Report from the recent imaging busy week

John McKean

Fabien Batejat
Ilse van Bemmel
Ger van Diepen
Francesco de Gasperin
Niruj Mohan
Emanuela Orru
David Rafferty
Evert Rol
Bas van der Tol
Reinout van Weeren
Joris van Zwieten

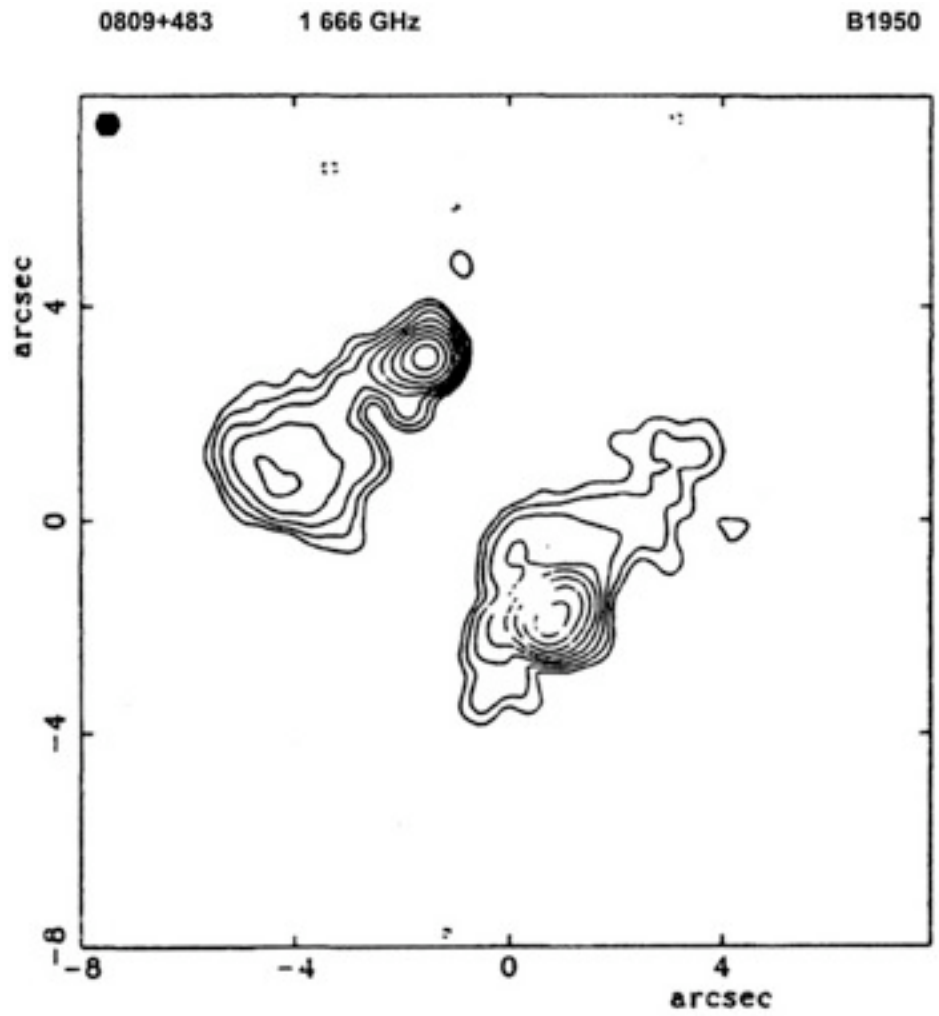
The Data

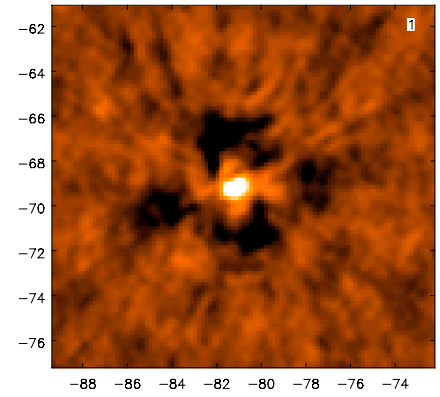
3C196 (~150 Jy at 60 MHz)

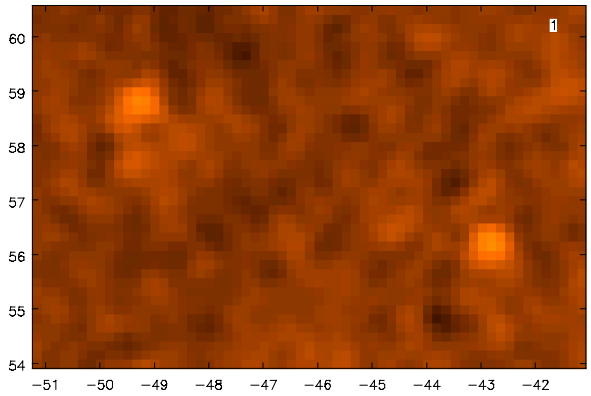
13 hour observation of 3C196
30--80 MHz
5 Dutch stations and Effelsberg
24 MHz bandwidth (non-continuous)
120 subands (256 channels)
3 second visibility integrations
300 Gb size

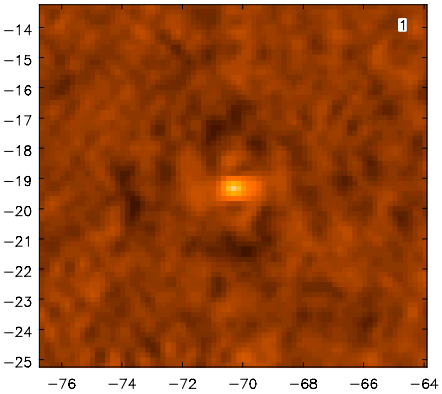
Processed through the pipeline in ~4.5 hours.

