

Multi-frequency VLBI studies of the OVV quasar NRAO 530

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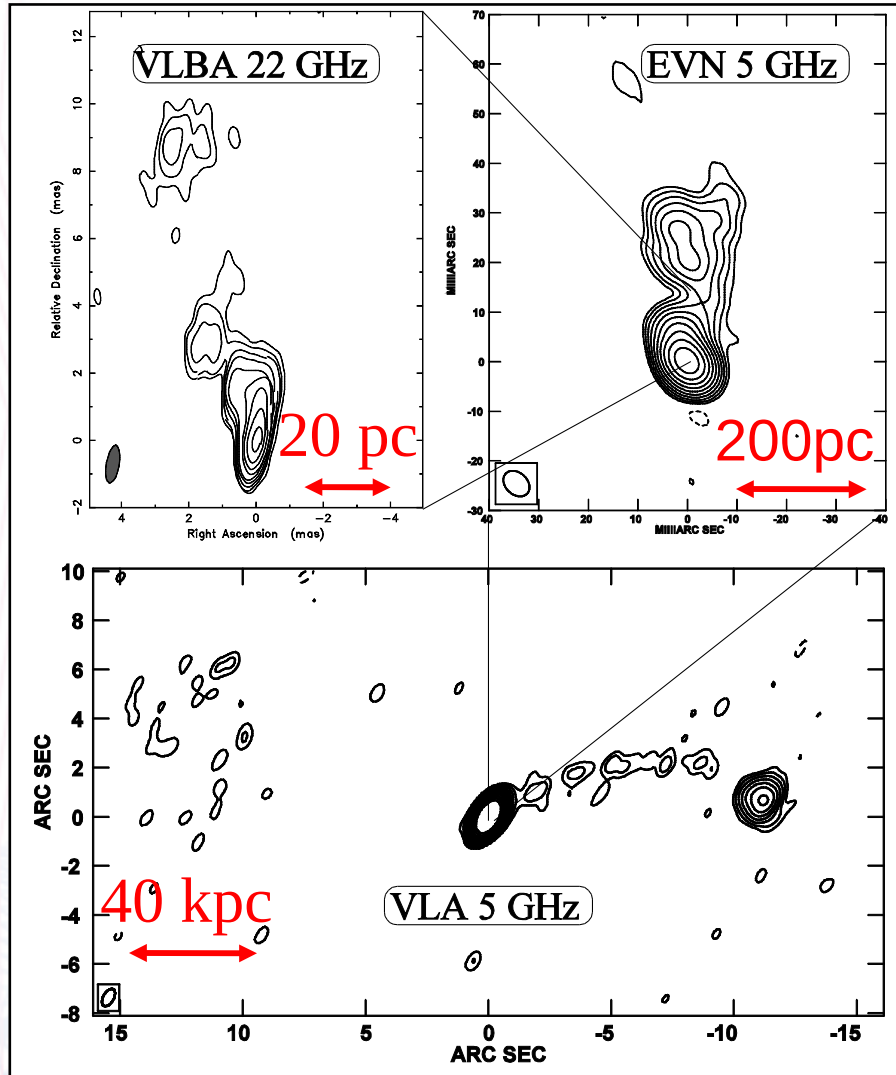
in collaboration with

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Introduction



A well know OVV:

- $z = 0.902$, $1 \text{ mas} \rightarrow 7.8 \text{ pc}$
- erratic and strong broad-band variability
- $\beta_{\text{app}} \approx 10\text{-}40 \text{ c}$

Morphology:

kpc scale:

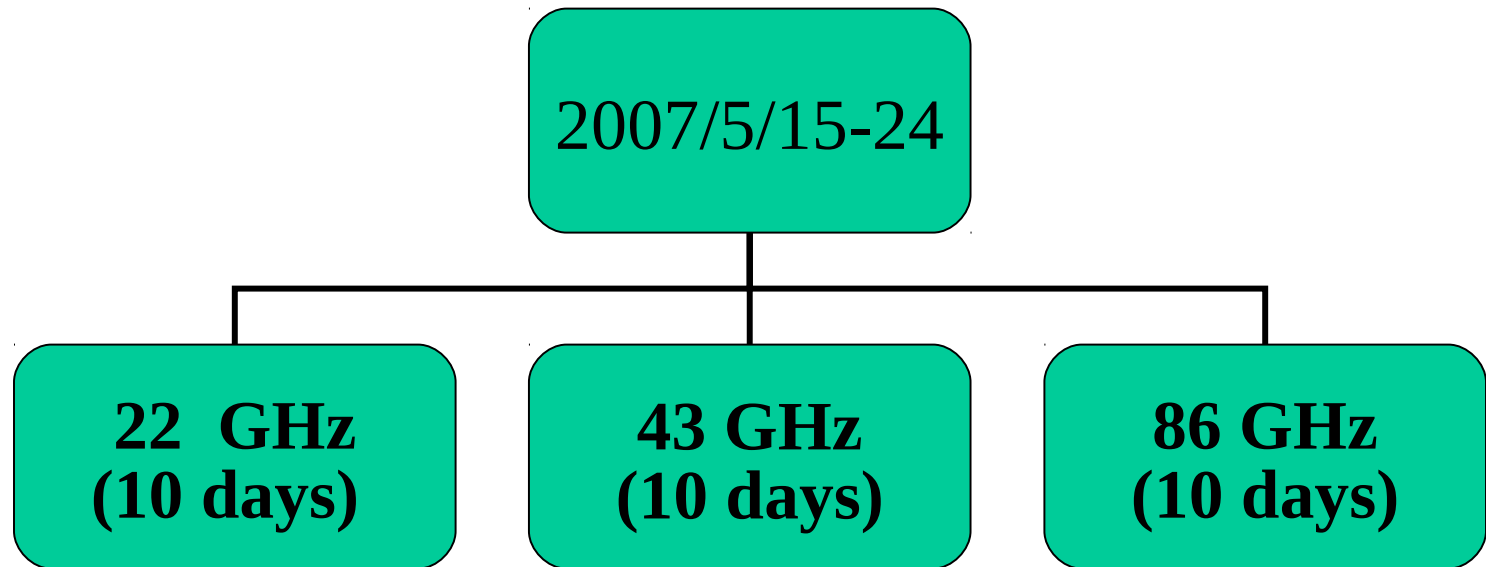
a core jet structure in P.A. -50° , double lobes in the E-W direction

pc scale:

oscillating jet consists of a number of emission components north to the core

Data collection

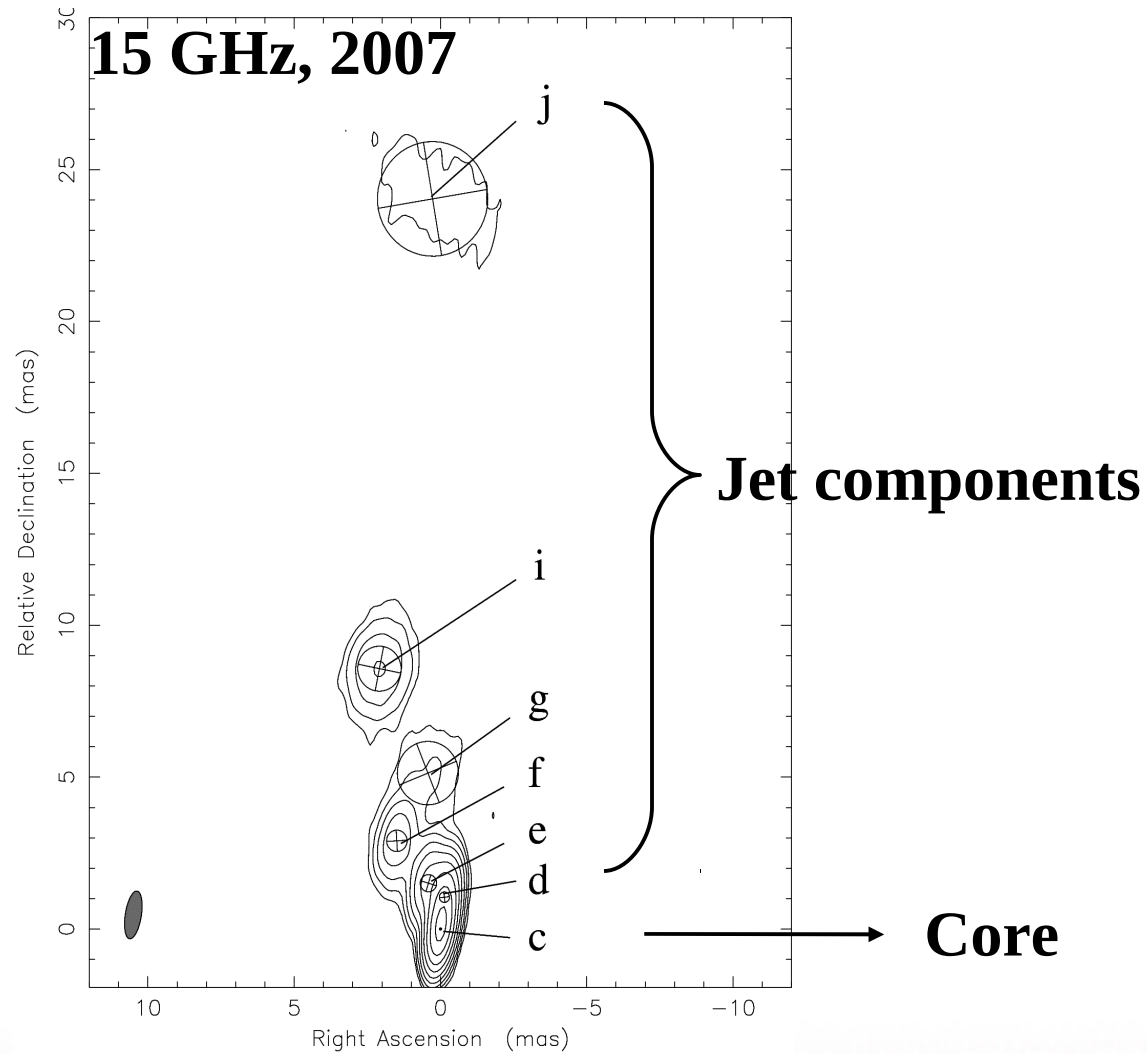
- **Main calibrator in 2007 Sgr A* observing campaign:**



