

# LOFAR Imaging Busy Week 5 Summary

George Heald  
on behalf of the busy week team  
(who did all of the work)



**Poor faceting!**

# Overview

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- Our first “away game” ... the busy week was held in Leiden’s Lorentz Center
- ~25 participants, of which ~20 were veterans of previous busy weeks; also including Ger+Joris+Michael+Ronald
- Preplanned “to-do list”, and division of participants into Action Teams
- Items in to-do list touched on every aspect of the Imaging Pipeline
  
- Worked with 4 datasets:
  - HBA (9 stations = 14 elements) Cygnus A [L2009\\_16007](#)
  - LBA (11 stations) 3C196 [L2010\\_05671](#)
  - LBA (12 stations) Field selected by David Rafferty [L2010\\_05703](#)
  - HBA (12 stations = 20 elements) 3C61.1 [L2009\\_16167](#)
  
- We had access to 3 subclusters, and “on-call” assistance from Teun.
- John Swinbank ran DPPP (or more) on all 4 datasets prior to the busy week

# Results

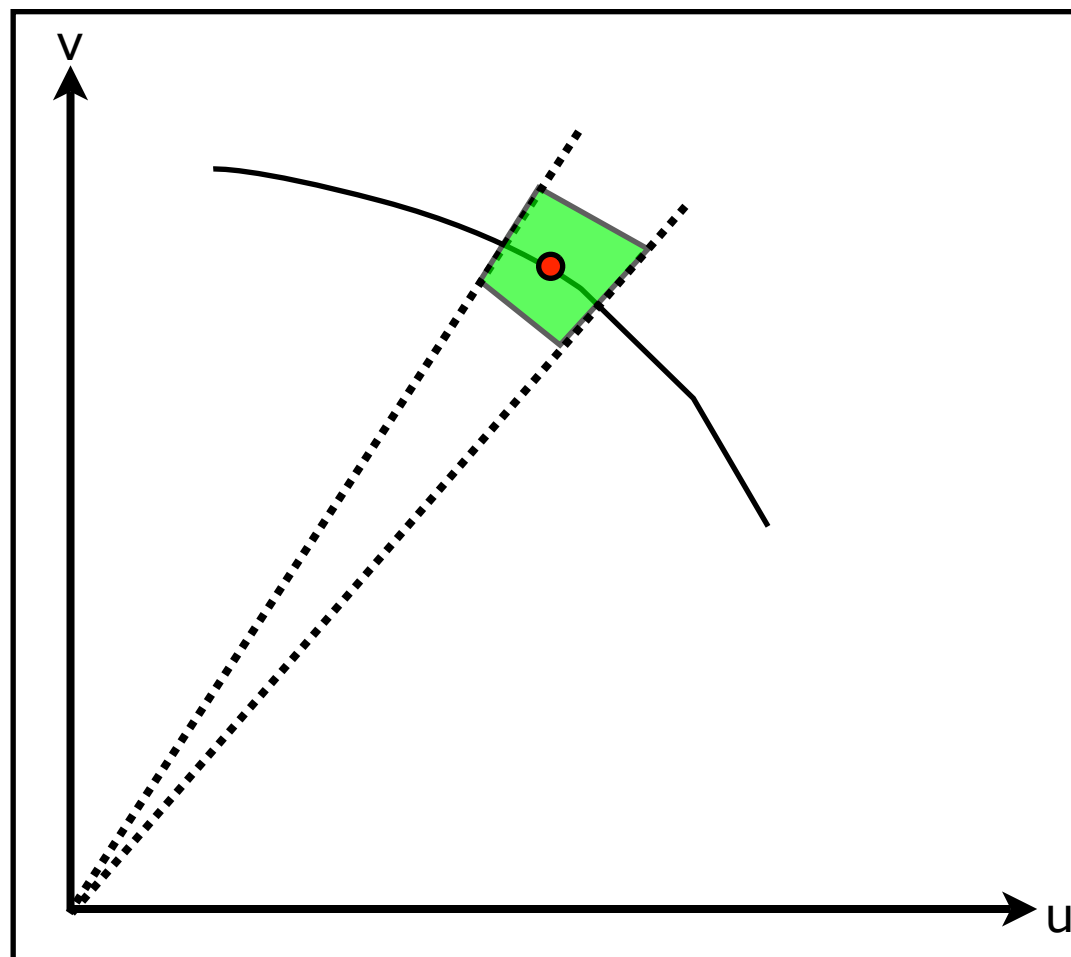
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- On the plus side:
  - Flagging works very well (John Conway: “This is the cleanest data I have ever seen...”)
  - The instrument works very well - when calibrated properly it produces spectacular images!
- On the minus side, more stations and more complicated data sets have revealed some areas where improvement is needed in the software
  - BBS (***as it is currently used***) was unable to properly handle the CygA HBA data set. - Manual interaction may be necessary for some sources?
    - Progress made in nailing down problems by comparing with difmap, CASA - more efforts needed along these lines!
  - The A-team *does* come into the data sets from far afield, and very strongly
    - Not seen before because we now have many short baselines, and smearing is significant especially after frequency compression
    - Calibration on short baselines avoided during busy week

# Smearing in a nutshell

- Finite bandwidth (even in single channels) and time resolution mean that each visibility is actually an *average* of a zone in  $u,v$  space

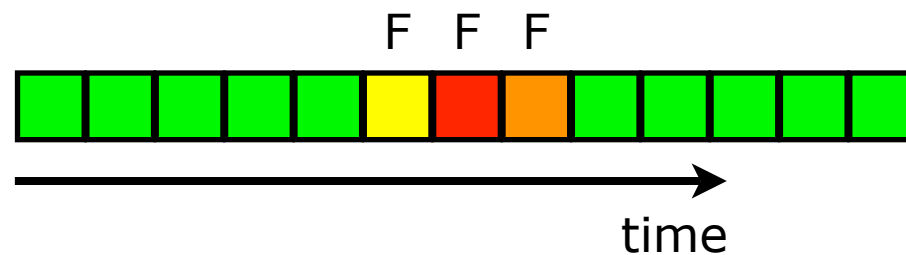
$$\tilde{V} = \int \int e^{2i\pi(ul)} d\nu dt$$