IDPPP: Flagging & compression
BBS: Phase and amplitude calibration
C-Imager: Imaging

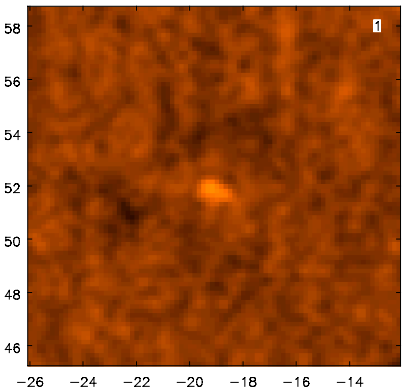


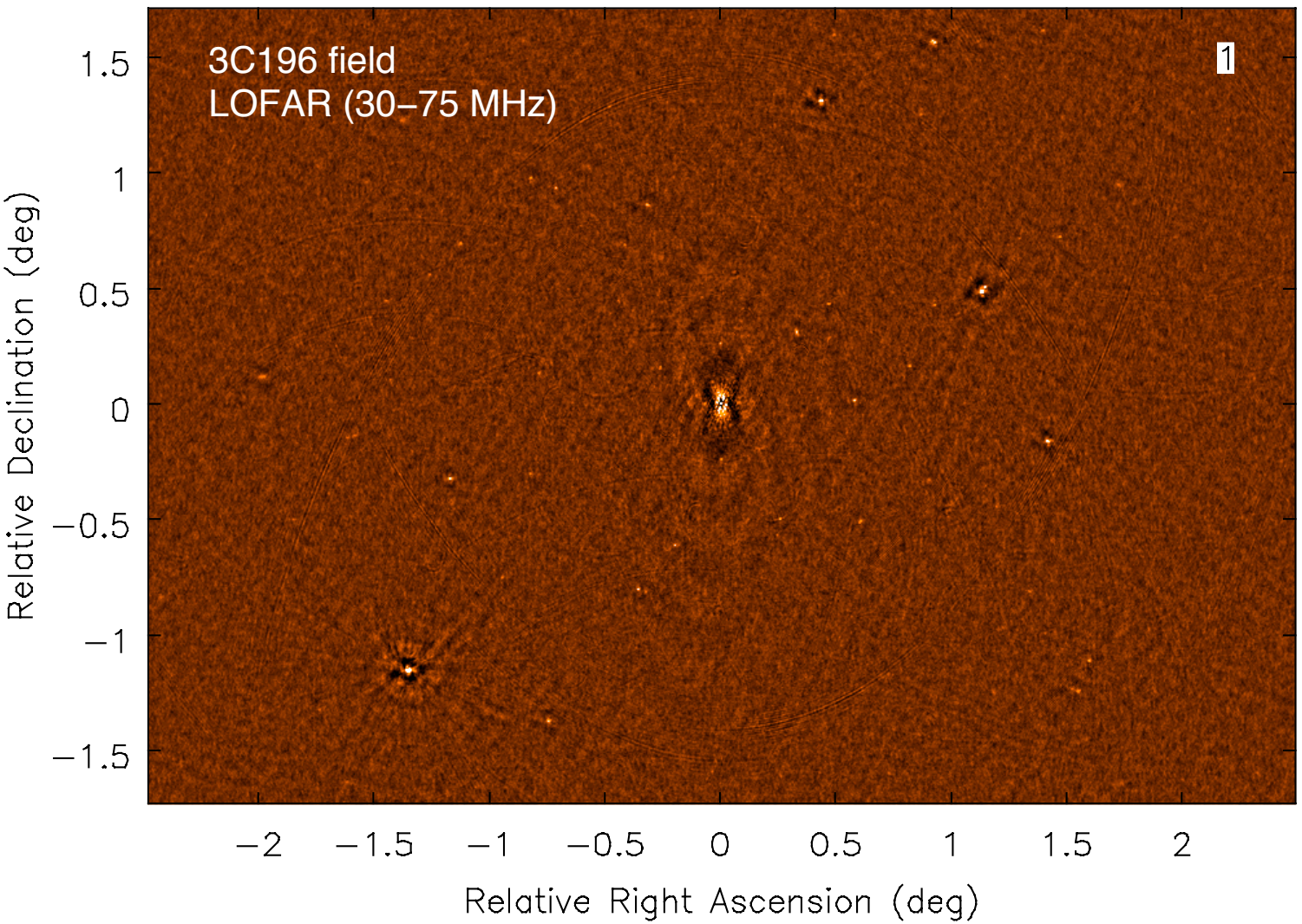

−62
−64
−66
−68
−70
−72
−74
−76
−88 −86 −84 −82 −80 −78 −76 −74

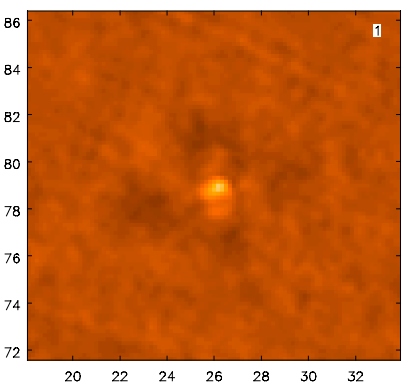

60
59
58
57
56
55
54
−51 −50 −49 −48 −47 −46 −45 −44 −43 −42

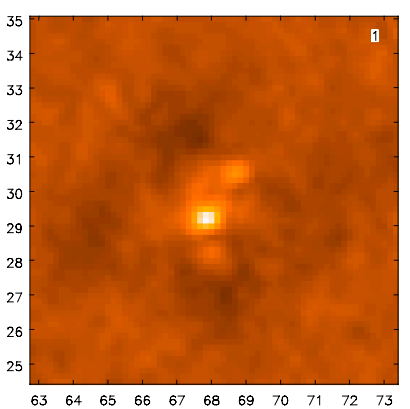

−14
−15
−16
−17
−18
−19
−20
−21
−22
−23
−24
−25
−76 −74 −72 −70 −68 −66 −64

ASTRON


58
56
54
52
50
48
46
−26 −24 −22 −20 −18 −16 −14


3C196 field
LOFAR (30–75 MHz)
1
Relative Declination (deg)
1.5
1
0.5
0
−0.5
−1
−1.5
−2 −1.5 −1 −0.5 0 0.5 1 1.5 2
Relative Right Ascension (deg)

