Bigger, Faster, Better

What's News with the LBA

Chris Phillips
eVLBI project scientist
25th May 2010

www.csiro.au

CSIRO

LBA Today

- Parkes, ATCA, Mopra, Hobart, Ceduna
  - Some Tidbinbilla time plus other international telescopes
- 1-22 GHz
  - 7 & 3 mm possible Mopra-ATCA
- Standard recording at 256 Mbps
  - 32 MHz dual pol bandwidth
- Recording up to 1 Gbps
  - 128 MHz dual pol
  - Half for Hobart, Ceduna, Tidbinbilla

LBA Today, cont

- All recorded experiments disk based
  - Network transfer of data
- eVLBI up to 1 Gbps ATCA, Parkes, Mopra
  - Hobart up to 128 Mbps
- Correlated using DiFX
  - Disk correlation at Curtin
  - High spectral resolution and short integration times

LBA Tomorrow

- Wider bandwidth
  - More sensitivity
- Better eVLBI
- More antennas
  - Better uv coverage, higher resolution
- Better calibrators

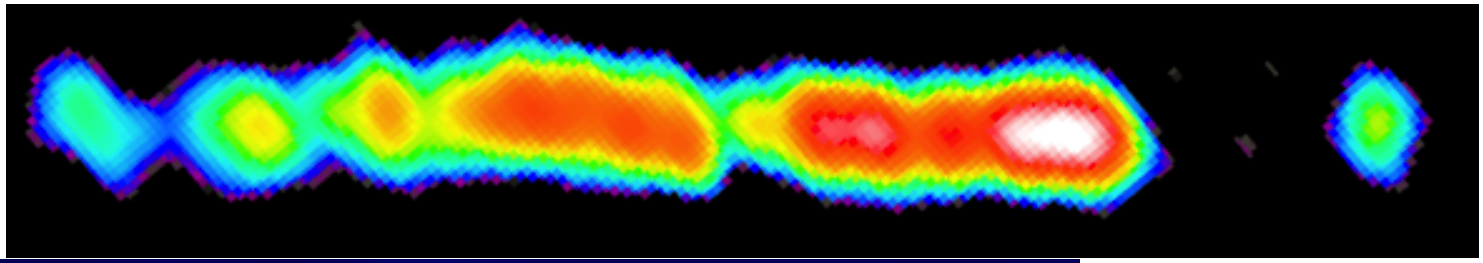
More Bandwidth

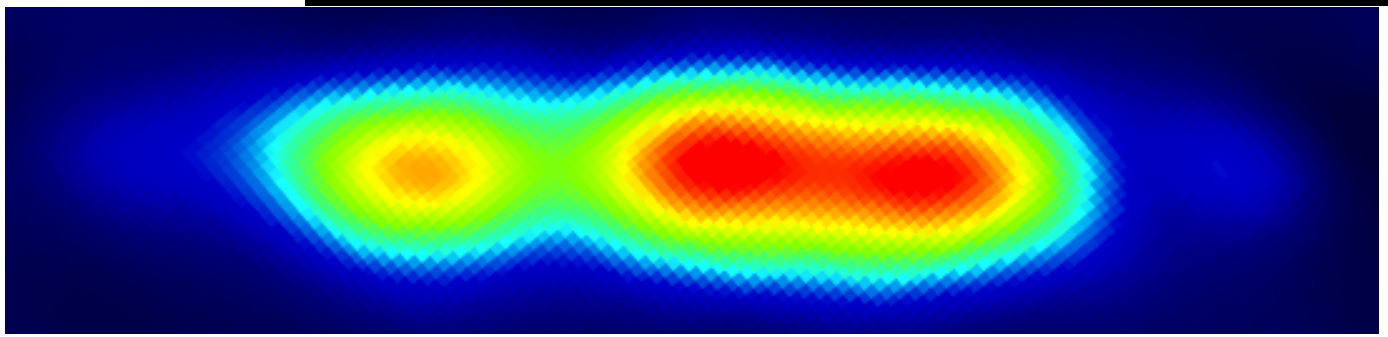
- Reusing existing hardware we can achieve bandwidths up to 1 GHz
  - CABB, DFB3, ASKAP, 3rd party
  - 11 uJy image sensitivity @ 8 GHz
    - 70% onsource on 12hrs
  - Multibit an option
- 10 Gbps link between Parkes and ATCA
  - 16 Gbps eVLBI
  - 0.14 mJy detection sensitivity in 1 minute
  - 4x better than current limits
- 1 Gbps link to Tidbinbilla

