

Multi-Epoch VLBA Observations of LLAGN

Jay Blanchard
Joint institute for VLBI ERIC

Neil Nagar - Universidad de Concepcion
Nestor Lasso-Cabrera - CEFCa



JIVE

Joint Institute for VLBI
ERIC

What are LLAGN

Seyferts:

$$[\text{OIII}]/[\text{OII}] > 1$$

$$[\text{OIII}]/\text{H}\beta > 3$$

LINERs:

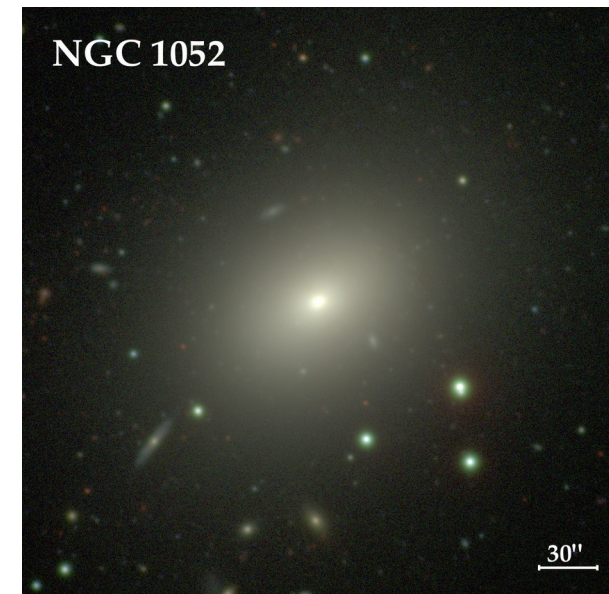
$$[\text{OIII}]/[\text{OII}] < 1$$

$$[\text{OIII}]/\text{H}\beta < 3$$

Weakly ionised lines.



Circinus (image public domain)

