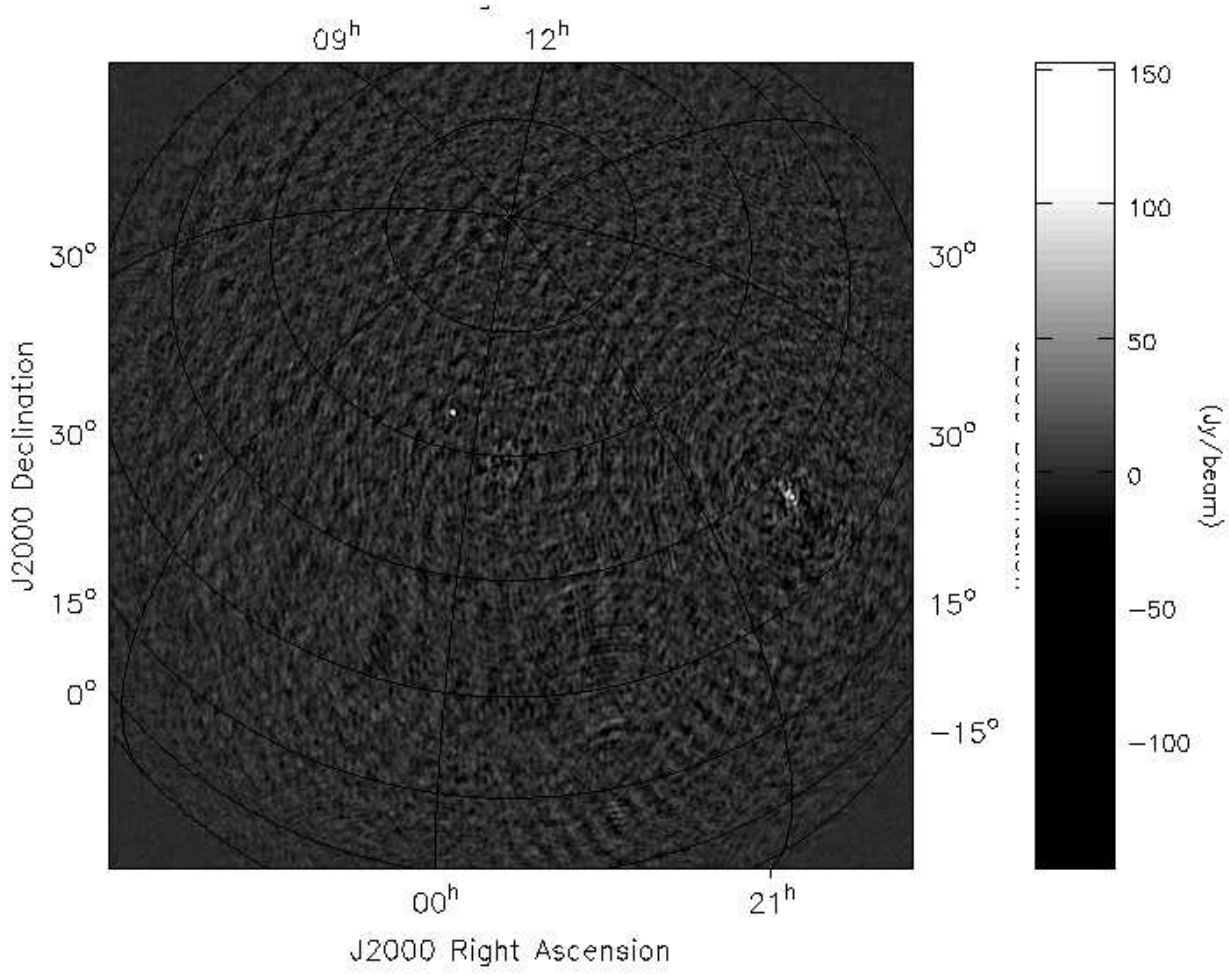
LOFAR CS1

Calibration and Imaging

(cont.)

More Sources!



