LEA128 data analysis:

Superterp phase stability & its applications

Ger de Bruyn

with help and data from Sarod, Panos, Michiel, Oscar,…

3C196 LEA 128 project

Goals

1) Monitoring of long-term stability (Gain, MTBF, clocks)

2) Assess data quality (noise, RFI)

3) Investigate calibration errors (due to e.g. beam and ionosphere)

4) Look for (subtle) systematic errors in DEEP imaging

5) Test pipelines on EoR cluster

Great diagnostic information in differential analysis: visibility, solutions, and images

Currently we have 3 epochs of LEA128 3C196 HBA data

23 Oct 2010 L2010_20984 (25 stations, HBA0 only)

Proper HBA beamformer tables mid Dec 2010

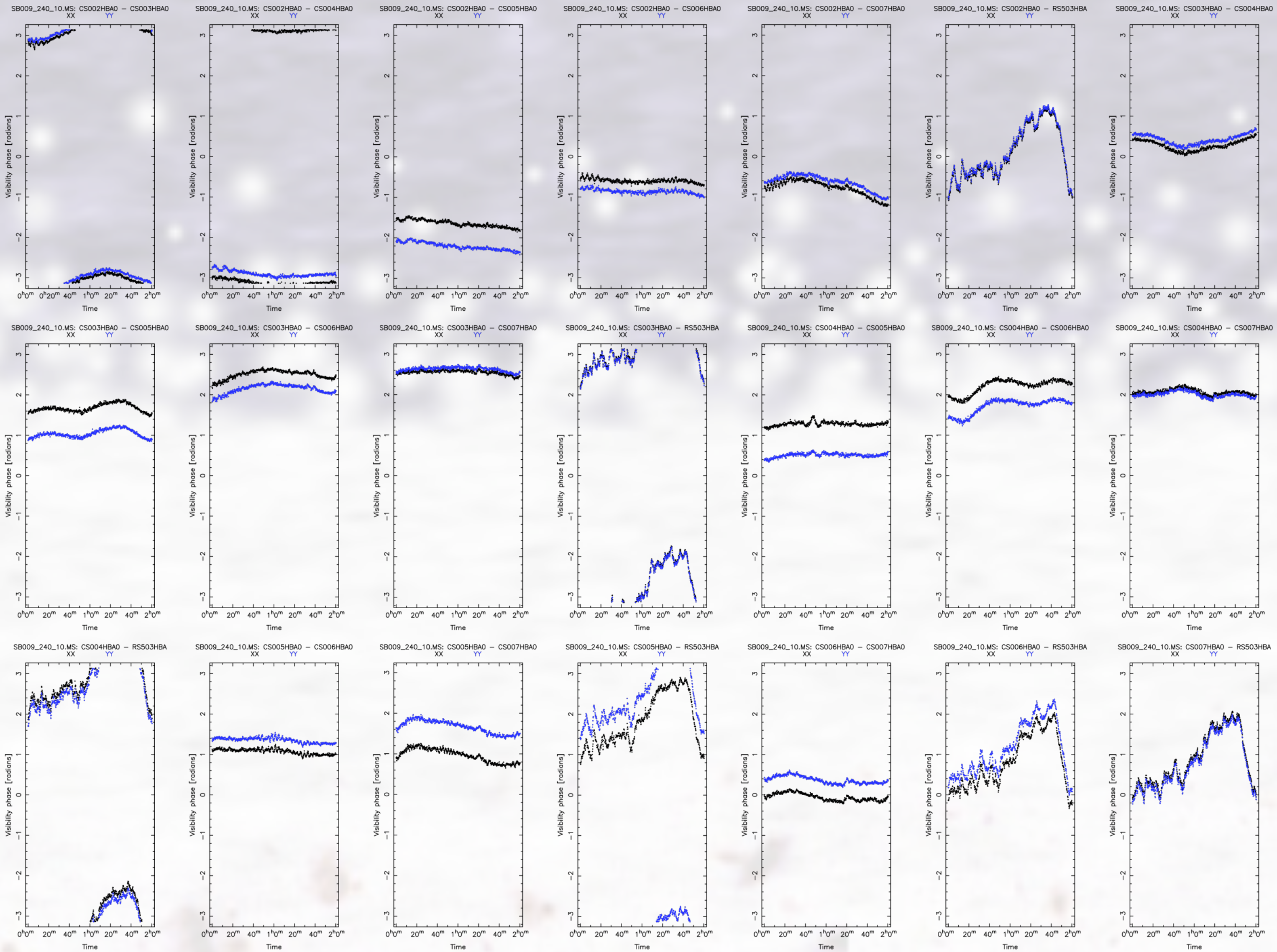
19 Dec 2010 L2010_22006 (44 stations HBA0 and HBA1)