New Antennas

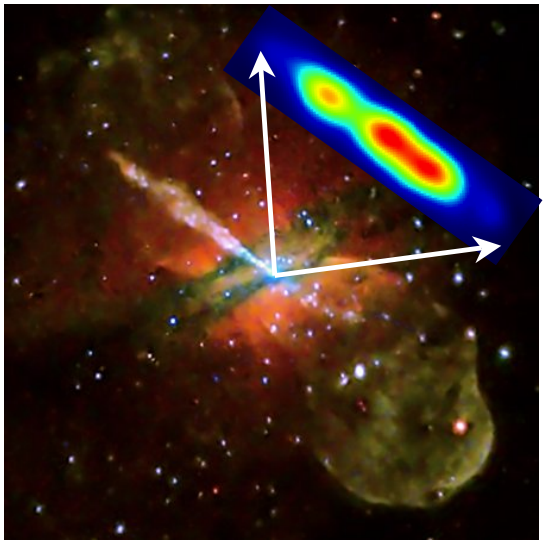
- NZ AUT 12m recently commissioned
  - 1.4, 2.3 & 8.4 GHz
- First ASKAP 12m antenna commissioned with VLBI observations
  - 1.4 GHz
- UTAS Auscope 12m antennas
  - 2.3 & 8.4 GHz
  - Broadband feeds under investigation
- 1.4 GHz feed for Ceduna