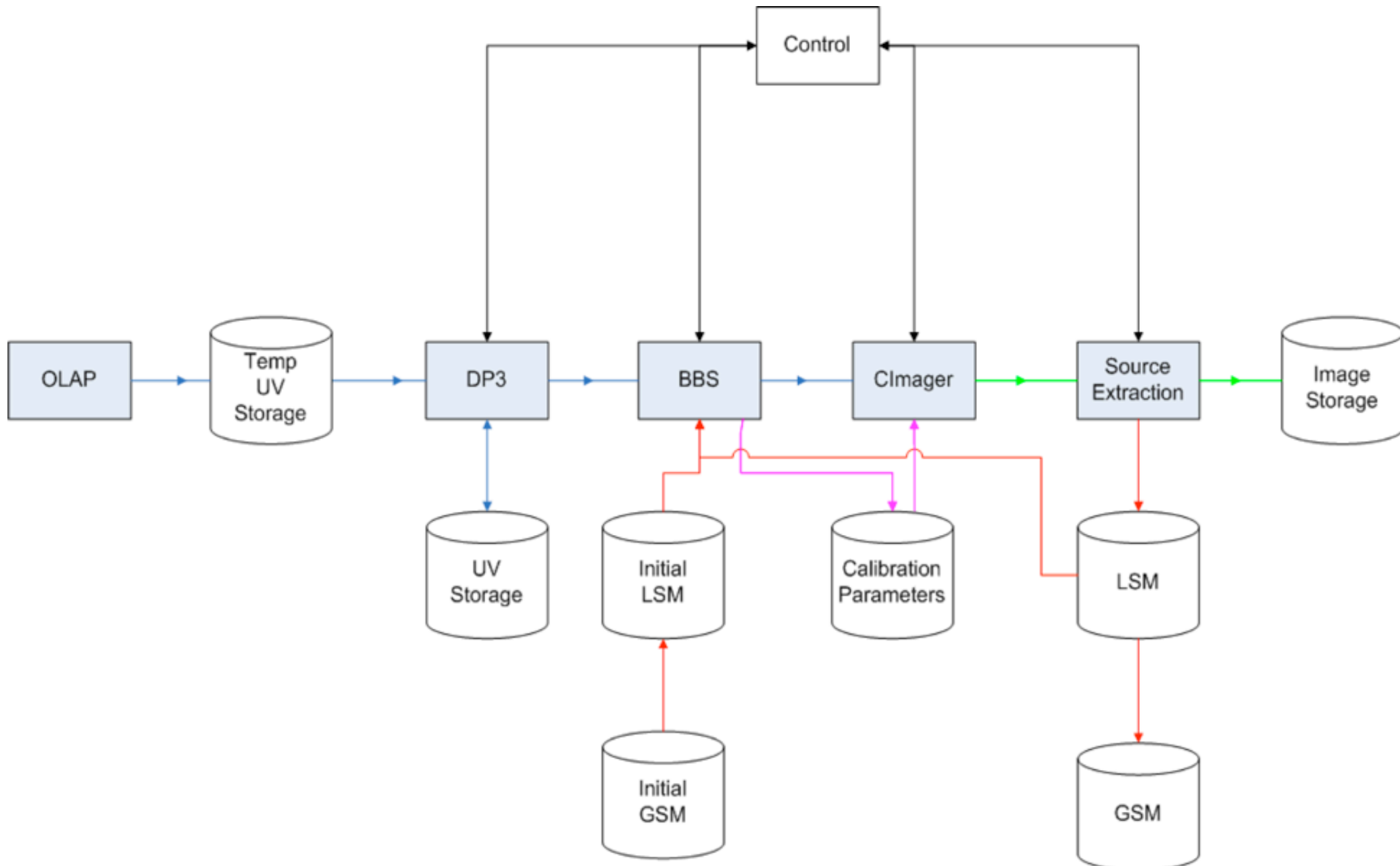
Time & frequency  
smearing??

# BW5: suggested features

- HISTORY information added to the MSs by DPPP and BBS
  - After pipeline runs, it can be unclear which steps were successful
- Flagging of visibilities adjacent to bad values (to avoid keeping bad data just below the threshold)