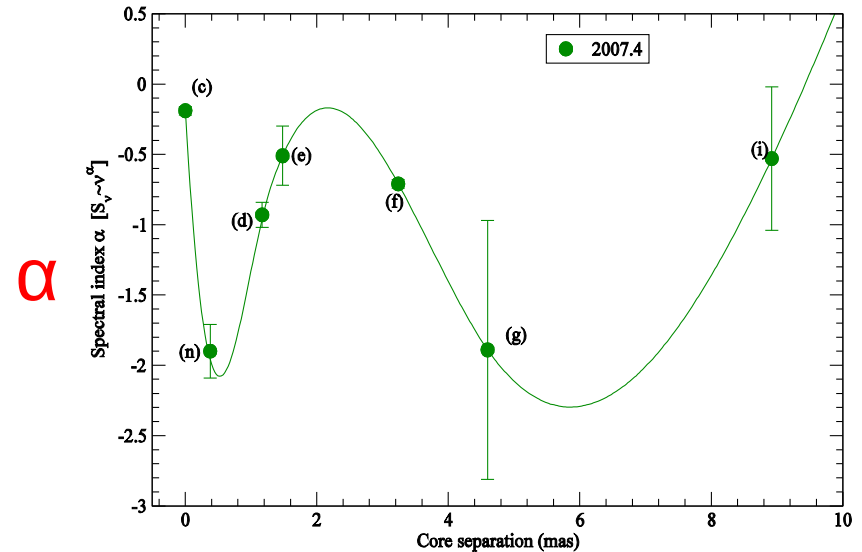
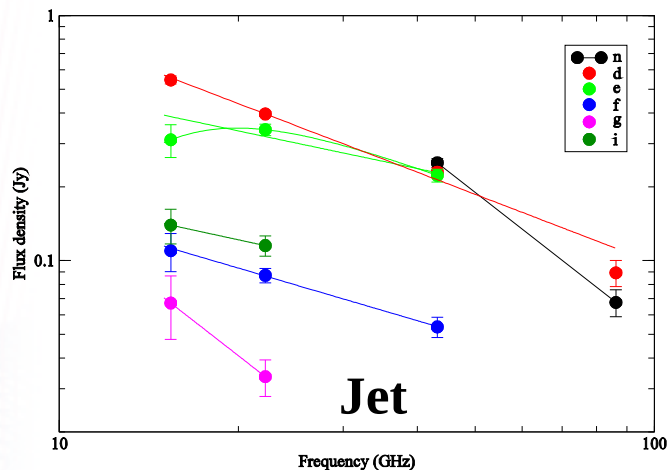
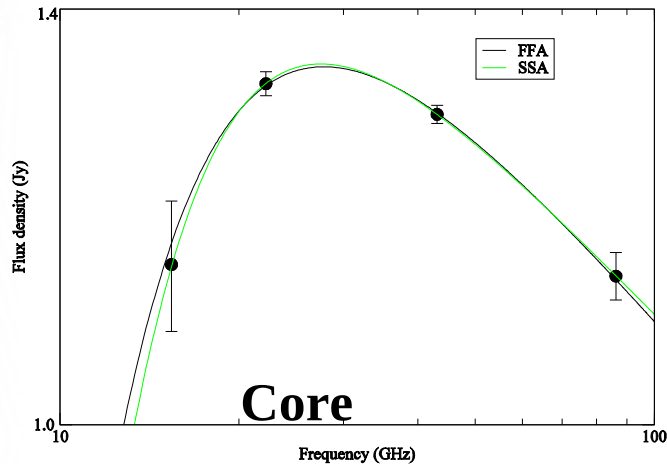
See my poster for other results from this campaign