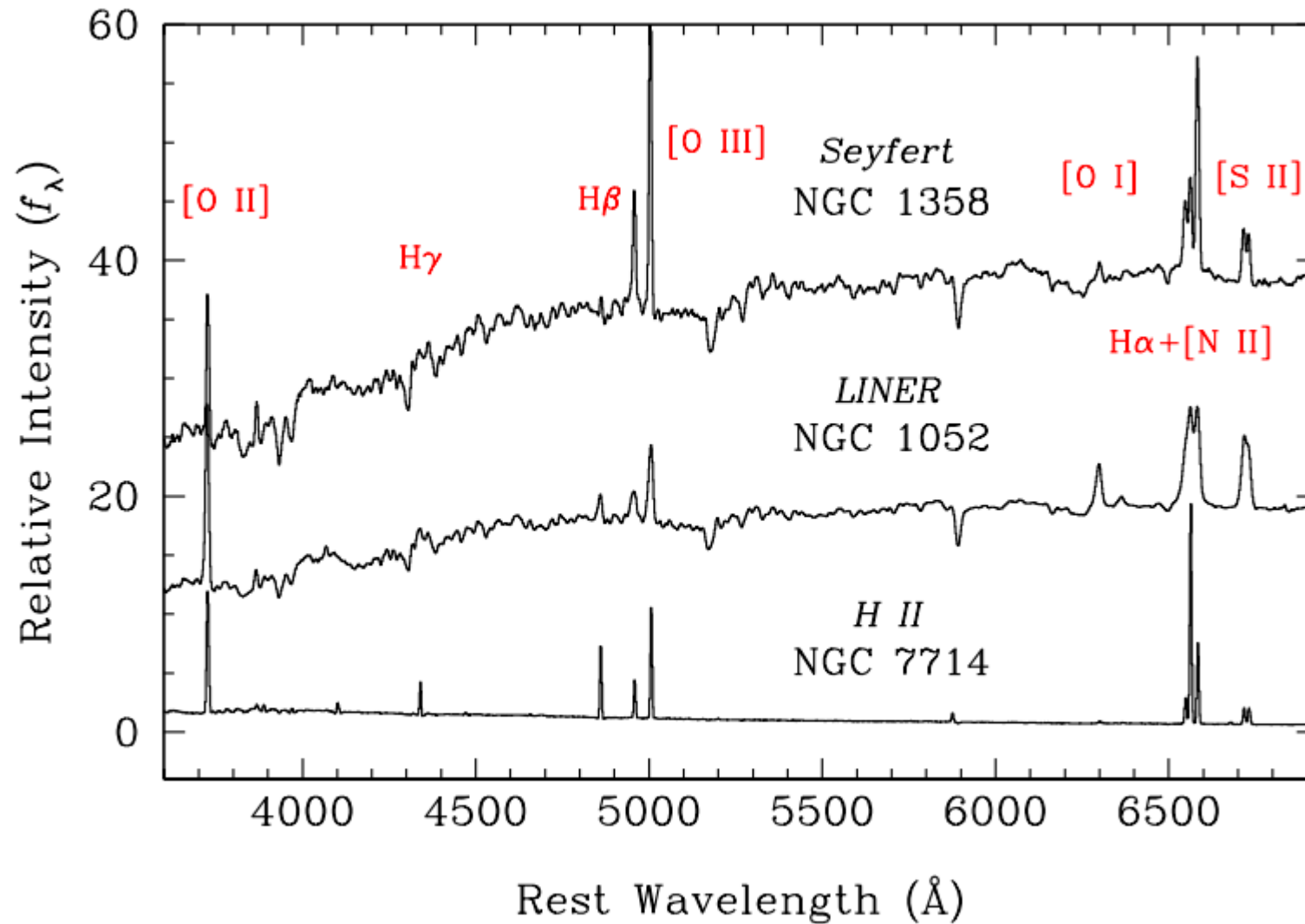


Credit: CGS

What are LLAGN

- $L(\text{H}\alpha) < 10^{40} \text{ erg s}^{-1}$ (Ho et al. 1997).
- More than 30% of nearby galaxies are LLAGN.
- Unresolved cores at mas scales.
- $T_b > 10^6 \text{ K}$.
- Variable radio cores.
- Cores have flat spectral index ($\sim 0 - 0.6$).
- Radio cores synchrotron emission from jet (Nagar et al. 2002, Falcke et al. 1999)

What are LLAGN



Data Sample

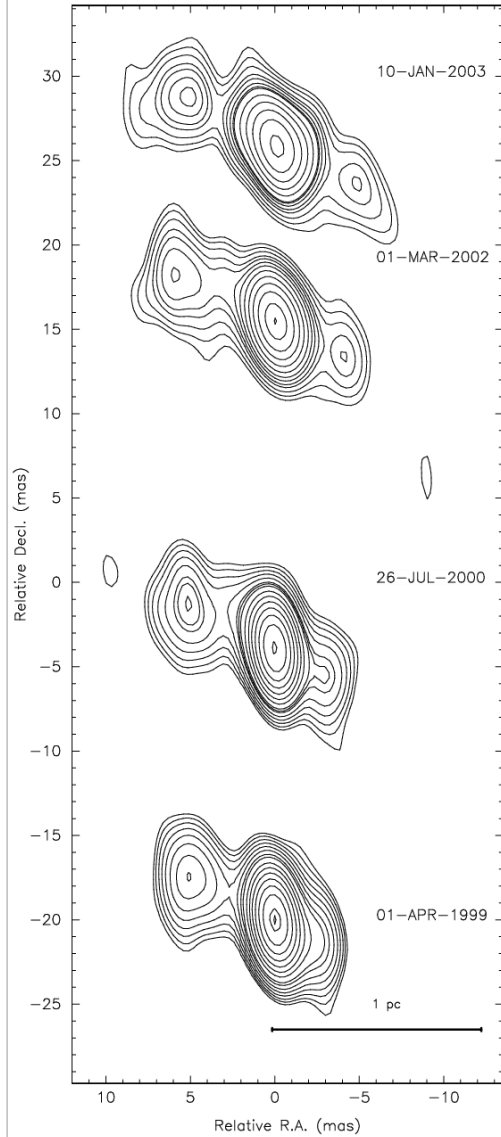
- The Palomar spectroscopic survey:
 - Identified 96 LLAGNs at $D < 19$ Mpc among all northern bright ($B_T < 12.5$ mag) galaxies (Ho et al., 1997a).
- VLA observations by Nagar et al. (2002).
 - Half had unresolved radio cores at scales of 150 mas.
 - Follow up of 16 with the VLBA showed all had milli-arcsecond cores.
 - Six showed extended structure.
 - One additional found to be extended by Falcke et al. (2000)
- VLBA used incorrect EOP between 2003 and 2005.