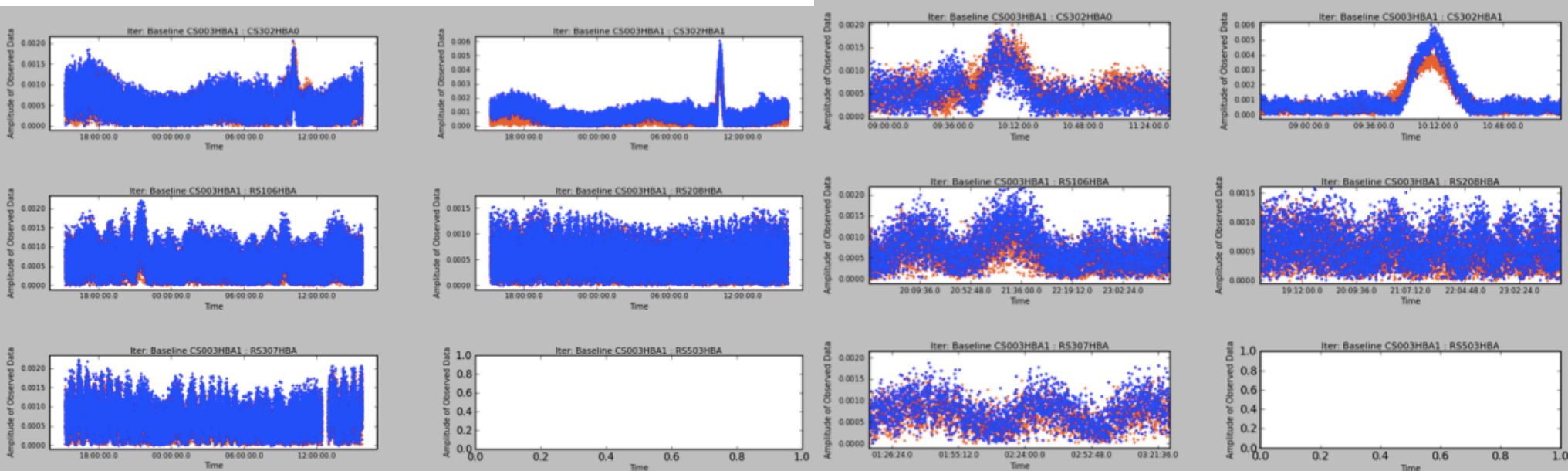
# Pipeline





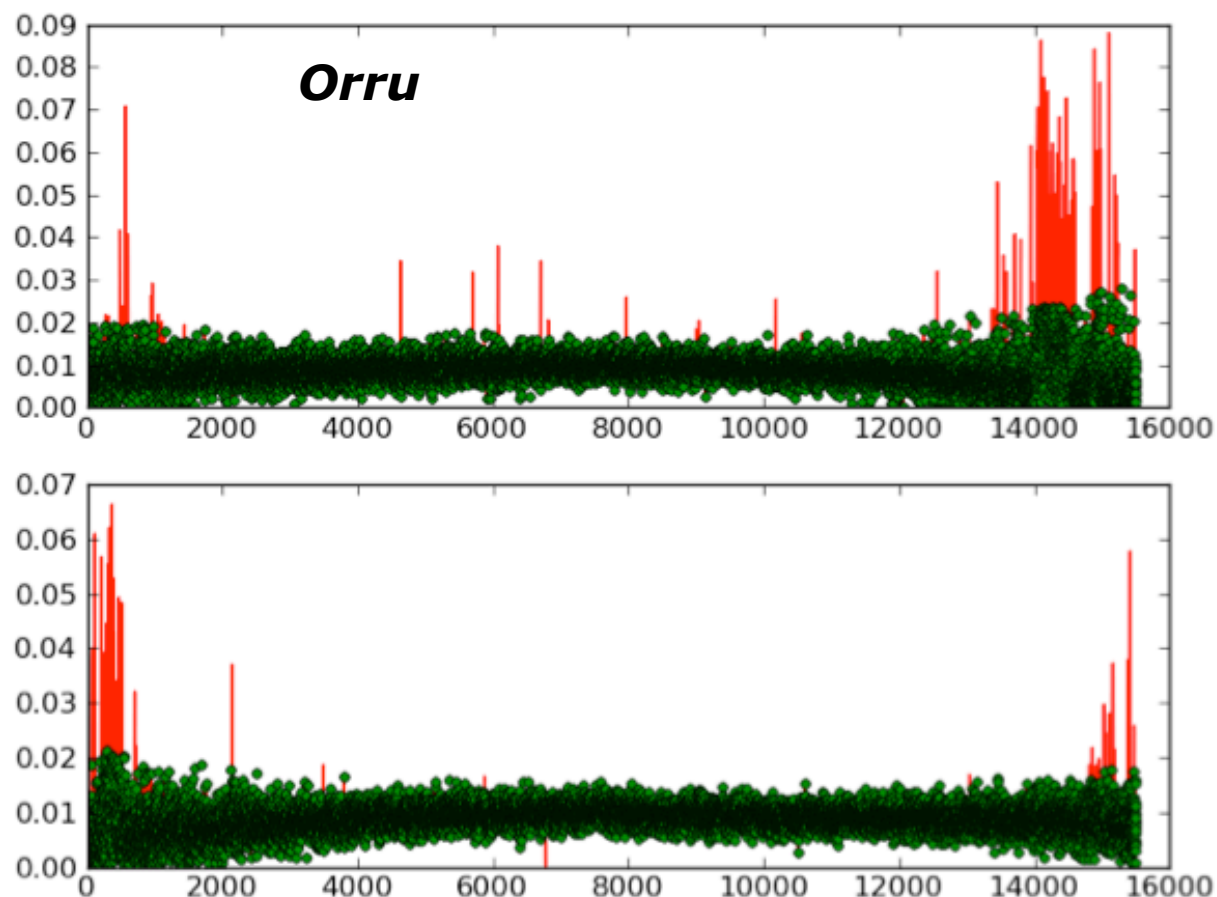
## DPPP

- Flagging works well!
  - LBA “four-pass” scheme seems to work well on HBA data - but with the data that we have in hand, only the first two steps are needed.
  - It is set up well enough that good data which by eye appears bad was not flagged....
- It appeared that LBA data taken with the 10-90 MHz filter were unusable!
  - It turned out that the “bad data” were corrupted by strong influence of Cygnus A - which is 30 degrees from 3C196.
  - HBA data also seem to show influence of off-axis sources



# Other flagging points

- Solution based flagging works well

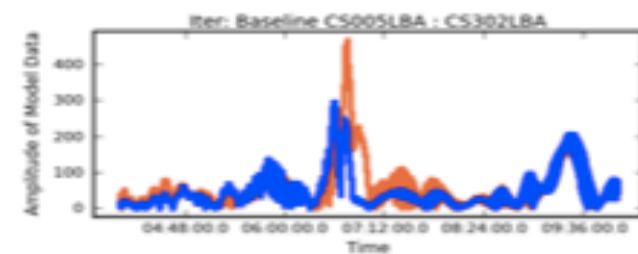
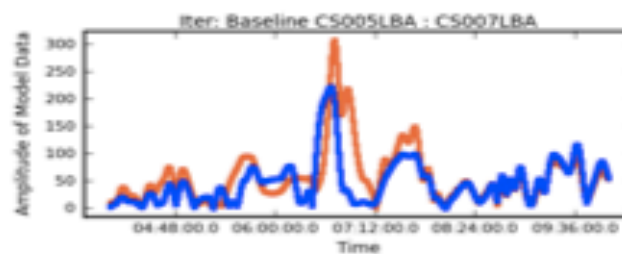
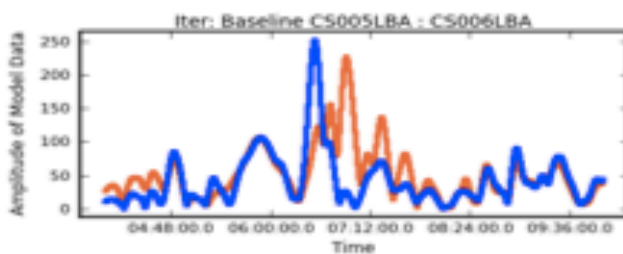
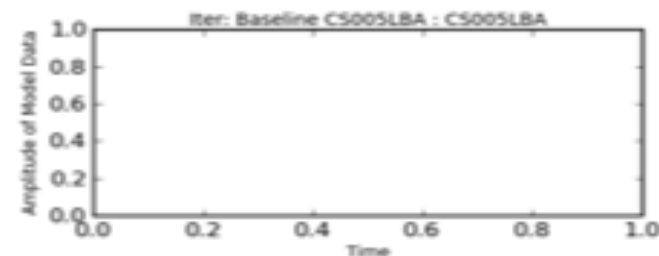
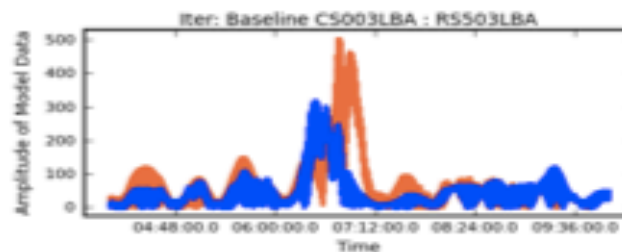
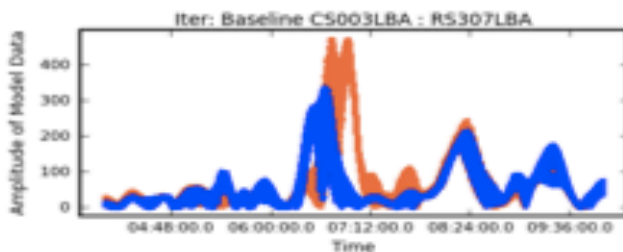
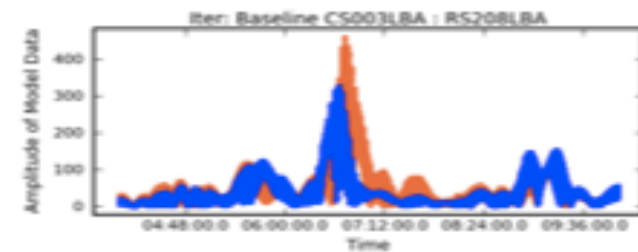
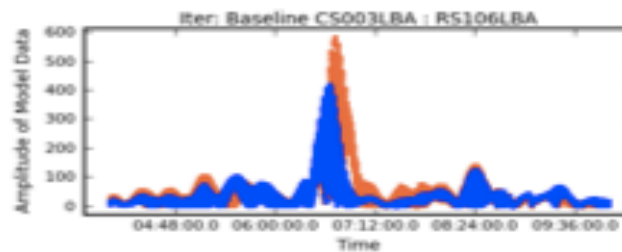
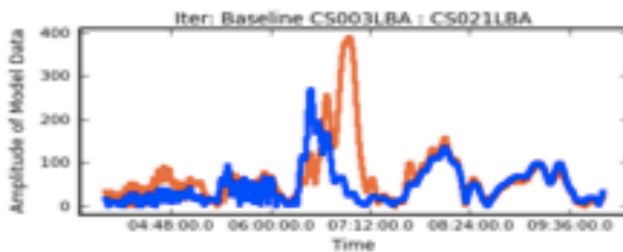


- "Condition number flagging" seems less useful than advertised - but more interaction with Sarod on this point is needed
- CORRECTED\_DATA flagging works. Flags can be written to input MS.