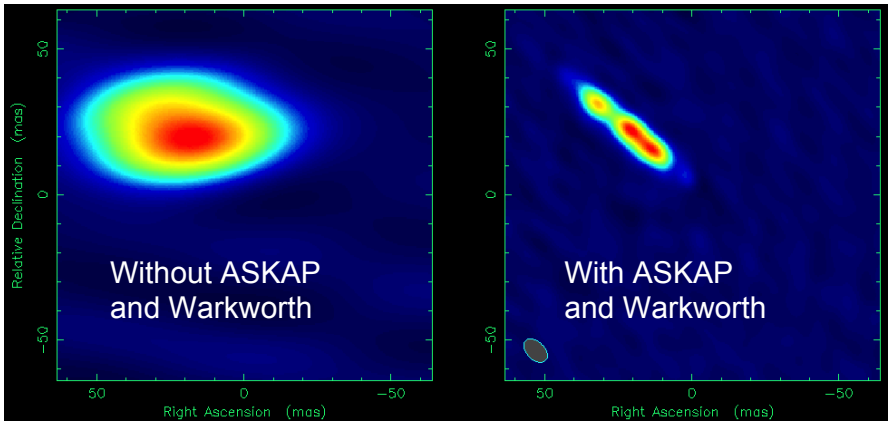
1 pc



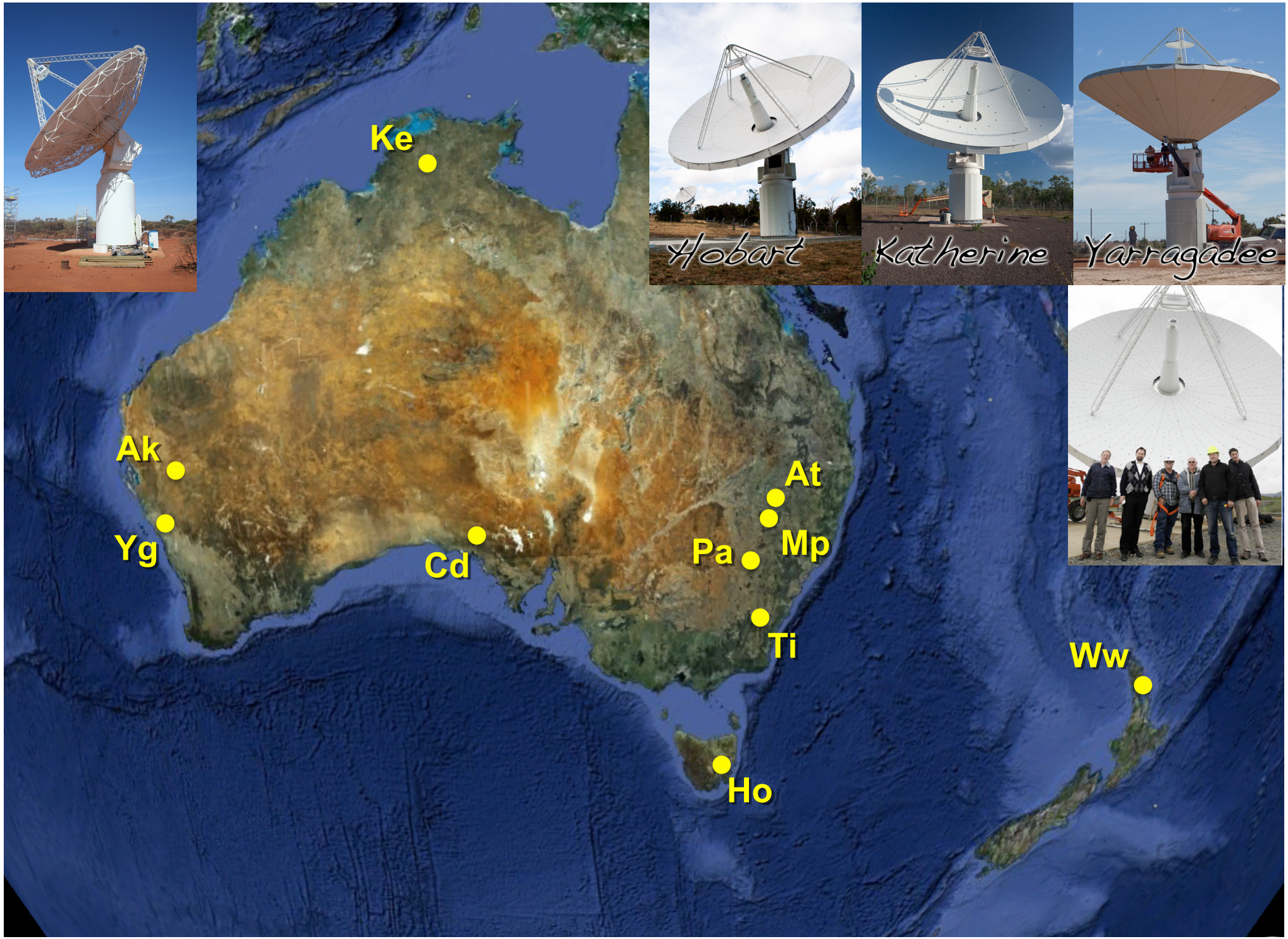


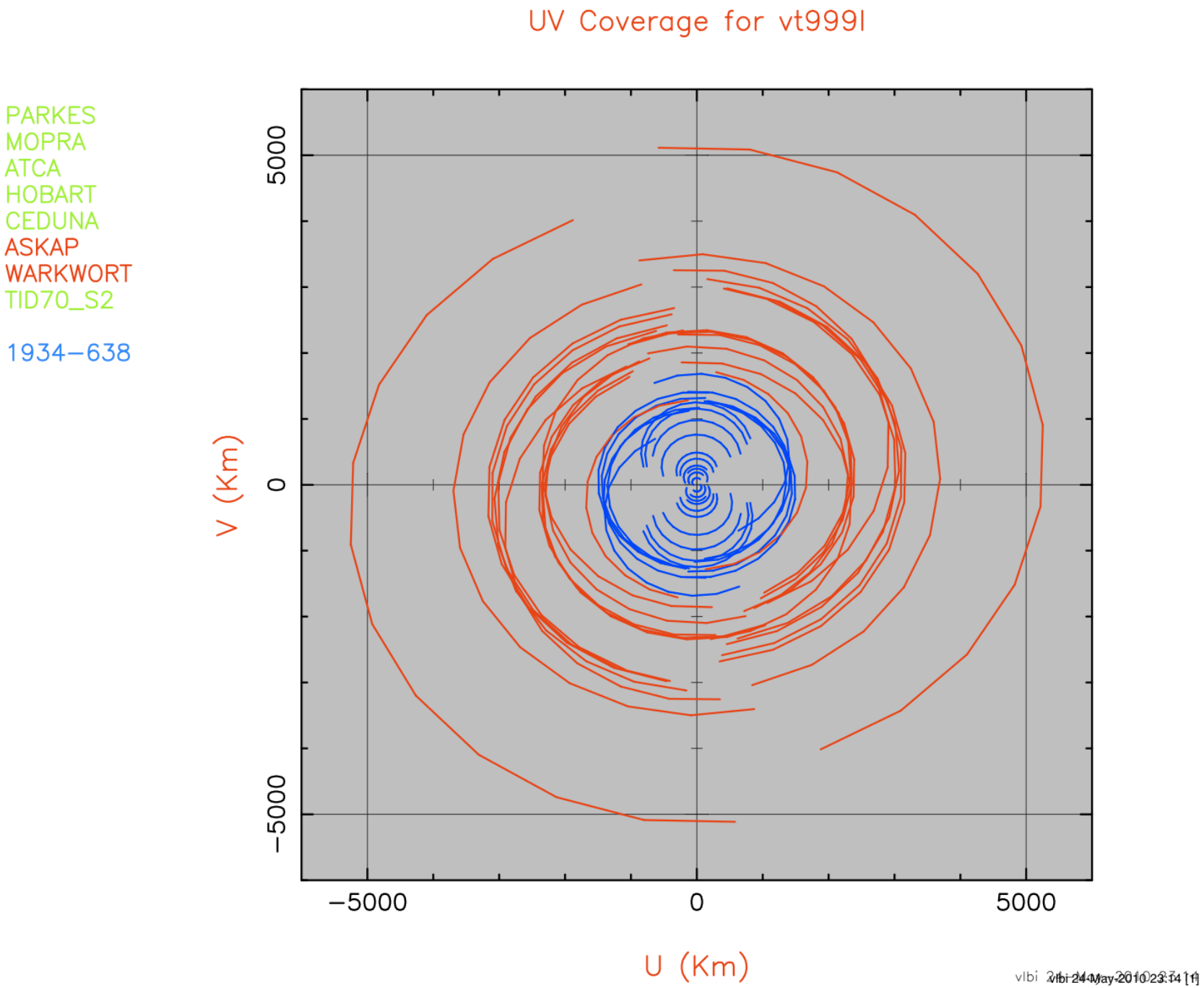
Free-free absorbed structure

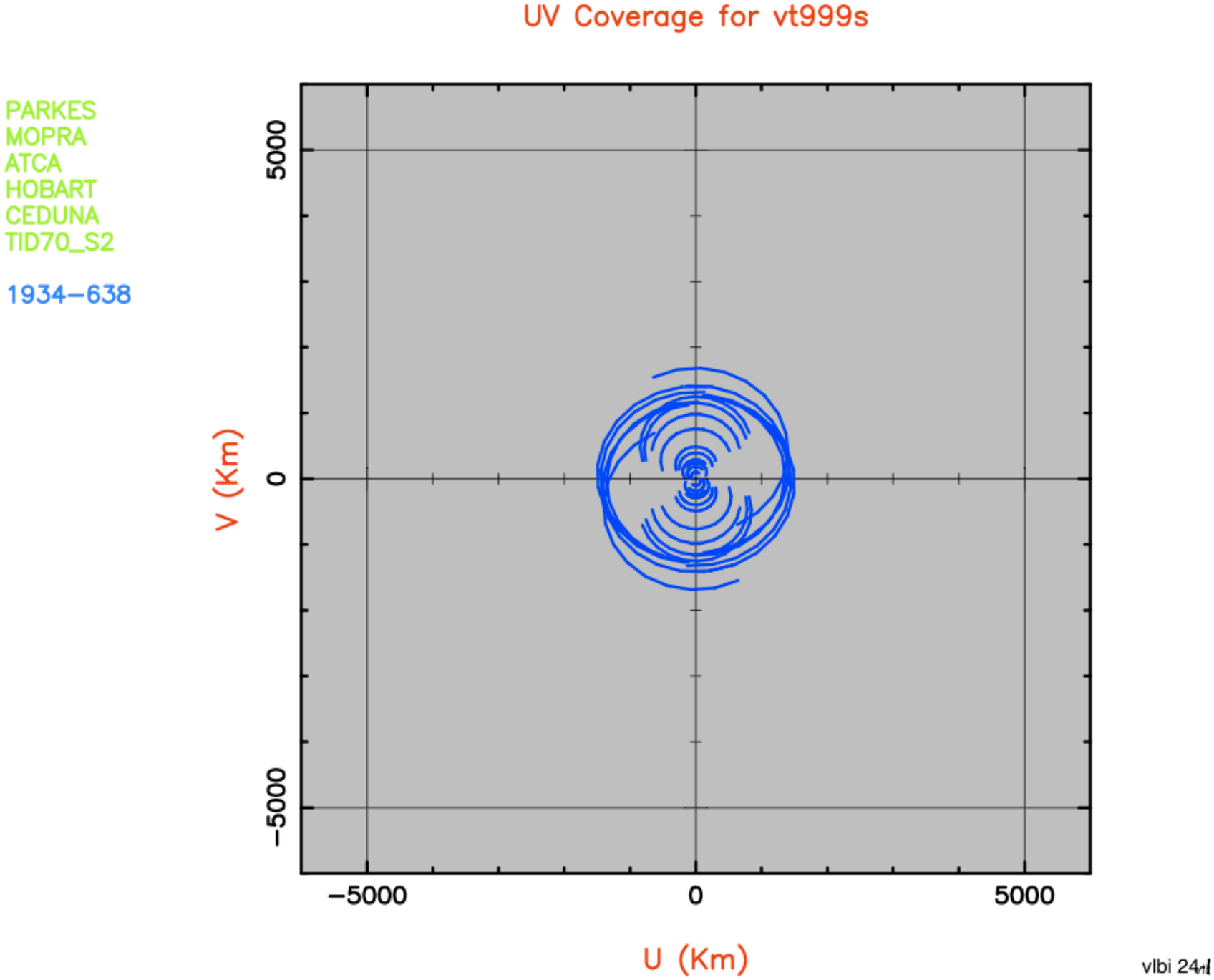


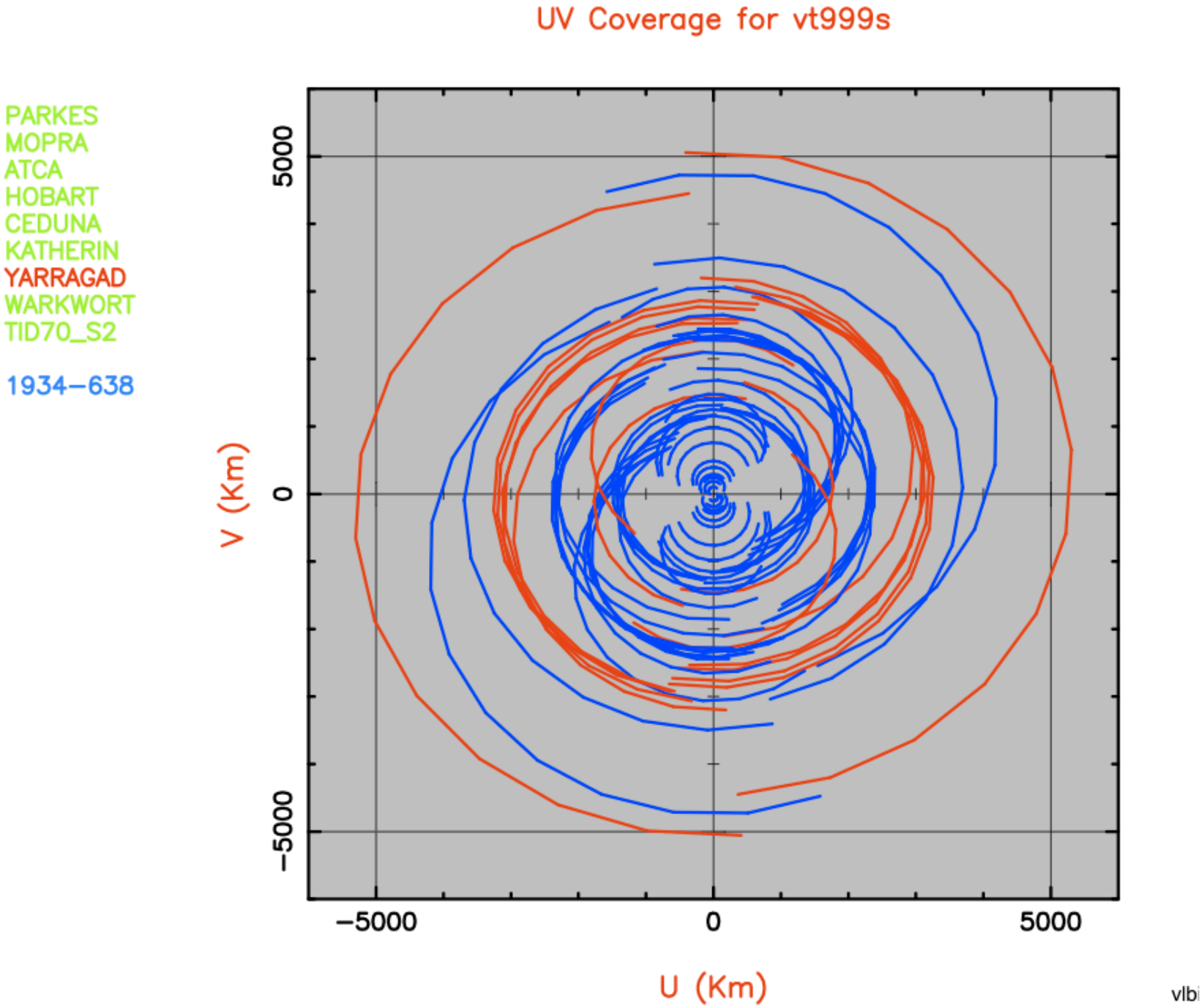


Montage courtesy Steven Tingay, Curtin


Ke