Data Sample

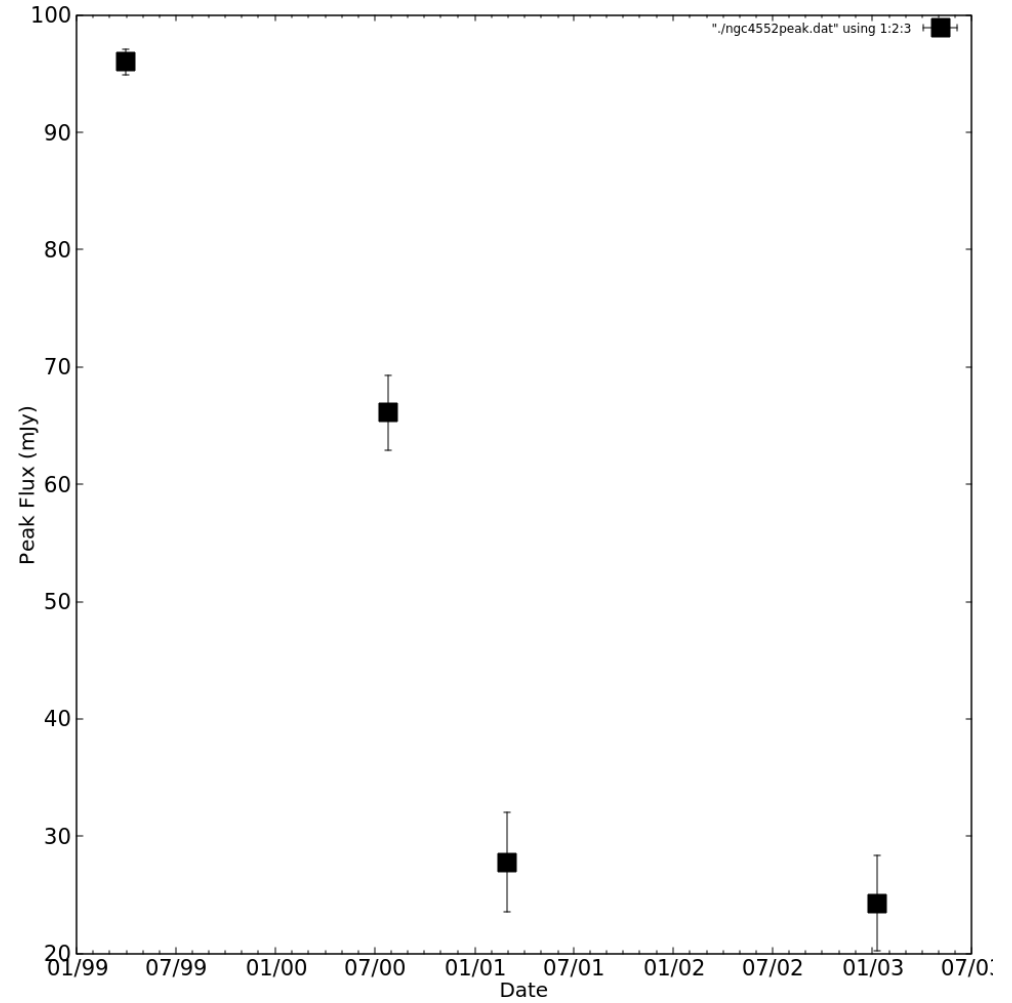
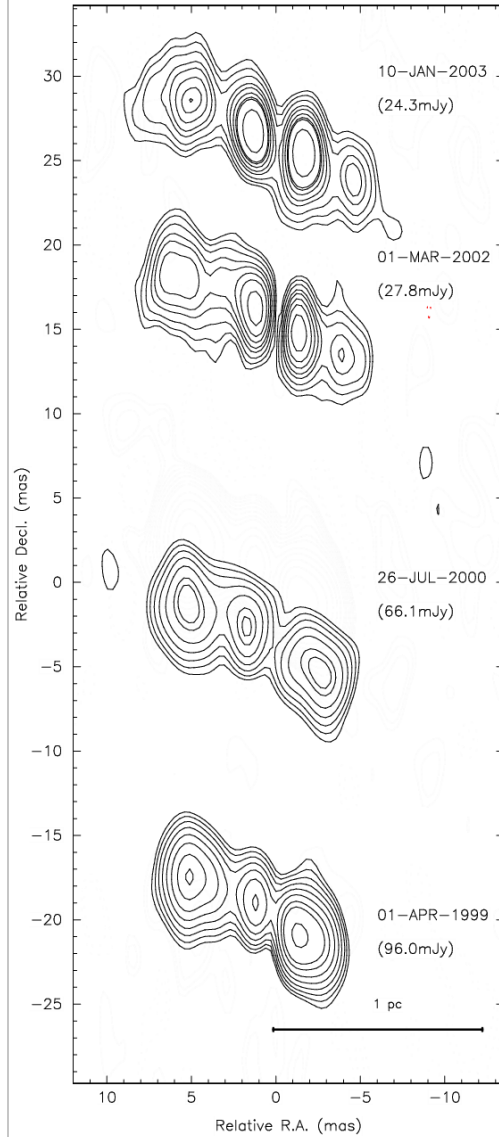
Source	Type	Redshift
NGC 6500	LINER	0.01
NGC 1052	Seyfert 2	0.005
NGC 3031 (M81)	LINER	0.0001
NGC 3938	LINER	0.003
NGC 4203	LINER	0.004
NGC 4278	LINER	0.002
NGC 4552 (M89)	Transition	0.001
NGC 4579 (M58)	Seyfert 1	0.005