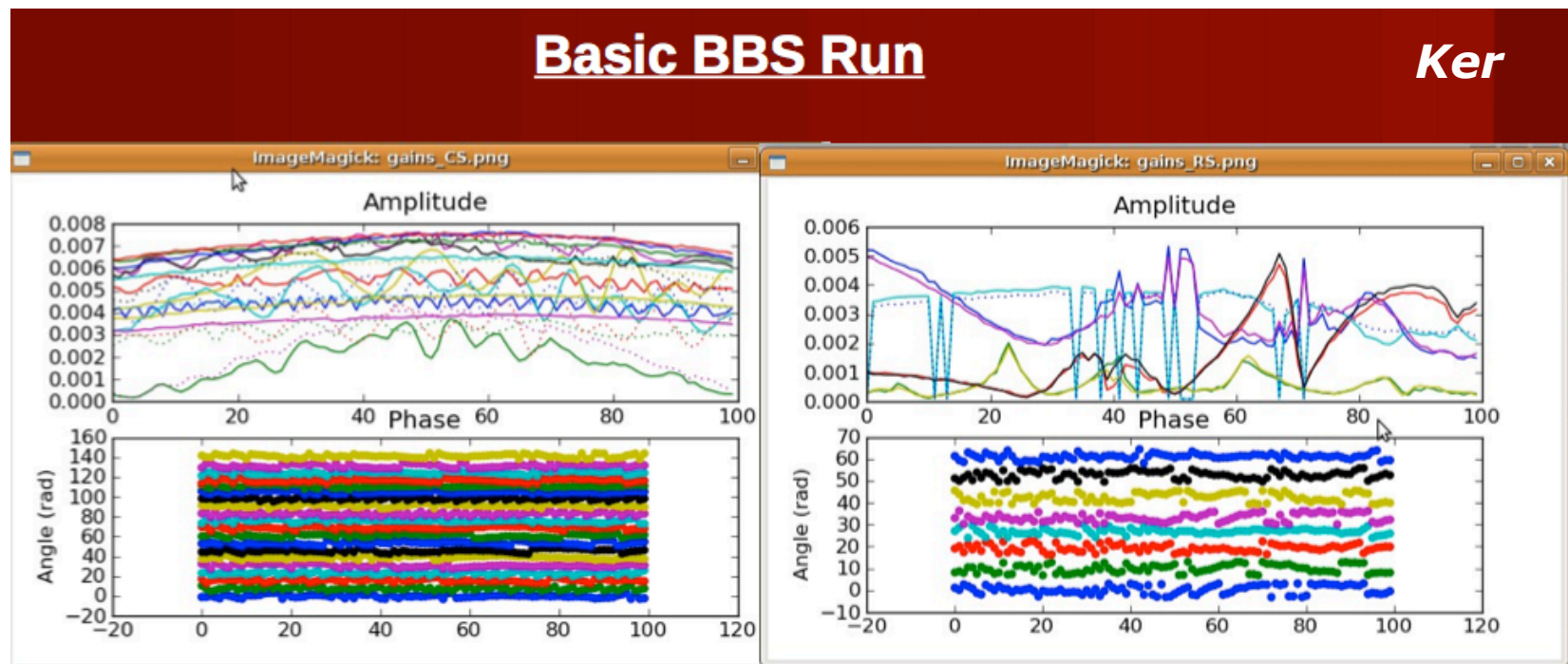
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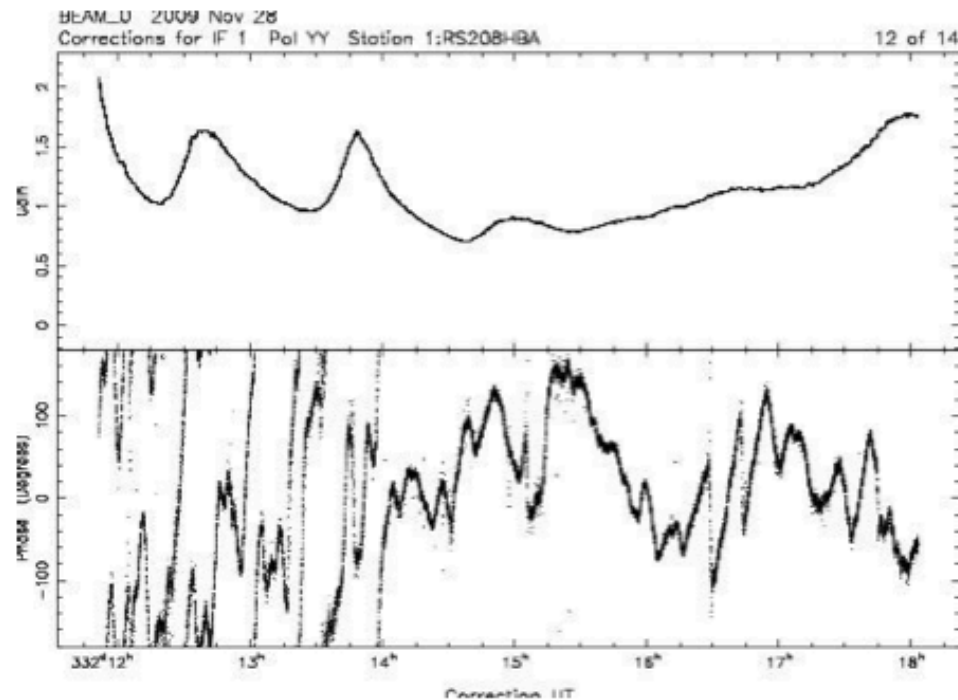
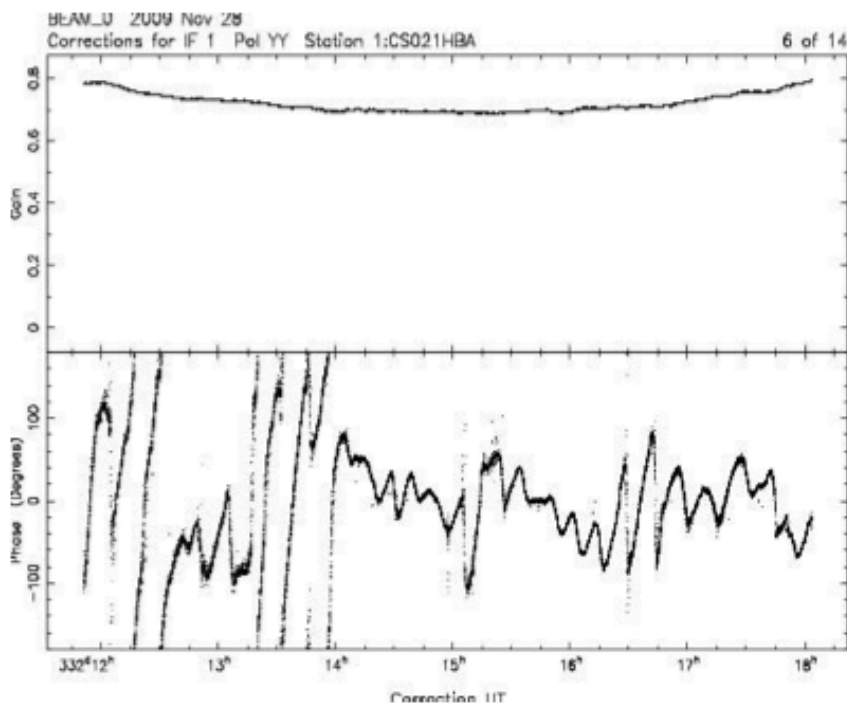