Hobart
Katherine
Yarragadee
Ak
Yg
Cd
At
Mp
Pa
Ti
Ww
Ho

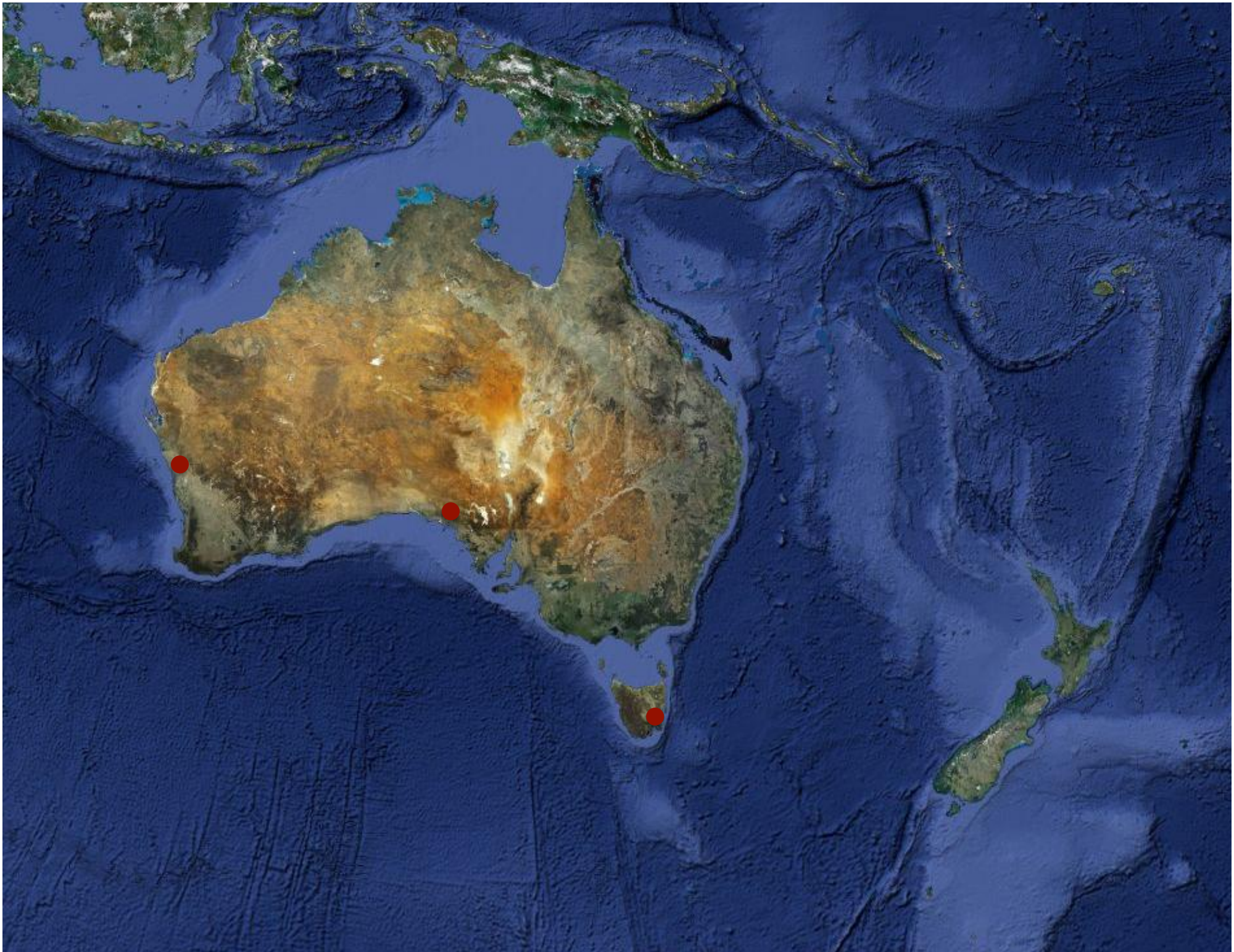

UV Coverage for vt999l
PARKES
MOPRA
ATCA
HOBART
CEDUNA
ASKAP
WARKWORT
TID70_S2
1934−638
5000
0
−5000
V (Km)
−5000
0
5000
U (Km)
vlbi 24-May-2010 23:14 [1]


UV Coverage for vt999s
PARKES
MOPRA
ATCA
HOBART
CEDUNA
TID70_S2
1934−638
5000
0
−5000
V (Km)
−5000
0
5000
U (Km)
vlbi 24nt


UV Coverage for vt999s
PARKES
MOPRA
ATCA
HOBART
CEDUNA
KATHERIN
YARRAGAD
WARKWORT
TID70_S2
1934−638
5000
0
−5000
V (Km)
−5000
0
5000
U (Km)
vlbi

Availability

- ASKAP and Warkworth available on “best effort” basis in current call for proposal
  - Longer term availability to be determined
- AUSCOPE not formally available for astronomical observations
  - Geodetic commitments
  - Availability for astronomy needs to be negotiated



LBA Calibrator Survey

- Imaging weak sources *requires* phase referencing
  - Calibrator within ~2deg of source
- LBA Calibrator Survey increasing density of calibrators in Southern Hemisphere
  - Based (initially) on AT20G catalog
- Increased number of calibrators from 163 to 600.
  - Goal is > 1000
- Increased sensitivity allows weaker calibrators