NGC 4552

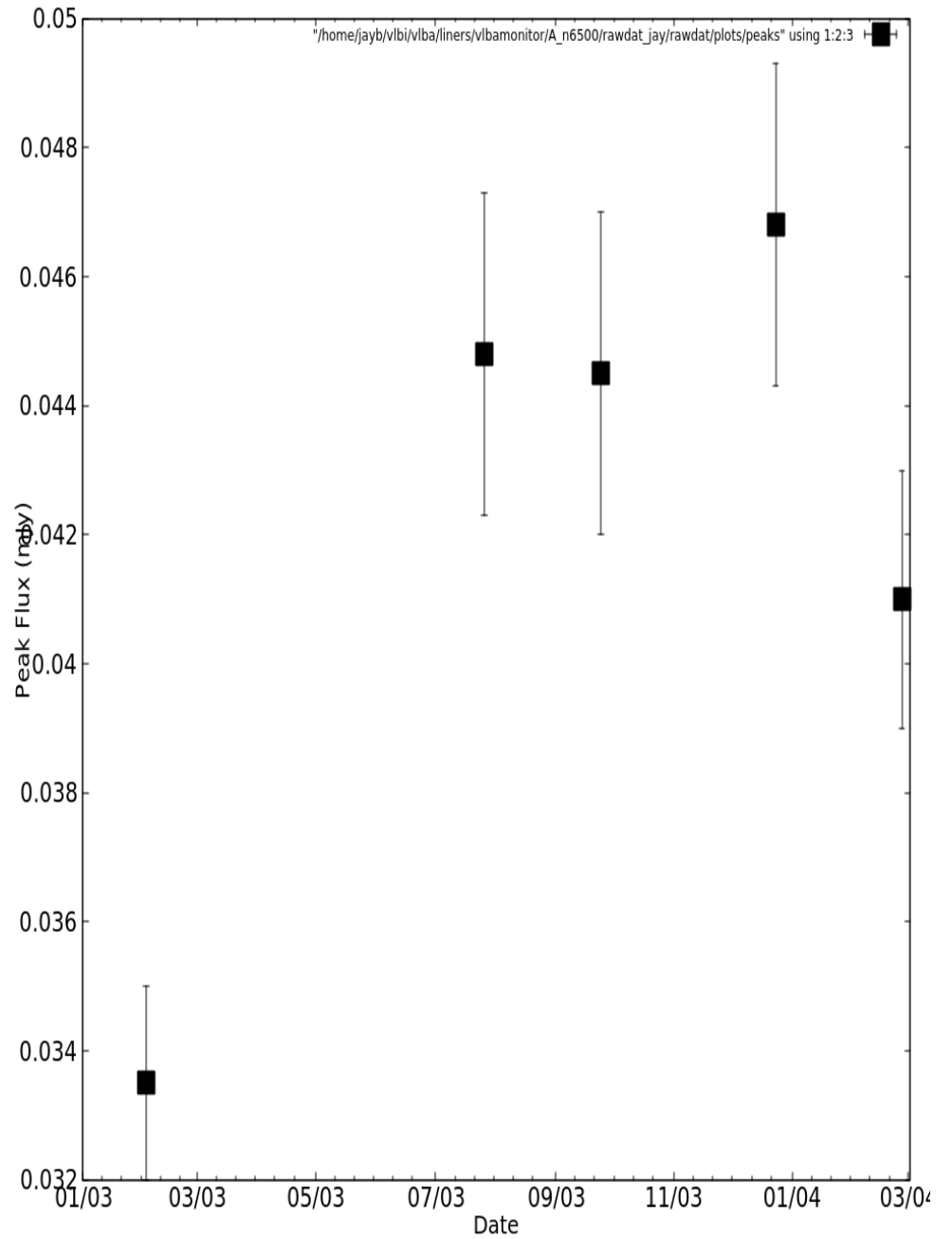
