5} - 10^{-4}



courtesy of W. Williams A. Stroe