07 Jan 2011 L2010_22667 (45 stations HBA0 and HBA1)

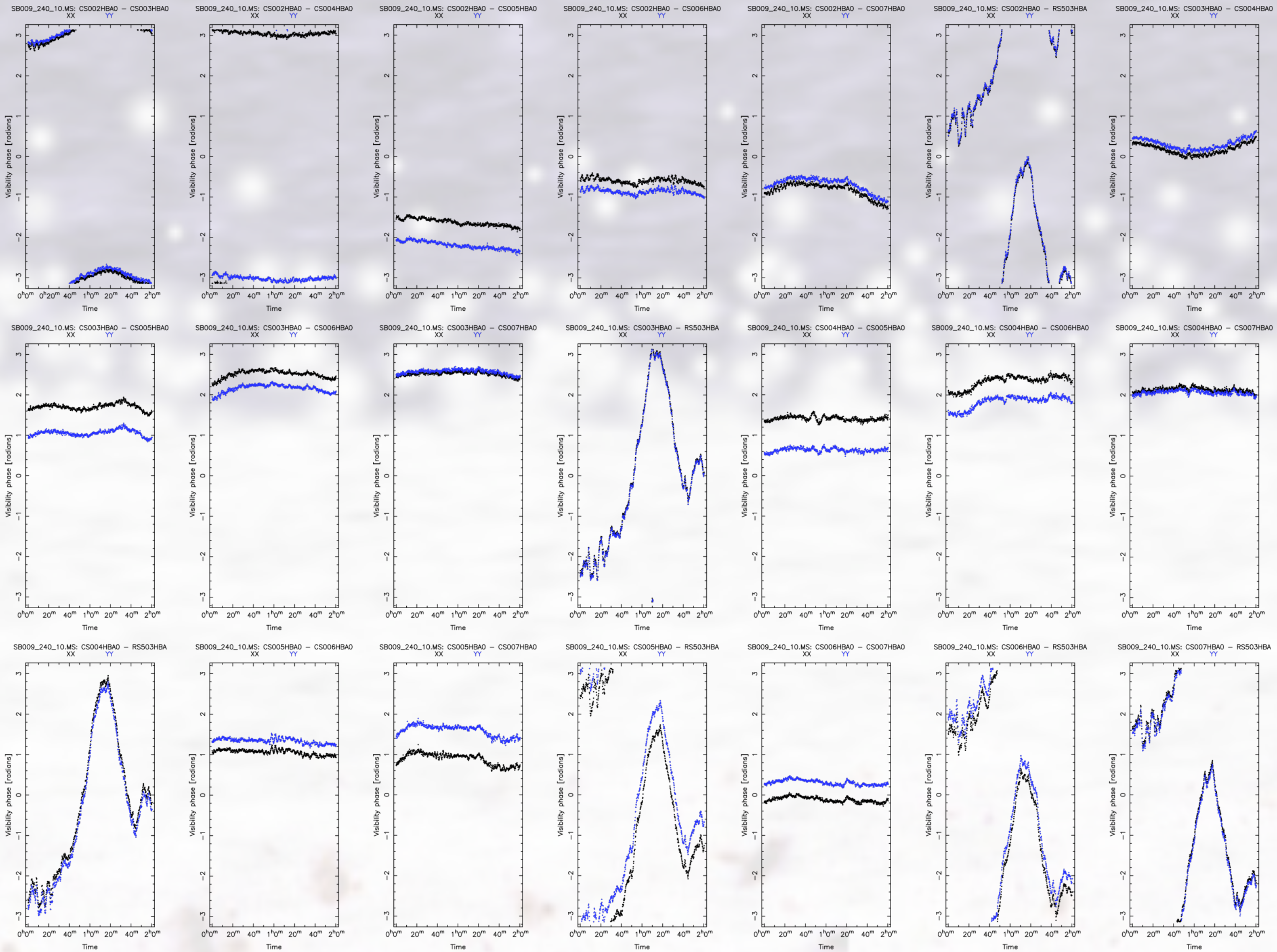
All 248 subbands with 64 ch
Frequencies from 115-163 Mhz
6h with 2s integration (~25 GB per subband → 6 TB raw data)

6 CS on superterp CS002,003,04,005,006,007
13/14 CS CS001,007,017,021,024,026,030,032,101,201,301,401,501,302,103
6/5 RS RS 106,205,208,306,(307),503