*Core Stations gains ok — Remote stations gains not.  
Running BBS on core stations only gives sensible  
result, but not with remote. Why?*

Note: head-to-head comparison with CASA showed better results

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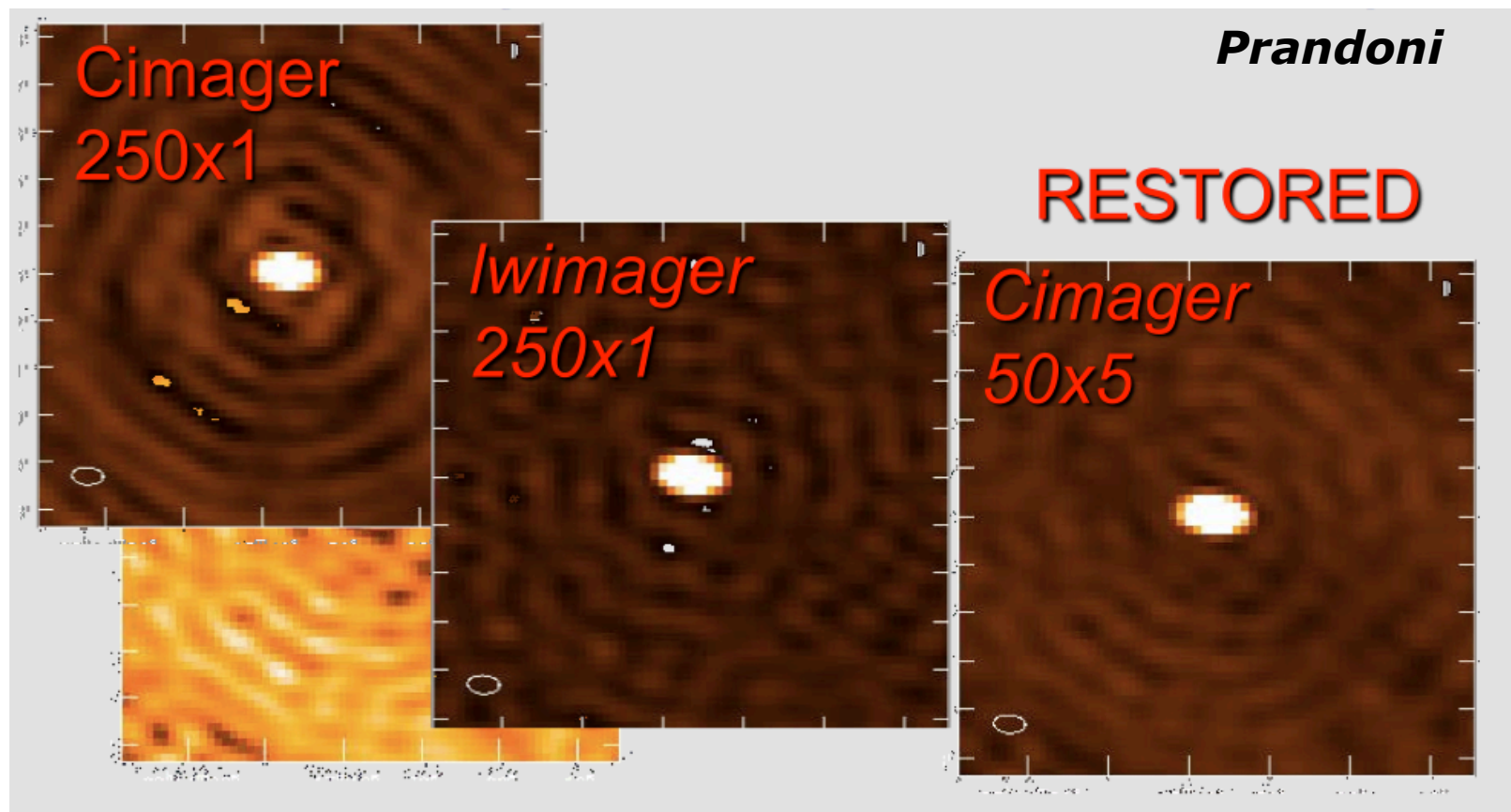
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**Jackson**