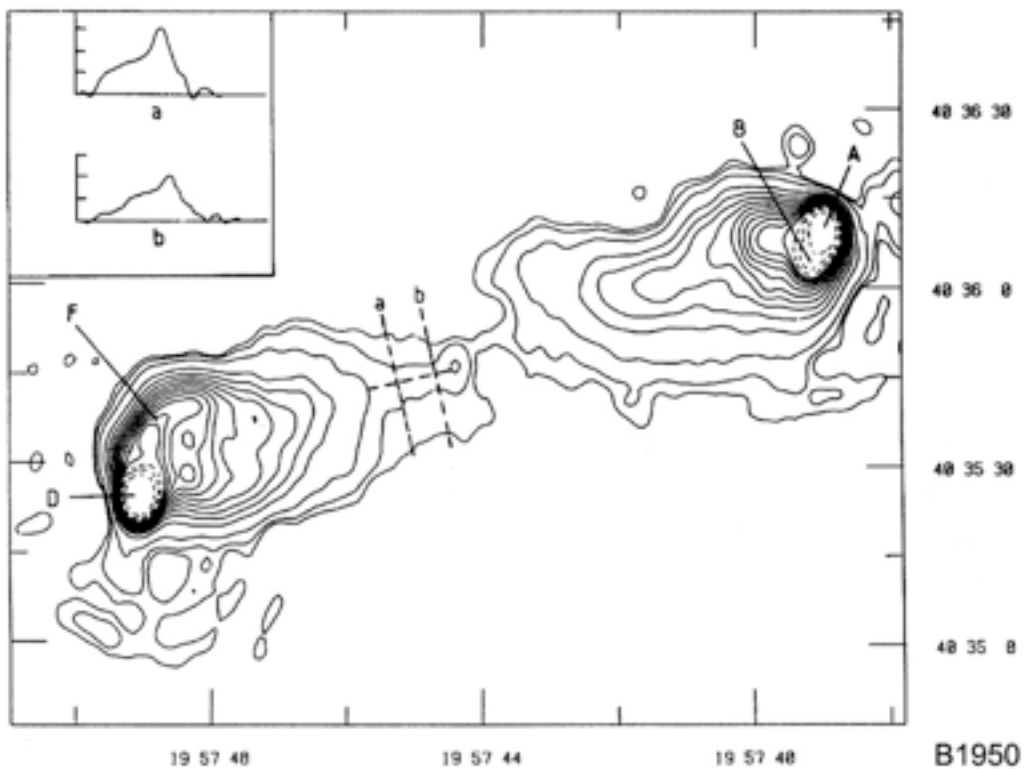

86
84
82
80
78
76
74
72
20 22 24 26 28 30 32


35
34
33
32
31
30
29
28
27
26
25
63 64 65 66 67 68 69 70 71 72 73

Cygnus A with the HBA

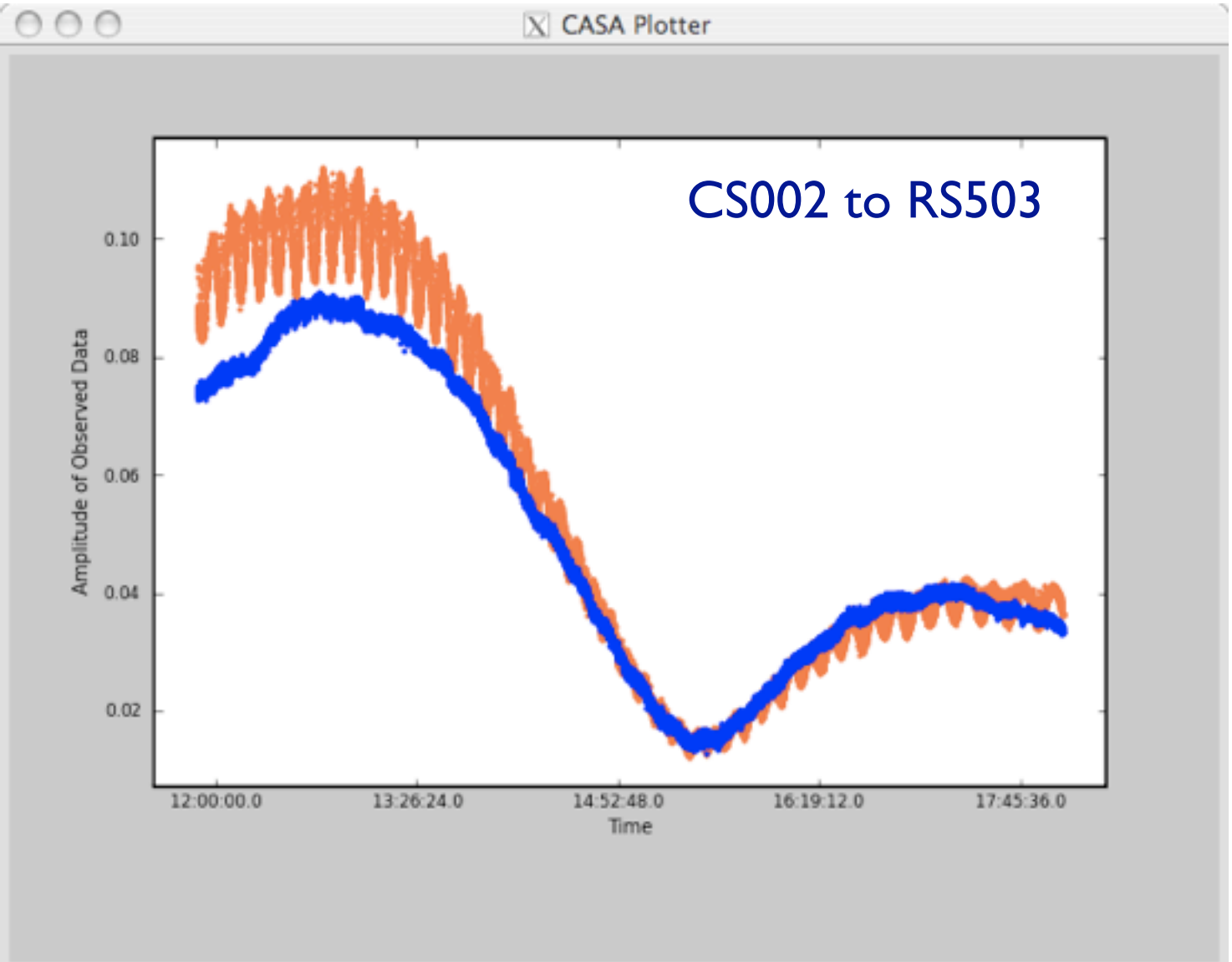
Cygnus A (~10^4 Jy at 150 MHz)

6 hour observation
115--163 MHz
9 Dutch stations (5 split-core stations; 14 independent stations)
48 MHz bandwidth (continuous)
248 subands (256 channels)
1 second visibility integrations
4.9 Tb size!!



Flagging and compression

The sub-bands we have inspected so far appeared to be clean from RFI and well processed using DPPP.