CSIRO

DiFX

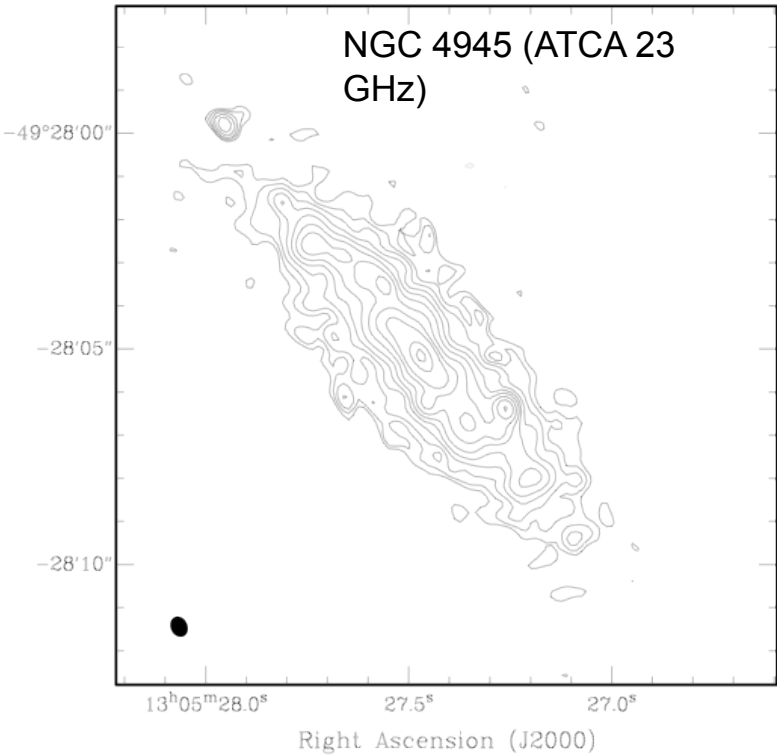
- Many improvements to DiFX
- Notably multiple phase centered across field of view
- 100 simultaneous “pointings” at ~ 2x compute requirements
- Bandmatch – allows correlation of different bandwidths at each telescope
- “Zoom modes” – correlate at high spectral resolution and keep subset of channels

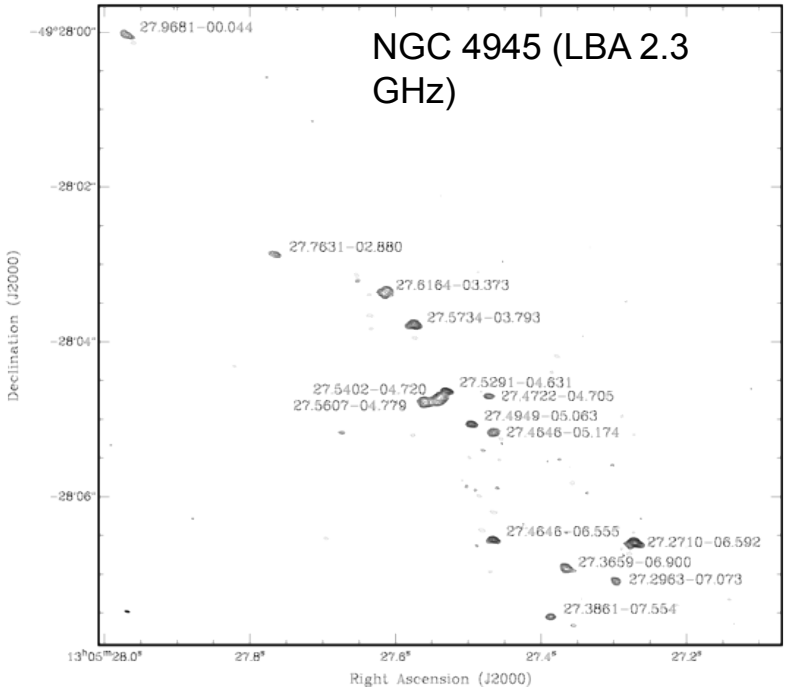
Science Applications

- More sensitivity, higher resolution, better uv coverage
  - Inbeam calibration
- Astrometry
  - Proper motion, parallax
  - Pulsars, Galactic distances
- Wide field imaging

VLBI Survey (Wide-Field) Capabilities

- A powerful capability enabling imaging, at full VLBI resolution and sensitivity, of multiple sources within the primary beam. e.g. monitoring of supernovae and supernova remnants (Lenc & Tingay 2009,AJ,137,537 and Lenc & Tingay 2006, AJ, 132,1333).





ATNF
Chris Phillips
eVLBI Project Scientist

Phone: 02 9372 4608
Email: Chris.Phillips@csiro.au
Web: www.csiro.au/atnf

www.csiro.au

Thank you

Contact Us
Phone: 1300 363 400 or +61 3 9545 2176
Email: enquiries@csiro.au Web: www.csiro.au

CSIRO