- **Mojave 15 GHz (1999-2009, 17 epochs)**

component identification: an example



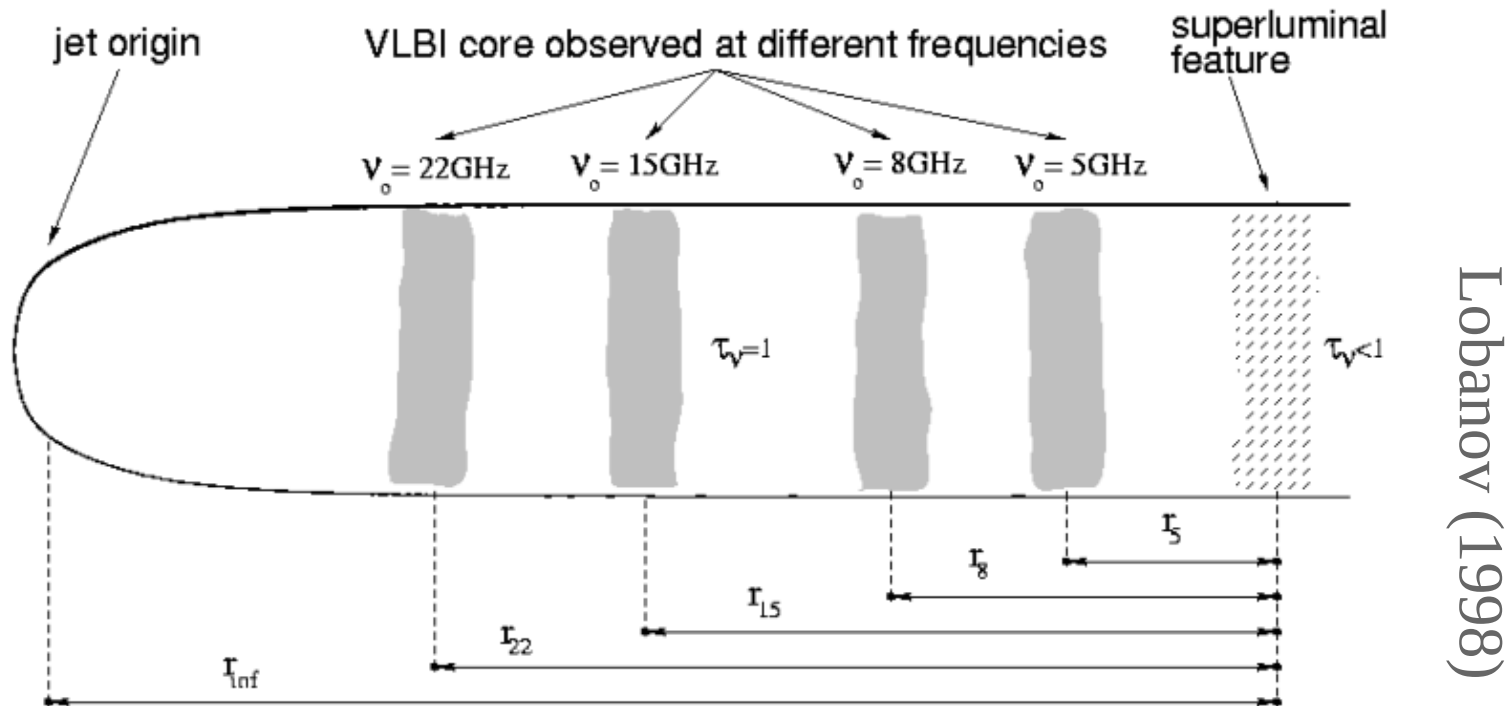
Spectra and spectral evolution



→ Core separation

- Core identification:
the compact component at the south end
- $B \approx 76 \cdot \delta$ mG based on SSA