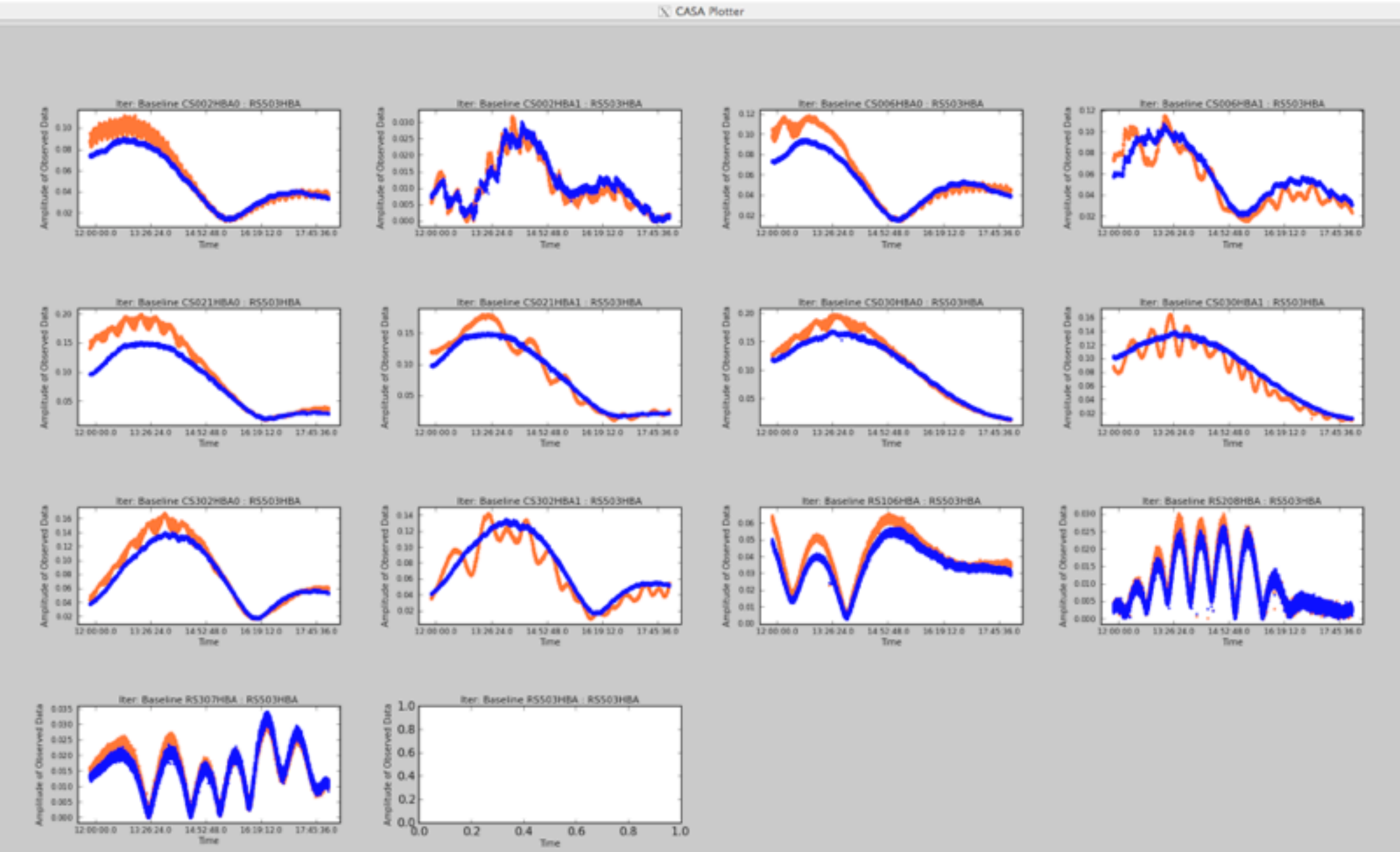