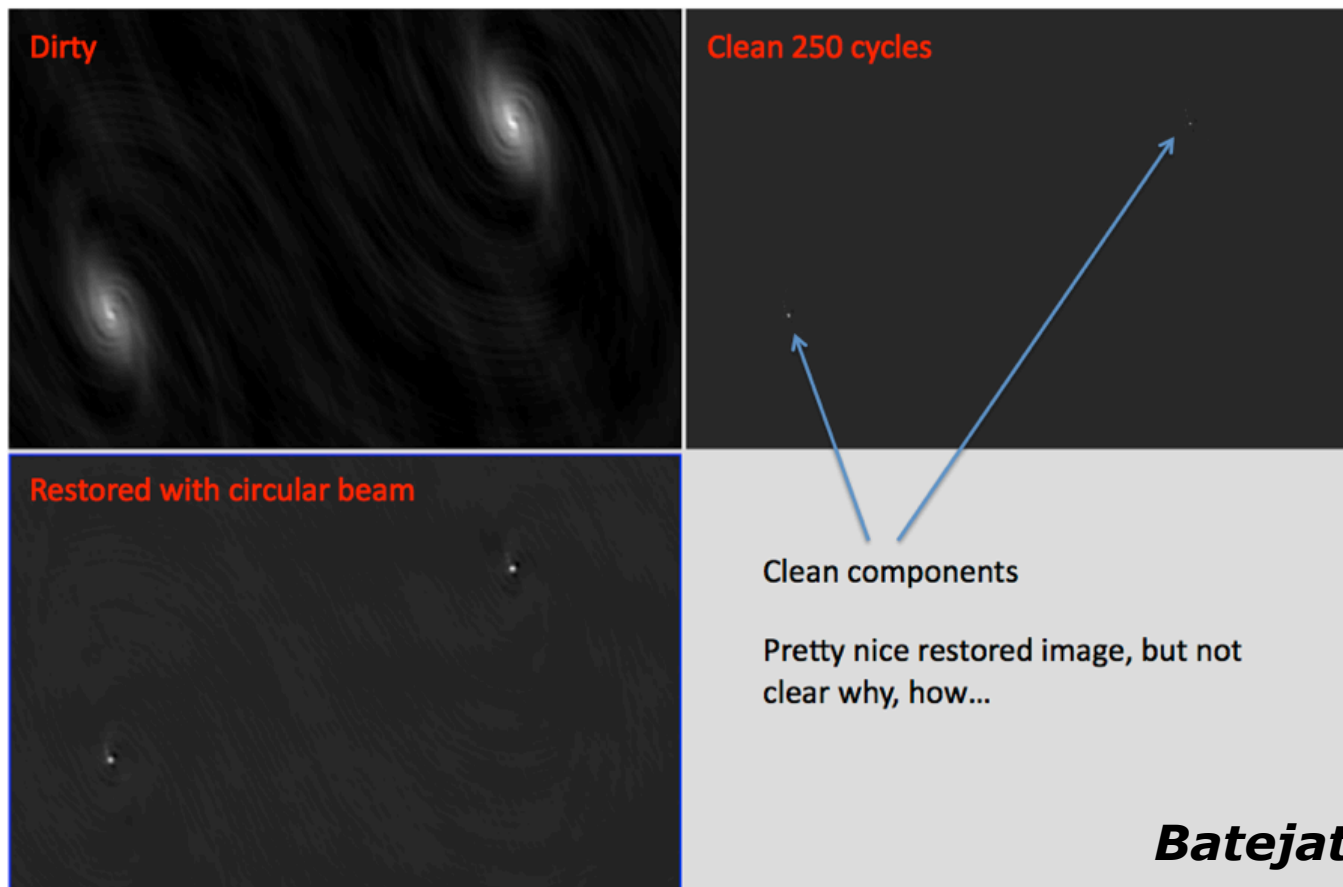
# Imaging

- Imaging with the CImager is difficult - options are unknown, obscure and/or poorly documented. Head-to-head comparisons with other imagers is therefore difficult.
- Lack of options particularly in aspects of visibility weighting and deconvolution
- Speed: 7 seconds in CASA, but 15 minutes in CImager -- typical???



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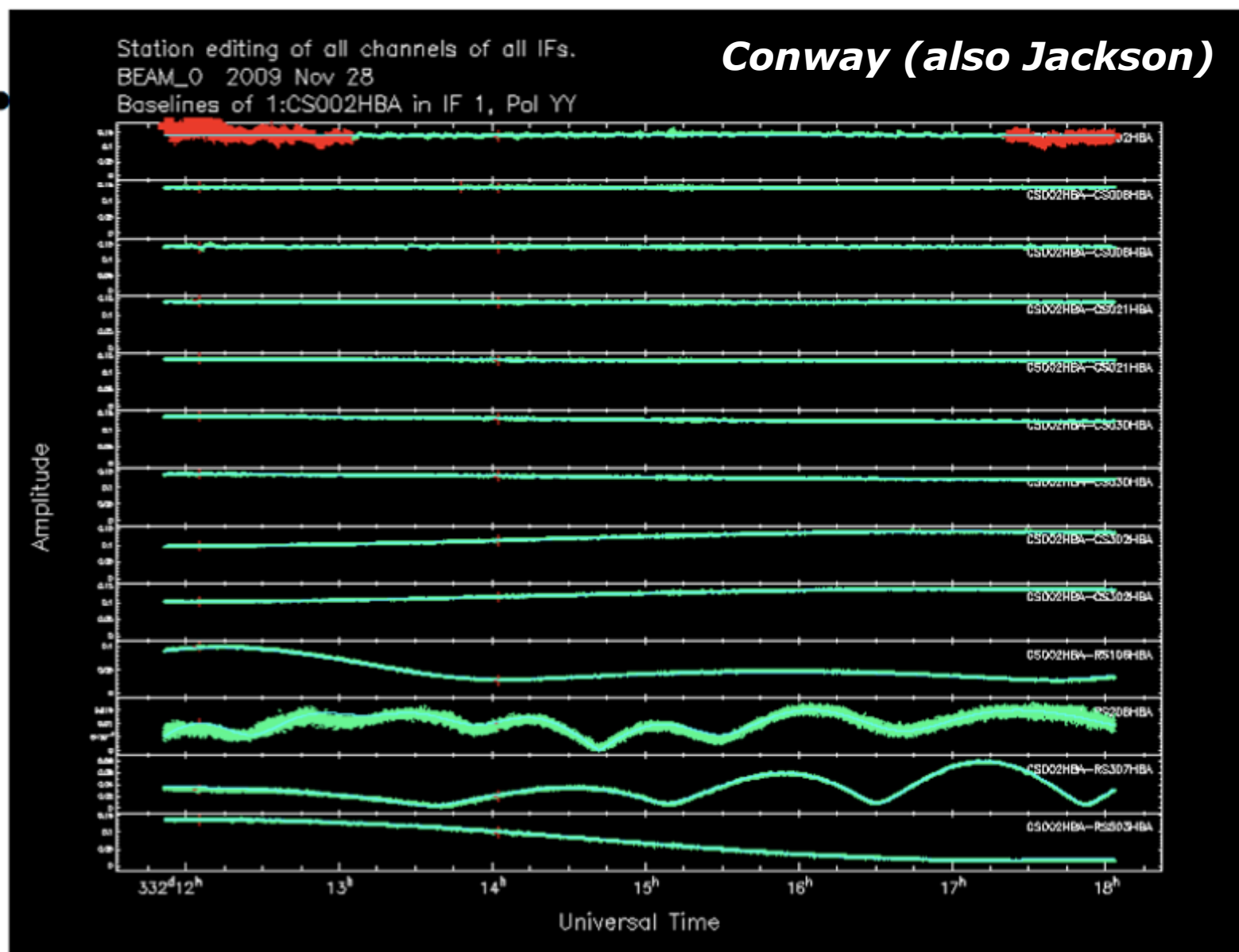
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# The good news!