- systematic change of α along the jet

ν -dependent positions of components



Core location r_{core} varies with ν : $r_{\text{core}} \propto \nu^{-1/K_r}$

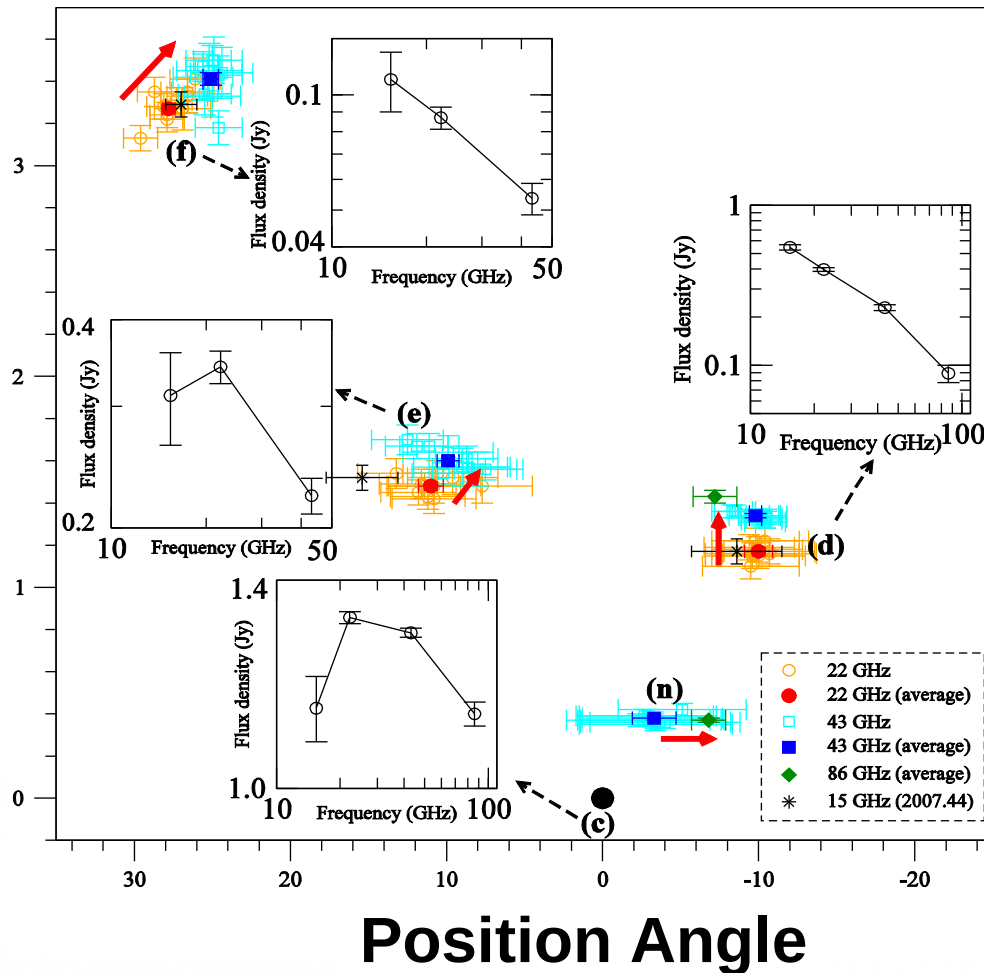
(K_r is related to the electron energy distribution, B-field, and the electron number density)