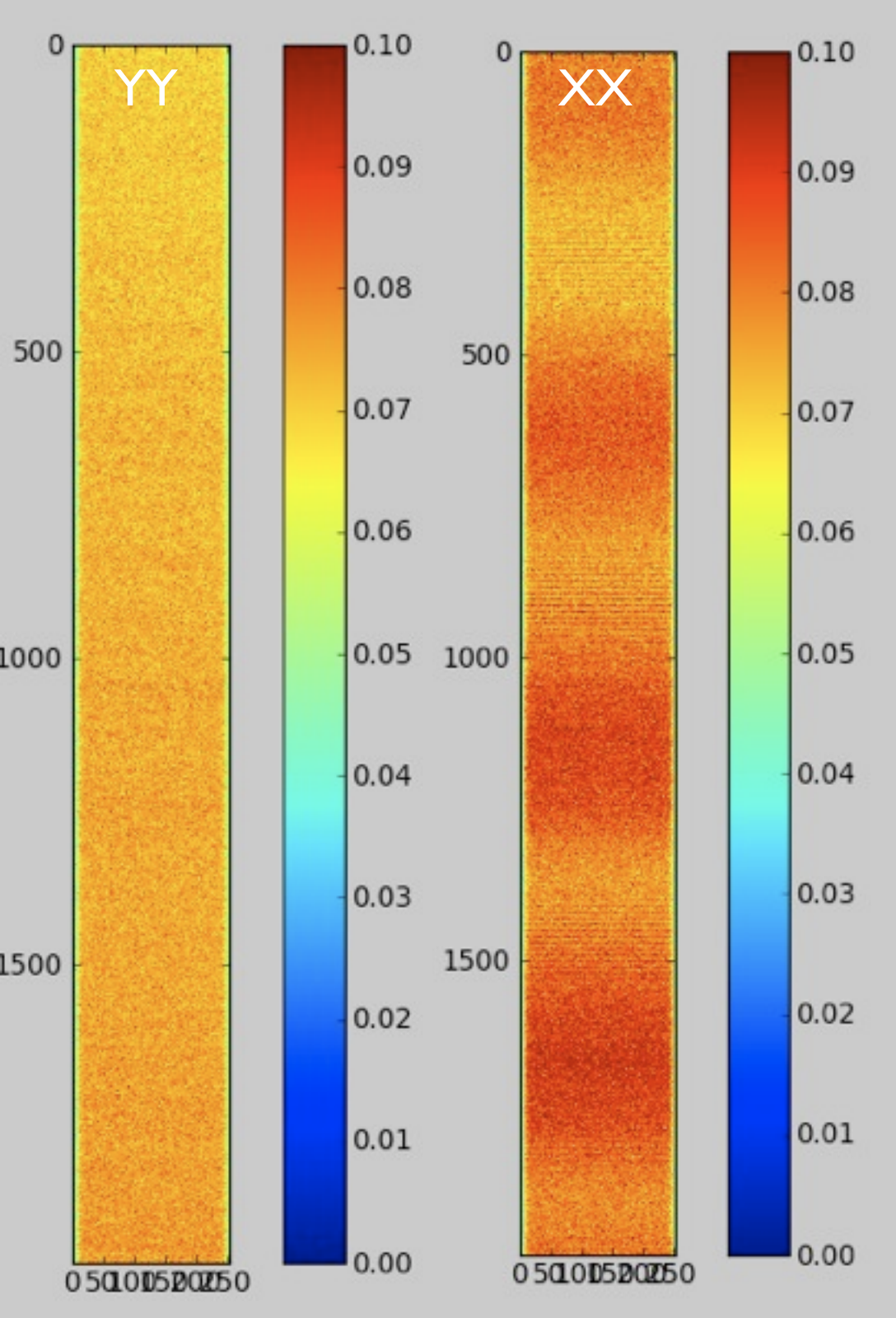
Ripples in XX polarization, but not YY.