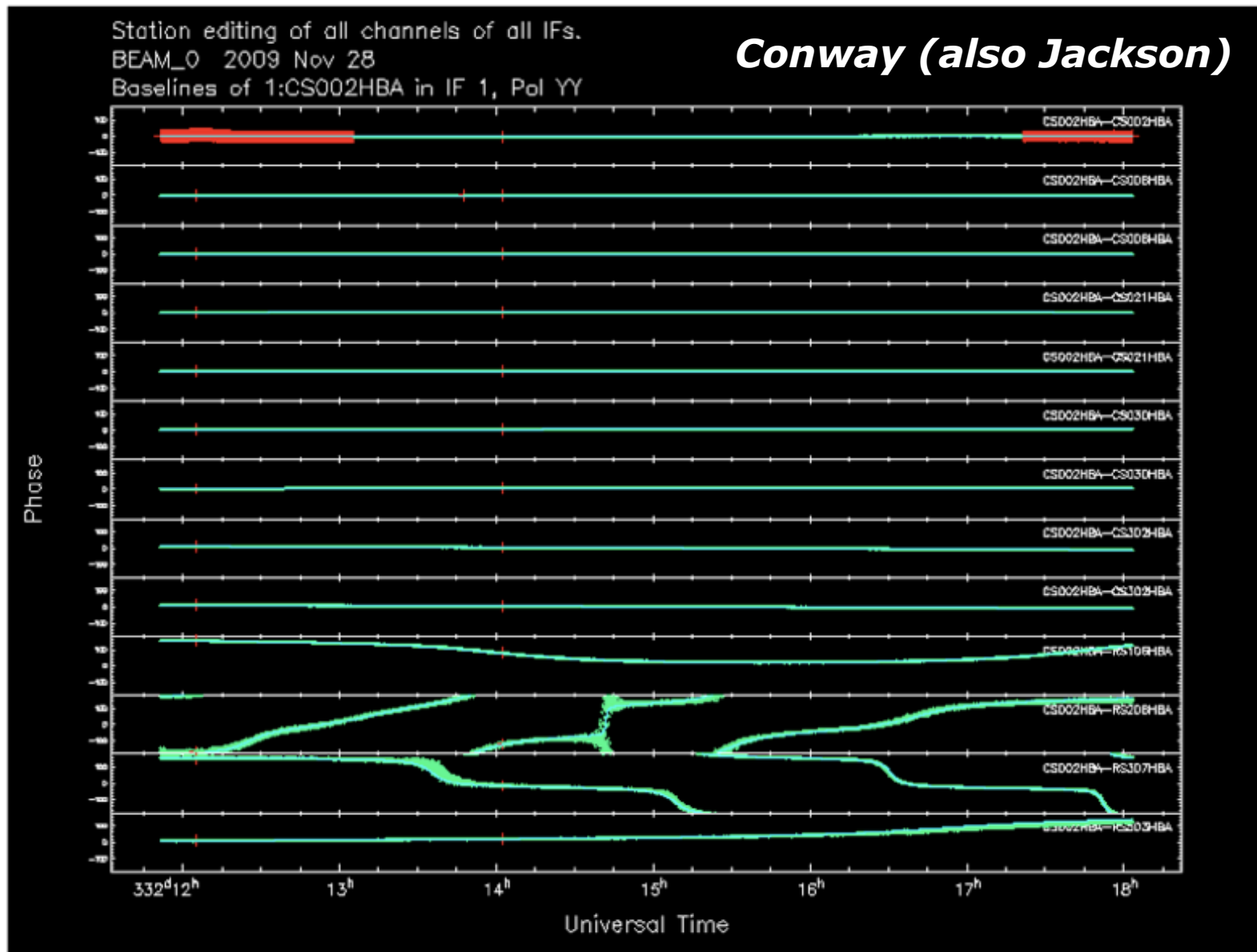
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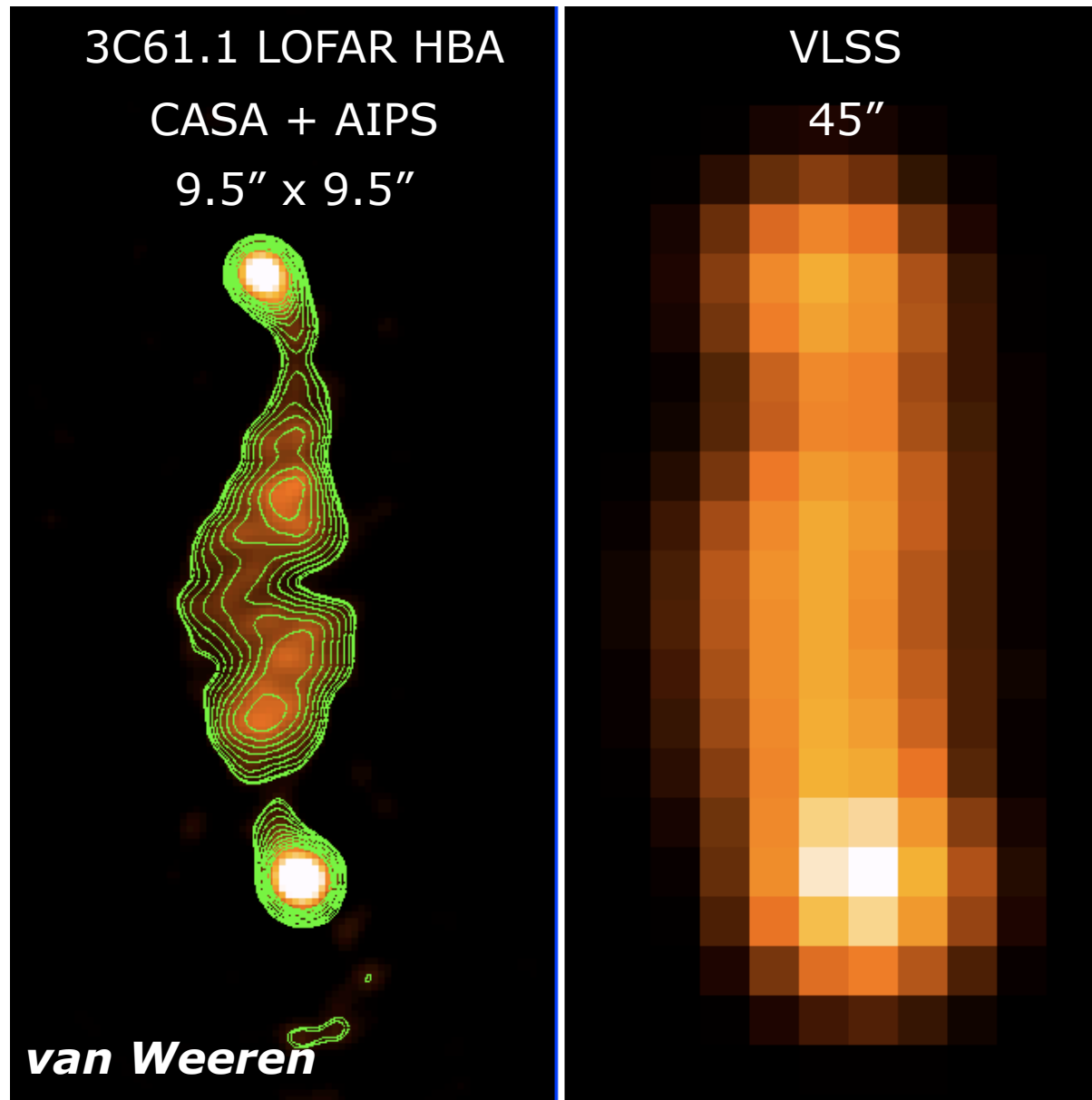
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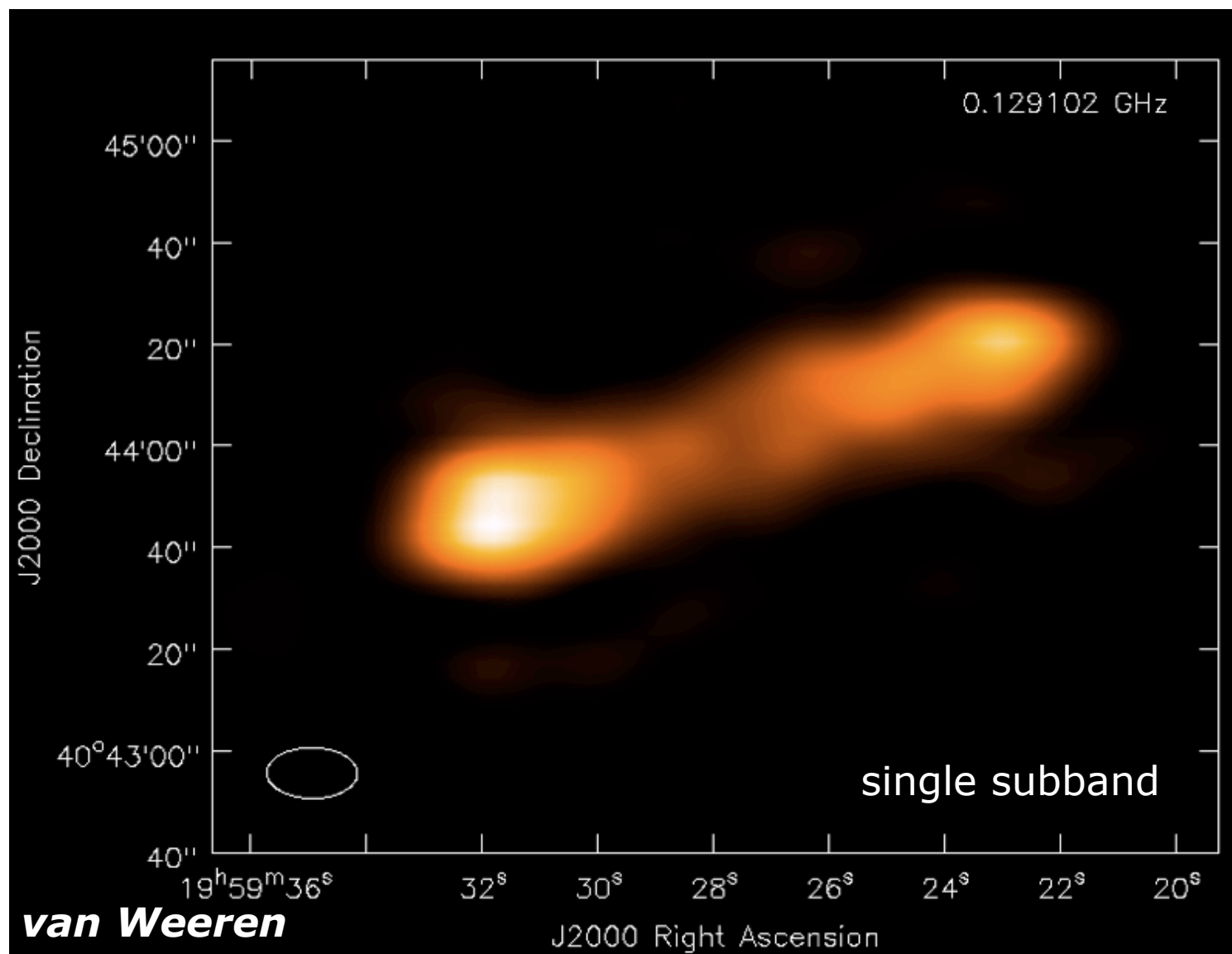
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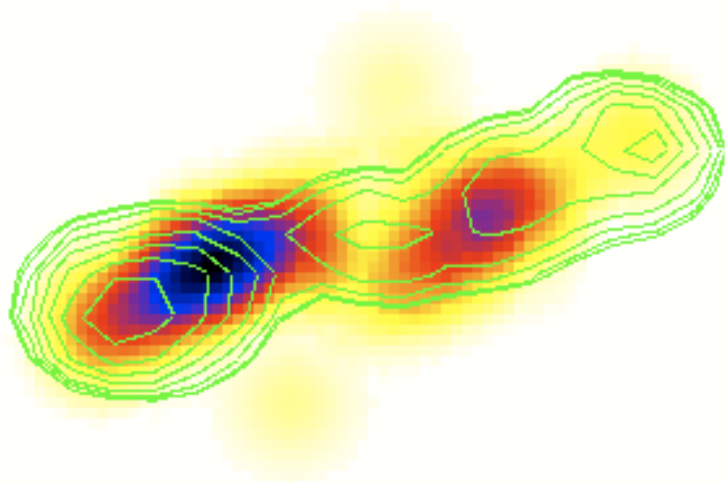