L2007_01576, subband 5 (60 MHz)

Peeling

- Jones Matrices

$$\mathbf{G} = \begin{bmatrix} g_{11} & 0 \\ 0 & g_{22} \end{bmatrix} \quad \mathbf{J} = \begin{bmatrix} J_{11} & J_{12} \\ J_{21} & J_{22} \end{bmatrix}$$

- Peel CasA and CygA. If we solve for $\mathbf{J}$ Jones what we get is $\mathbf{JP}$ where $\mathbf{P}$ is the beam and projection. Since $\mathbf{P}$ is an image plane effect, we cannot use this to correct the residual data.
- Hence we peel with diagonal $\mathbf{J}$ Jones and use the solution of CasA to correct the residual data.
- More dipoles: better sensitivity, CasA has high SNR: better solution, 29hr observation, beamforming

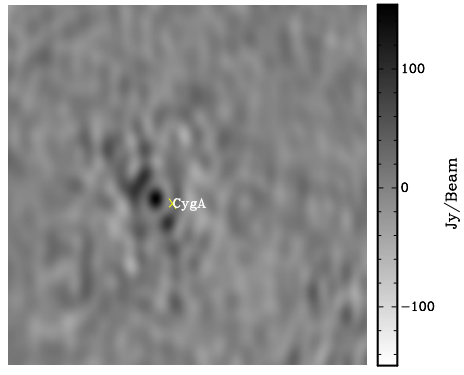
Peeling...

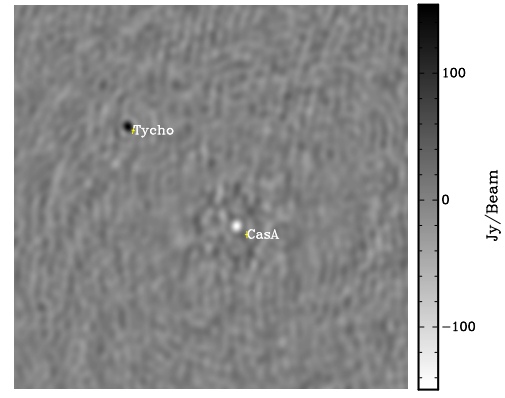
- Solve for diagonal $\mathbf{J}$, real and imaginary parts

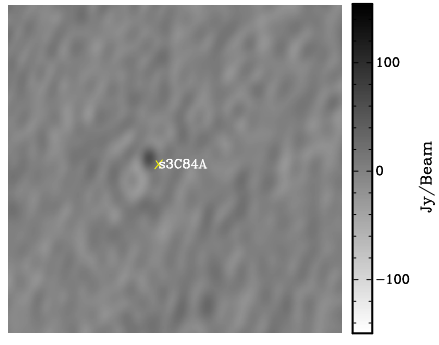
$$\mathbf{J} = \begin{bmatrix} J_{11} & 0 \\ 0 & J_{22} \end{bmatrix}$$

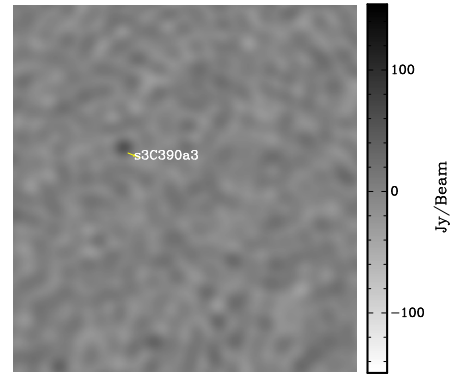
- Solution domain: one timeslot (1 min), 10 channels (10 kHz)
- Simultaneous solution in directions of CasA and CygA
- $\mathbf{J}$ include the cumulative effect of electronics (uv plane), station beam (Az,El), model error in source fluxes