Synchrotron self-absorption, $K_r = 1$

ν -dependent positions of components

Epoch: 2007.4

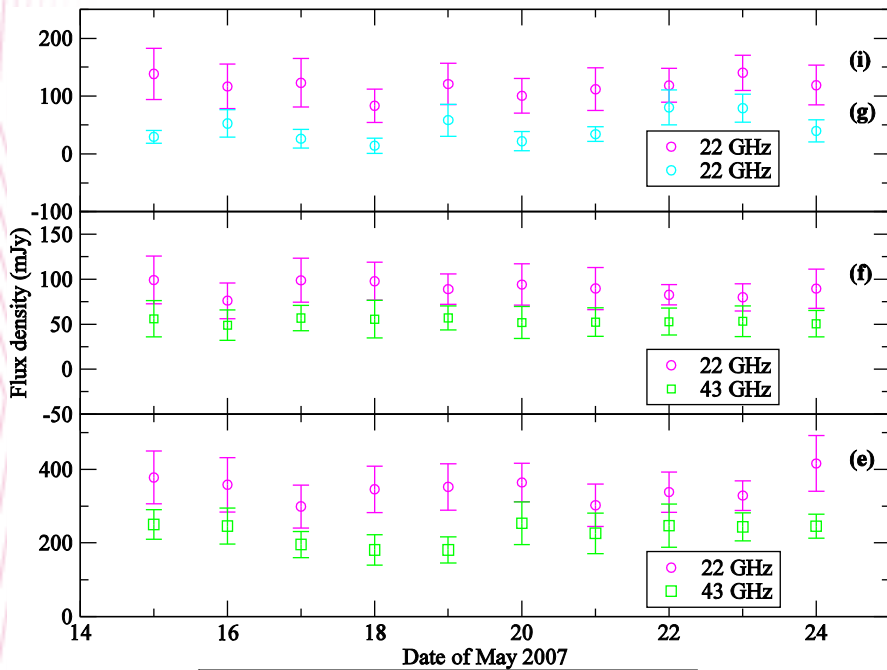
Core separation



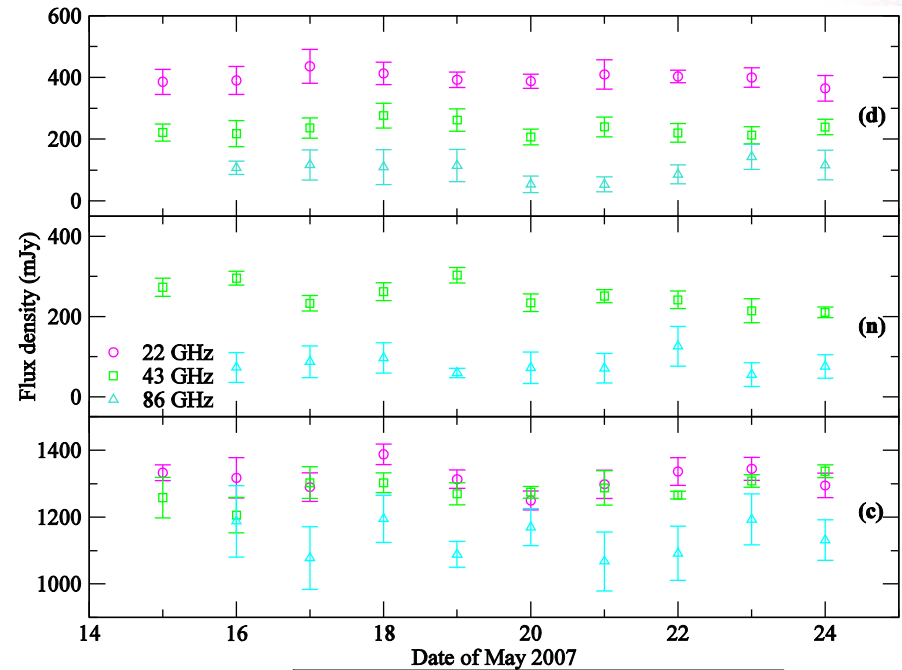
Id.	$\Delta r_{22/43}$ [mas]	$\Delta r_{43/86}$ [mas]
<i>d</i>	-0.17 ± 0.02	-0.09 ± 0.03
<i>e</i>	-0.12 ± 0.03	...
<i>f</i>	-0.14 ± 0.04	...

• Two-dimensional shift for component *f* ($>4\sigma$ for P.A.)