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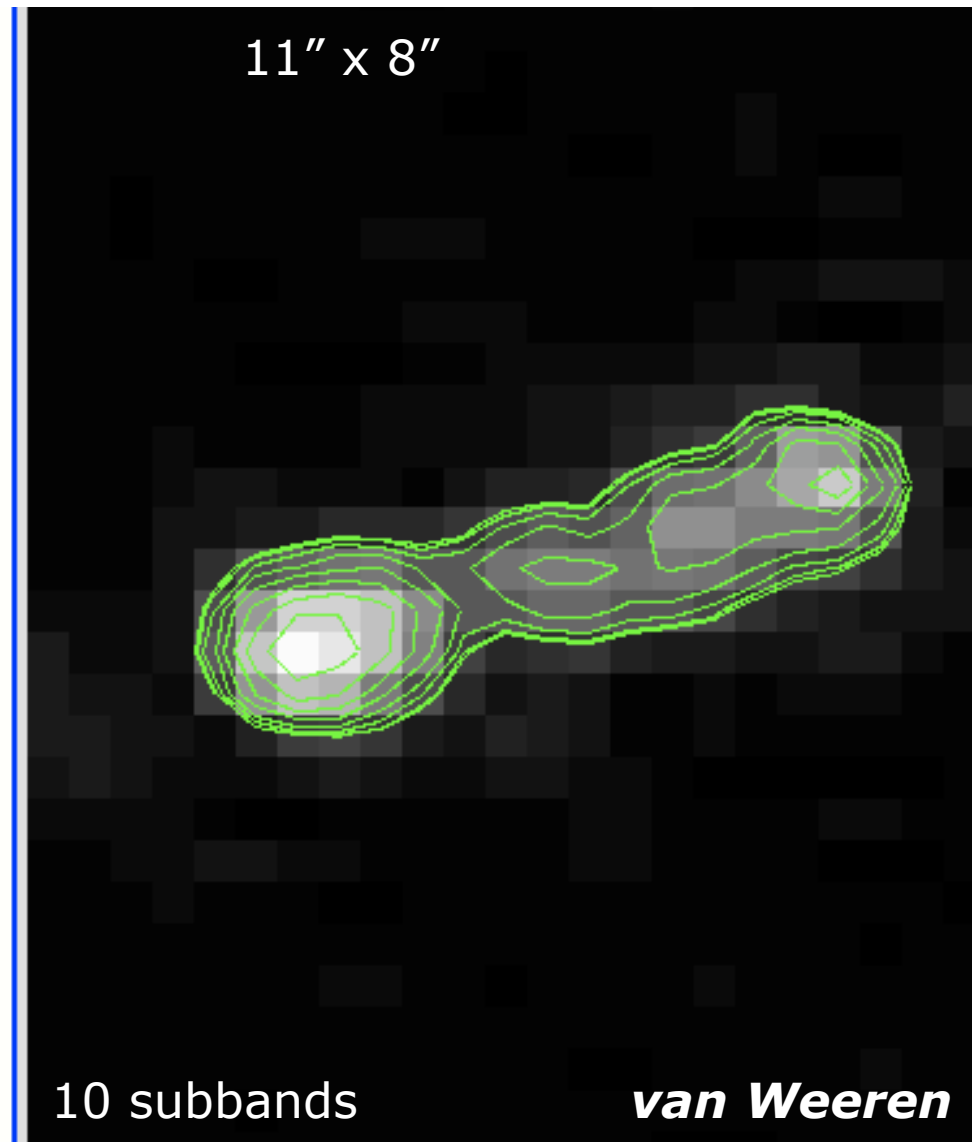


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color-scale from  $[-1.1, -0.7]$  [blue,yellow].  
Using 10 subbands between 115 and 160 MHz



10 subbands

*van Weeren*

# Image rotation

- is gone

BW1

BW5