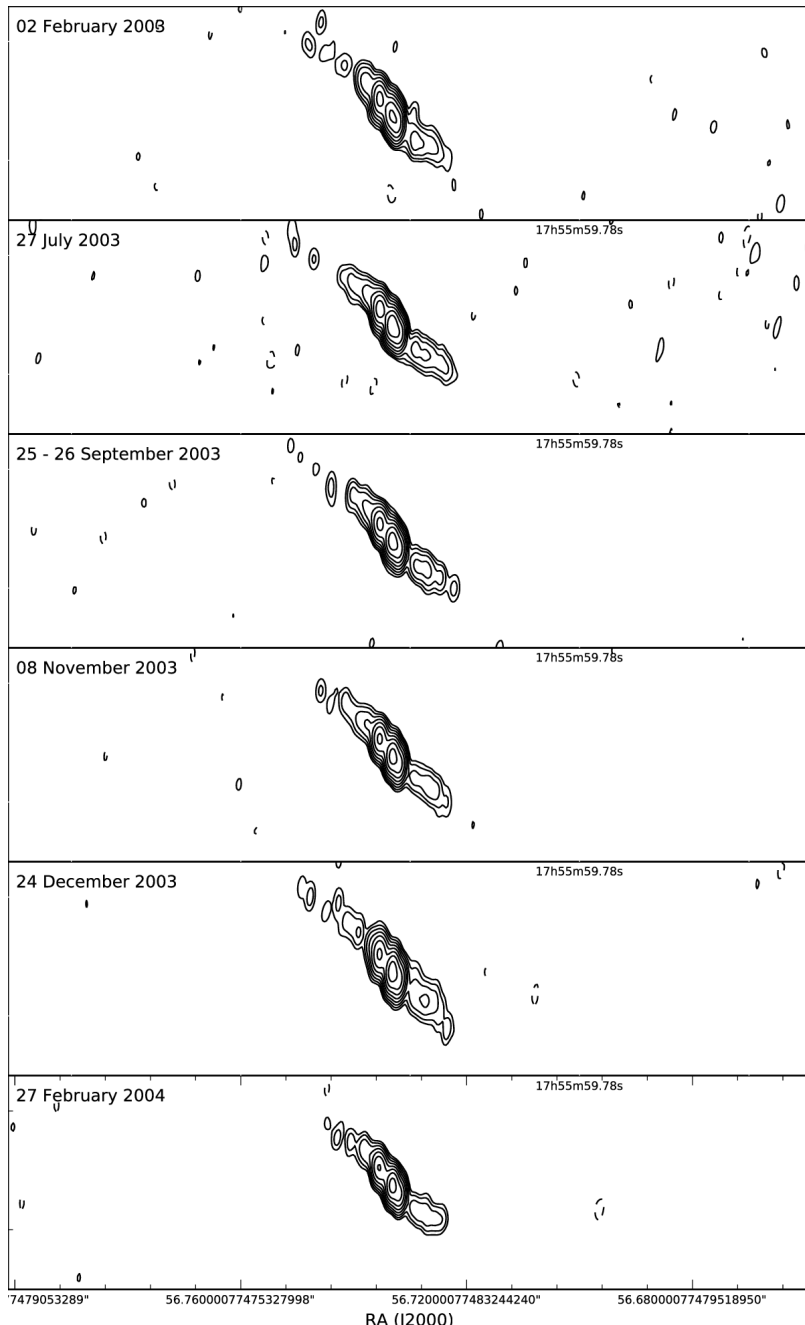
5 GHz