Only in baselines involving split-cores stations

Due to the splitter?

Ripples


CASA Plotter
Iter: Baseline CS002HBA0 : RS503HBA
Iter: Baseline CS002HBA1 : RS503HBA
Iter: Baseline CS006HBA0 : RS503HBA
Iter: Baseline CS006HBA1 : RS503HBA
Iter: Baseline CS021HBA0 : RS503HBA
Iter: Baseline CS021HBA1 : RS503HBA
Iter: Baseline CS030HBA0 : RS503HBA
Iter: Baseline CS030HBA1 : RS503HBA
Iter: Baseline CS302HBA0 : RS503HBA
Iter: Baseline CS302HBA1 : RS503HBA
Iter: Baseline RS106HBA : RS503HBA
Iter: Baseline RS208HBA : RS503HBA
Iter: Baseline RS307HBA : RS503HBA
Iter: Baseline RS503HBA : RS503HBA
Amplitude of Observed Data
Time



A short 2000s part of the data.

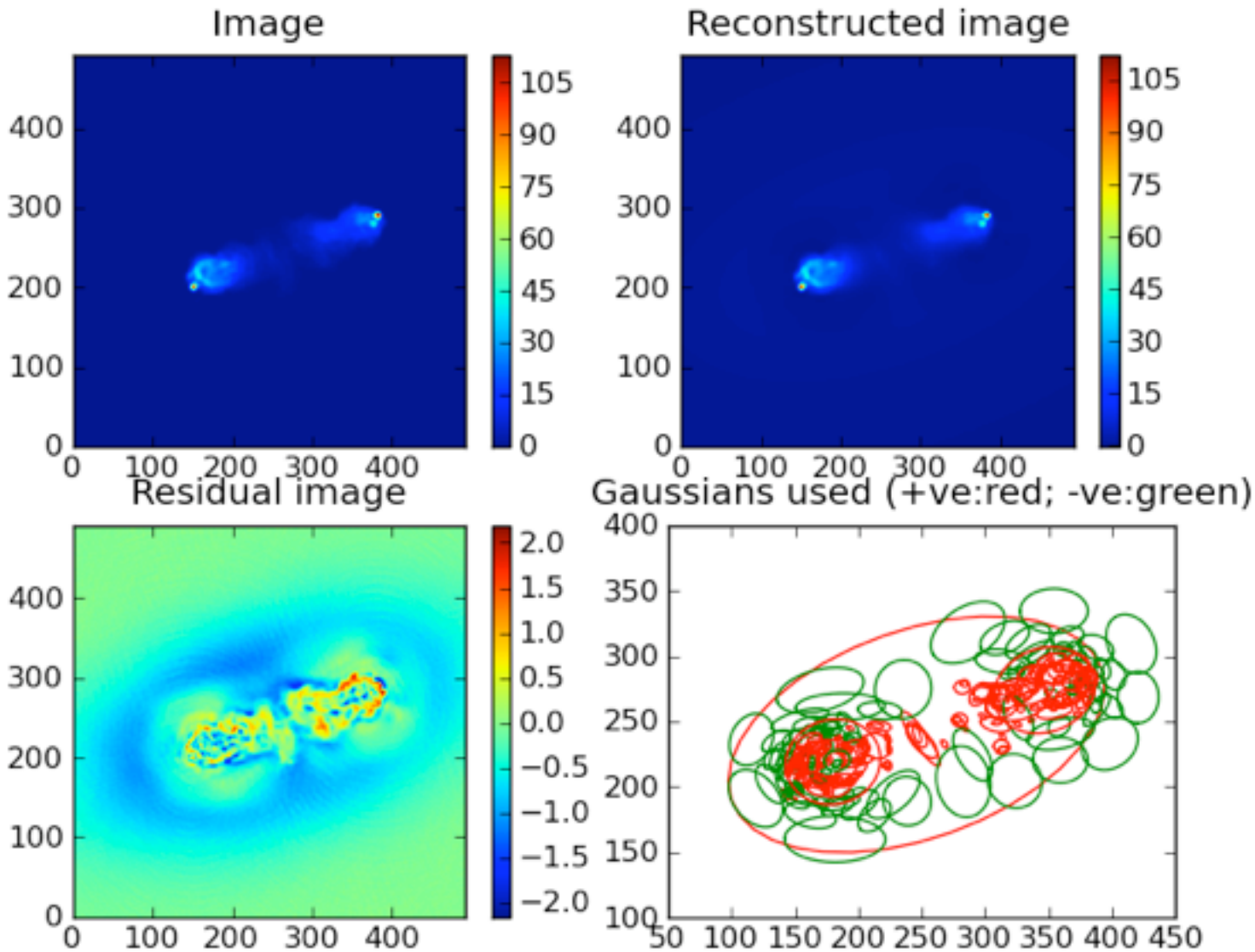
YY looks good.