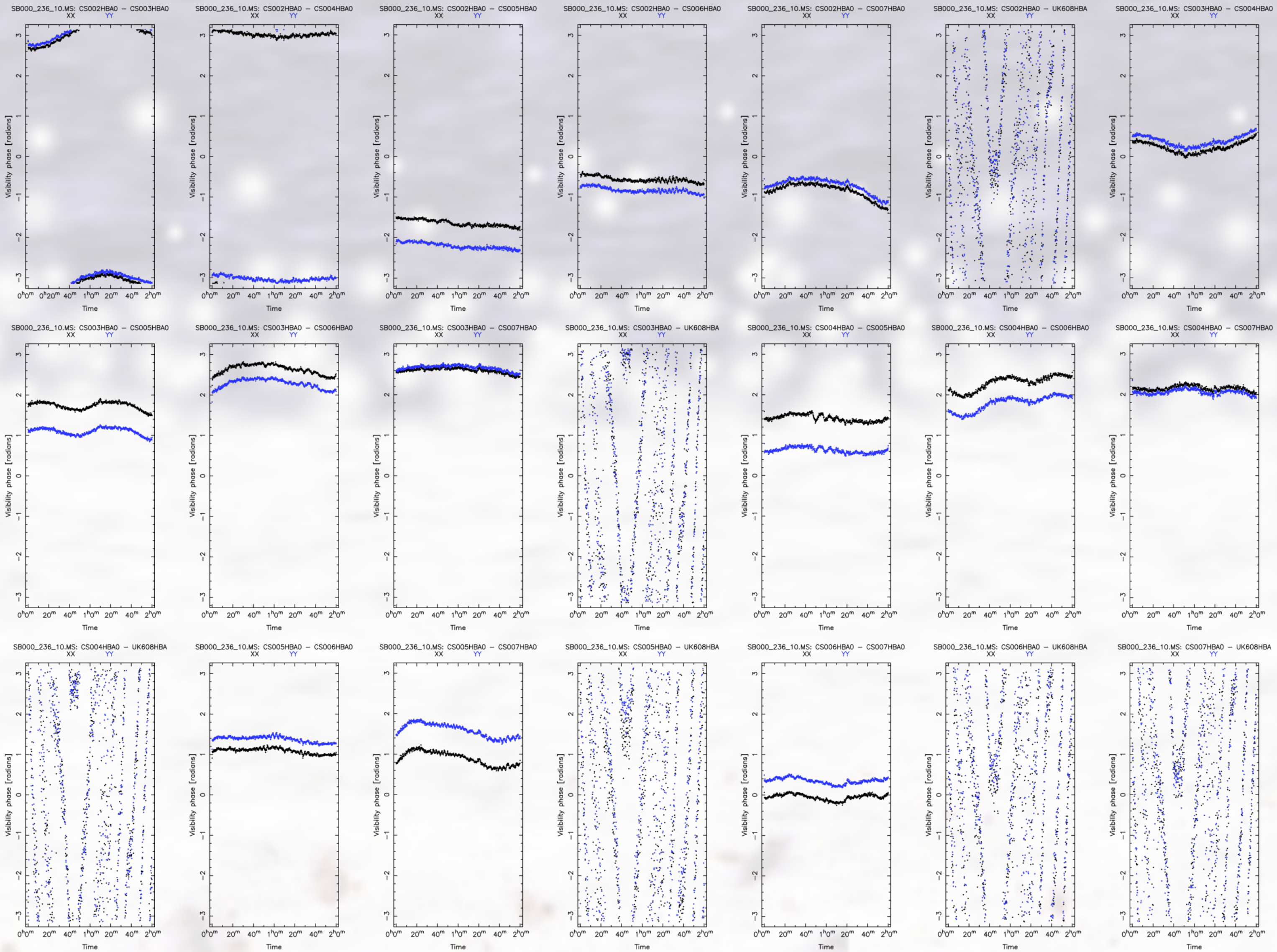
3C196 HBA 117 MHz 6ST + RS503 18-Dec-10



3C196 HBA 117 MHz 6ST + RS503 7-Jan-11



3C196 HBA 119 MHz 6ST + UK608 11-Jan-11



A coherent superterp

With a phase-stability of < 5-10^{o} we can easily make a coherent superterp.
This can be done in two ways:

1)adding raw voltages before correlation (like is done for pulsars)
2)Adding visibilities after correlation works on the MS)

Both approaches will give a S/N improvement of a factor 3.5

The 1st approach is preferred (to save storage when we have 72 stations !).
The 2d approach allows applying residual phase delays in case differential superterp clock errors would be larger than say 1 ns

Applications:

1)European scale LOFAR

2) Solving for DDE's on faint sources → ionospheric and beam mapping