Core - subtracted



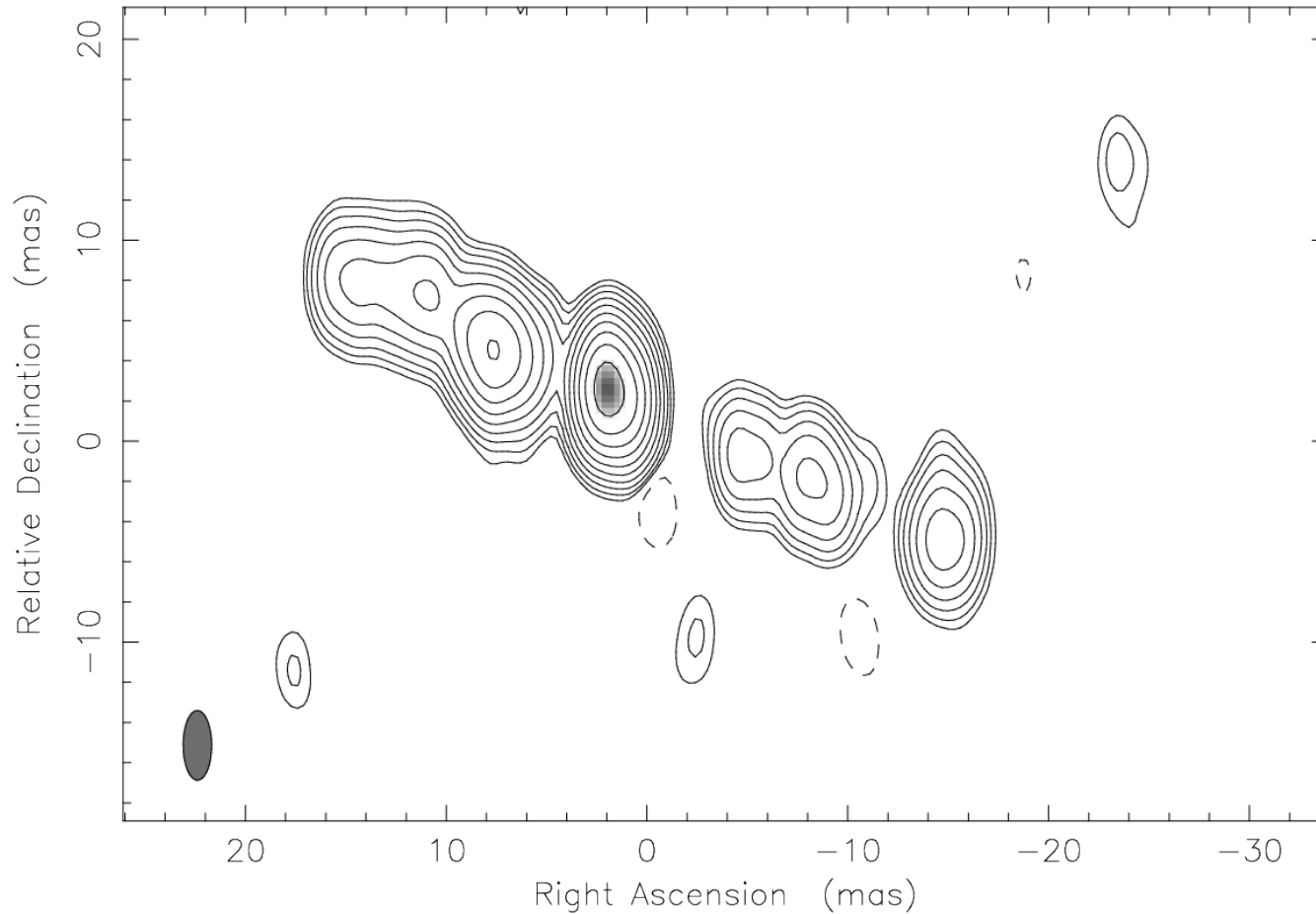
NGC 6500



NGC 1052

Clean LL map. Array: BFHKLMNOPS

NGC1052 at 4.987 GHz 2003 Jan 17



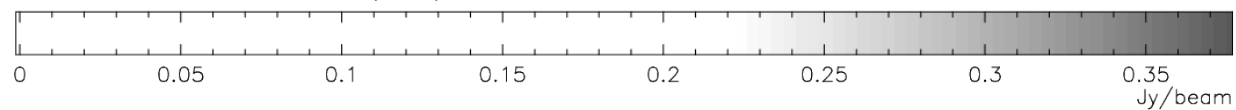
Map center: RA: 02 41 04.798, Dec: -08 15 20.752 (2000.0)

Map peak: 0.377 Jy/beam

Contours: 0.0005 Jy/beam x (-1 1 2 4 8 16 32 64

Contours: 128 256 512)

Beam FWHM: 3.47 x 1.42 (mas) at 0.175°



Future work

- Reduce epochs of remaining sources.
- Model fitting.
- Analyse variability.
- Follow up now with new observations.
EVN?
- Unify model of all AGN.