XX shows the ripples, but also short time-scale jumps in amplitude across all the frequency channels.

Test observations without the splitter in place are planned.

Complex models for Calibration

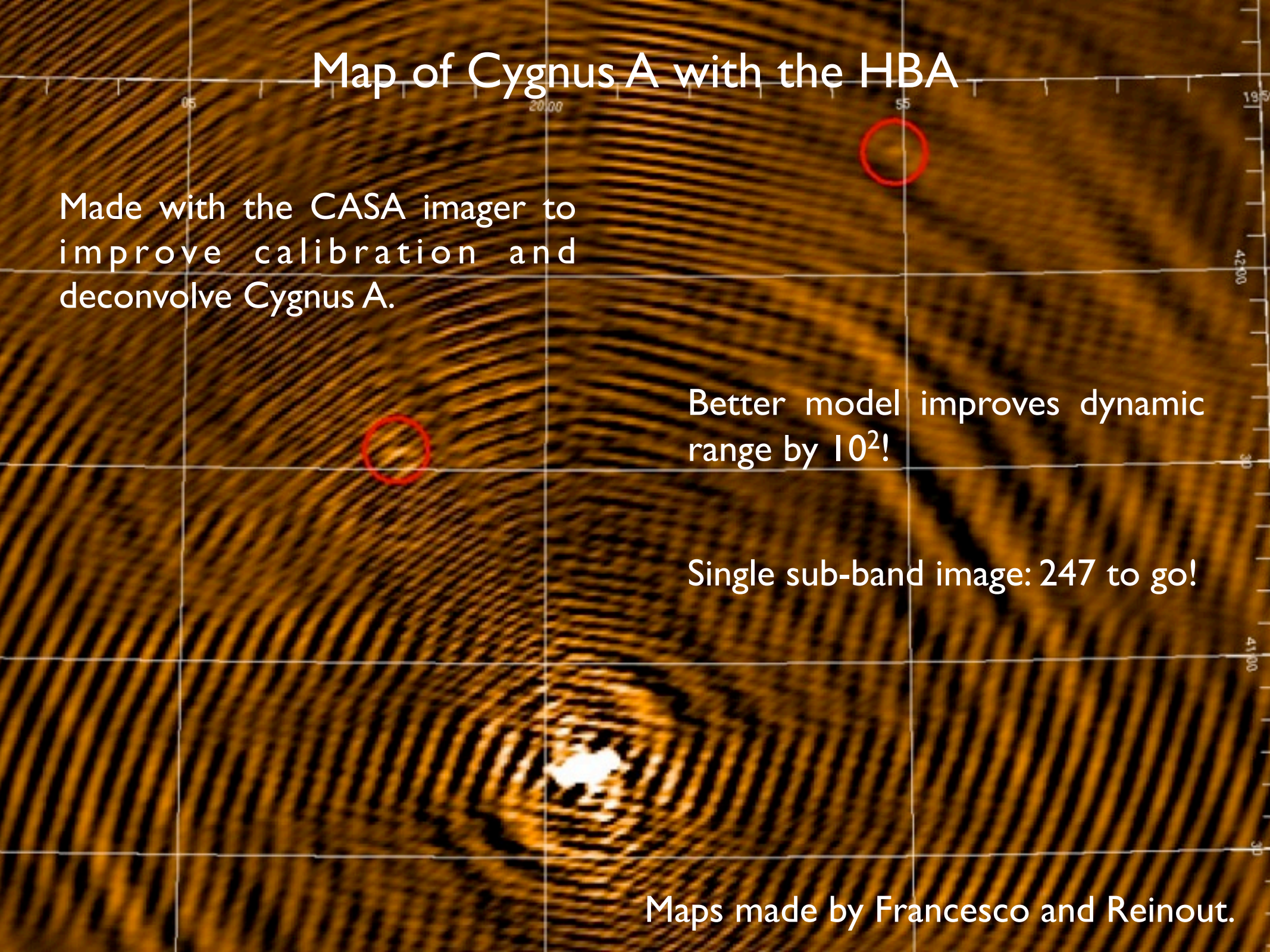
The resolution of the 30 km baselines with the HBA resolved Cygnus A, so point source models for the lobes no longer worked.