Inter-day Variability: flux density



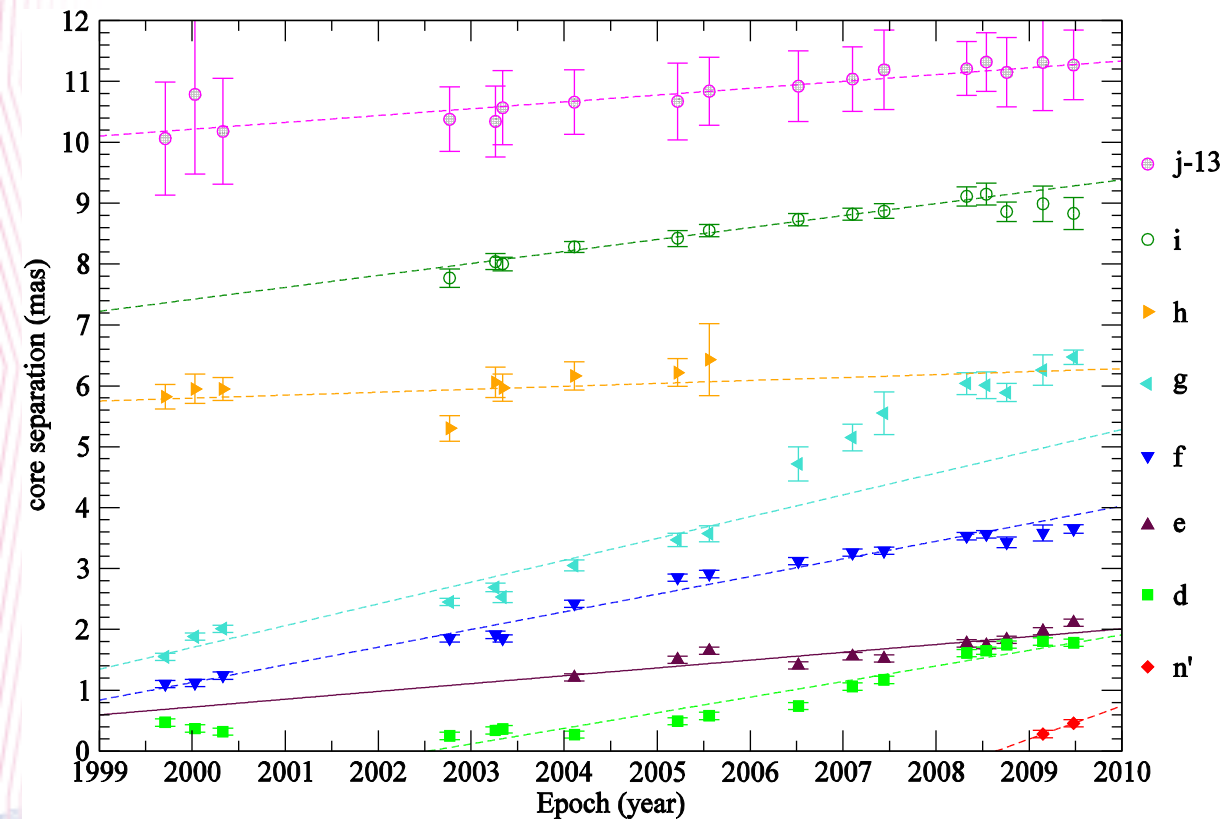
Outer jet components



Inner jet components

- The probability for variability for most components is low
- $m < 4\%$ for the core, and $m < 20\%$ for the jet

Jet kinematics at 15 GHz



Core separation vs. time

Physical parameters :