Closeups







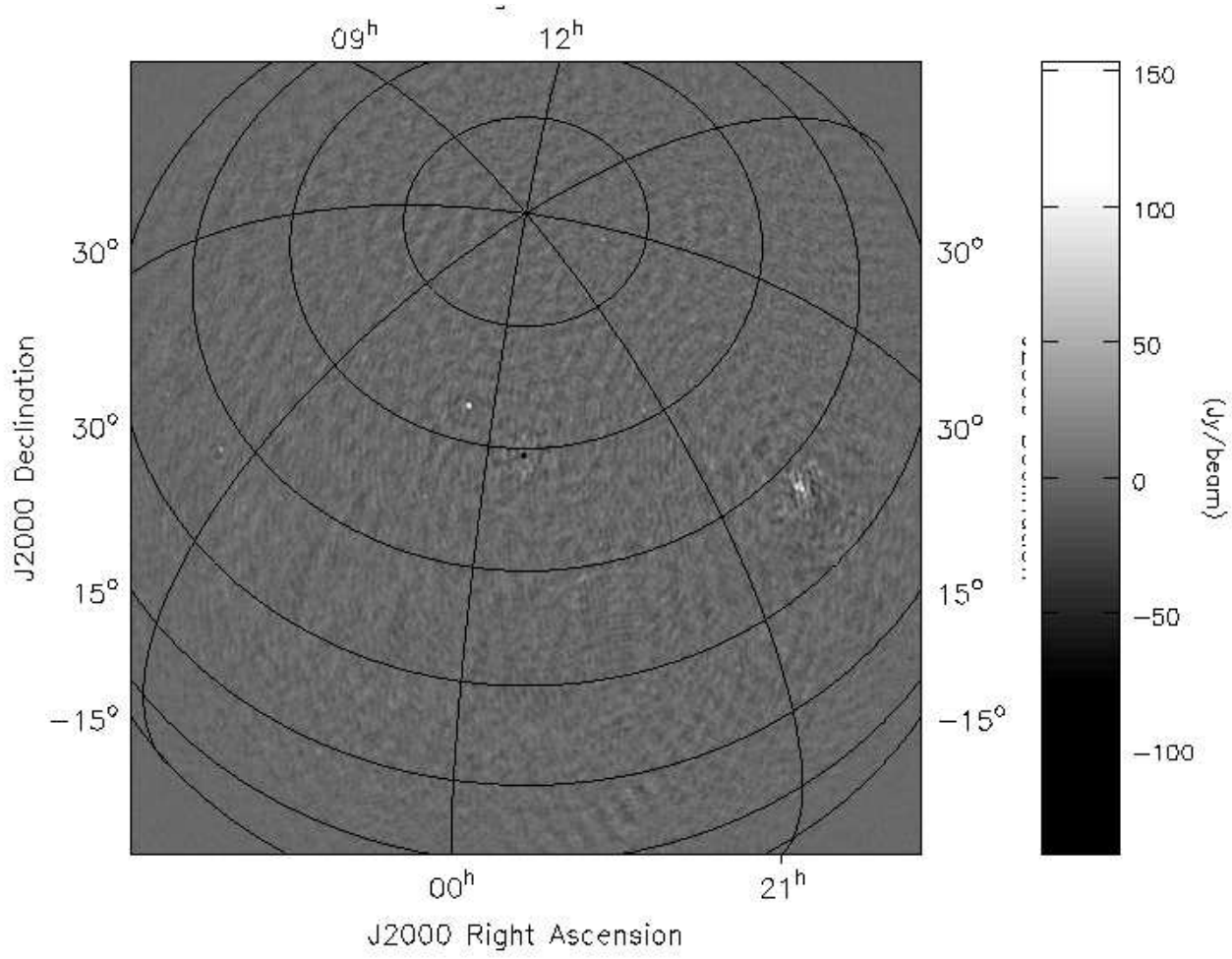


- Dynamic range close to CasA $\approx$ 1:2000

Improvements in Speed

- From 4 hr 30 min to 10 min
- Do not save solutions: $\times$ 7
- Subtiling solutions: parallel solvers $\times$ 4
- Next: Solve for an entire subband at a time, using 2nd order freq polynomials for all parameters.
- Next: Resampling when shifting the phase-centre.

Again!



L2007_01576, subband 4 (58 MHz) + subband 5 (60 MHz)