307 Gaussian model by Niruj.

For simplicity, 2 Gaussian model used.

Map of Cygnus A with the HBA



Made with the CASA imager to improve calibration and deconvolve Cygnus A.

Better model improves dynamic range by 10^2!

Single sub-band image: 247 to go!

Maps made by Francesco and Reinout.

Summary

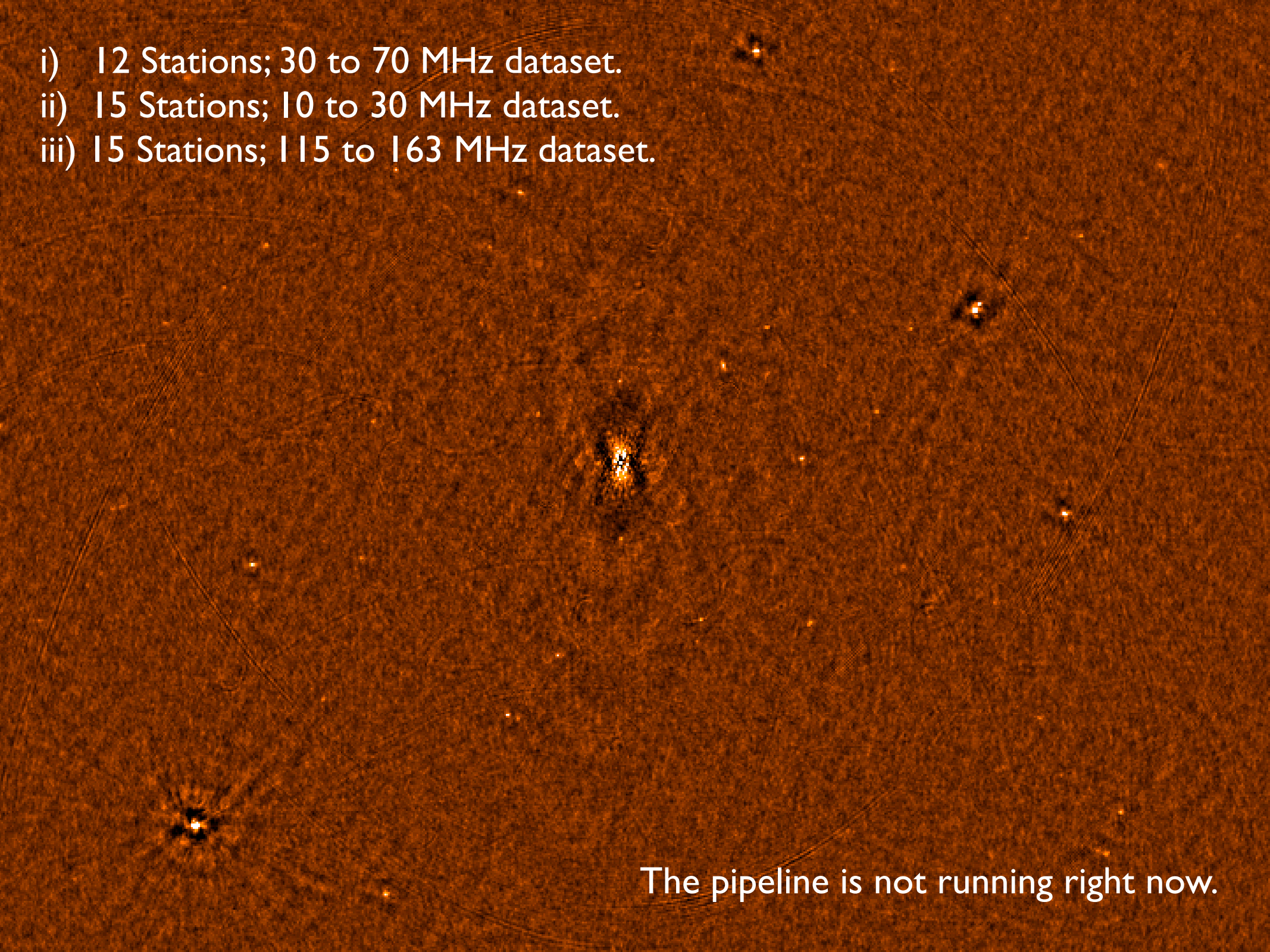
This is just some of the results from the last imaging busy week.

Flagging - The flagging routine appeared to work well with HBA data.
Ger improved the speed of DPPP by x 2.5.

Calibration - More complex models needed to calibrate the data.
Post calibration flagging tested.

Imaging - Casa imager used to make single subband maps of Cygnus A
Detection of nearby sources show that calibration works!

Next Busy Week will be in Leiden (Jan 25).
Make pipeline images of Cygnus A.
Use new datasets of 3C196 to test LBA beam models and more complex calibration.


i) 12 Stations; 30 to 70 MHz dataset.
ii) 15 Stations; 10 to 30 MHz dataset.
iii) 15 Stations; 115 to 163 MHz dataset.
The pipeline is not running right now.