- apparent speeds β_{app}

2-26 c

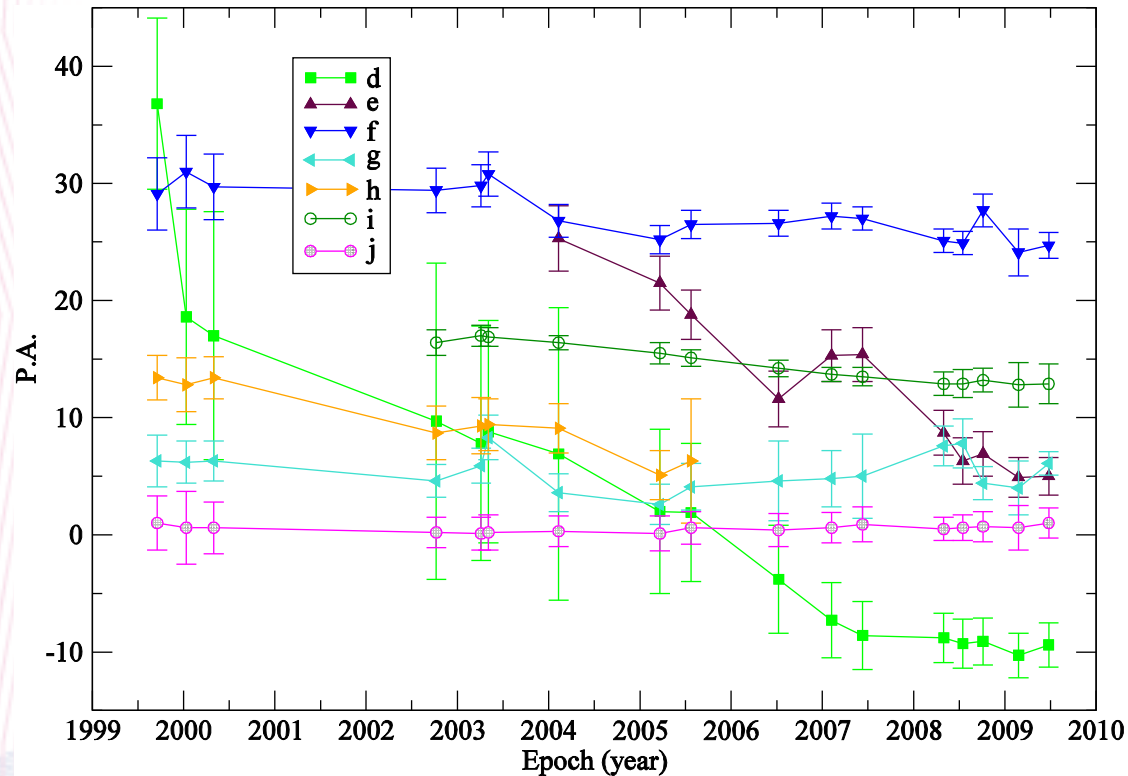
inter-day variability

< 170 c

- $\Gamma_{\text{min}} = \delta_{\text{min}} = 14.1$

$\theta_{\text{cri}} = 4.1^\circ$ (for comp. f)

Jet kinematics at 15 GHz



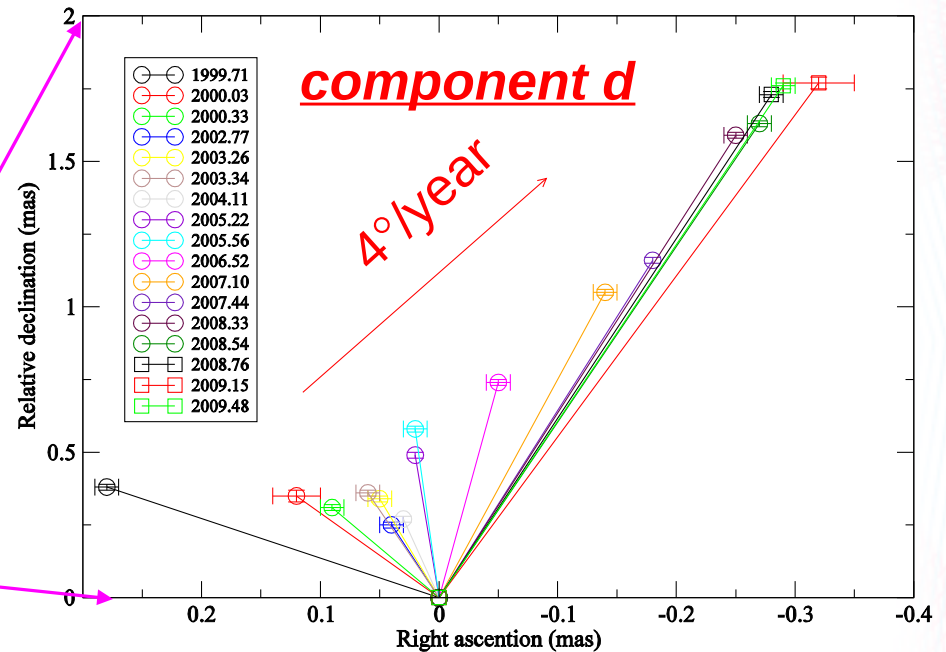
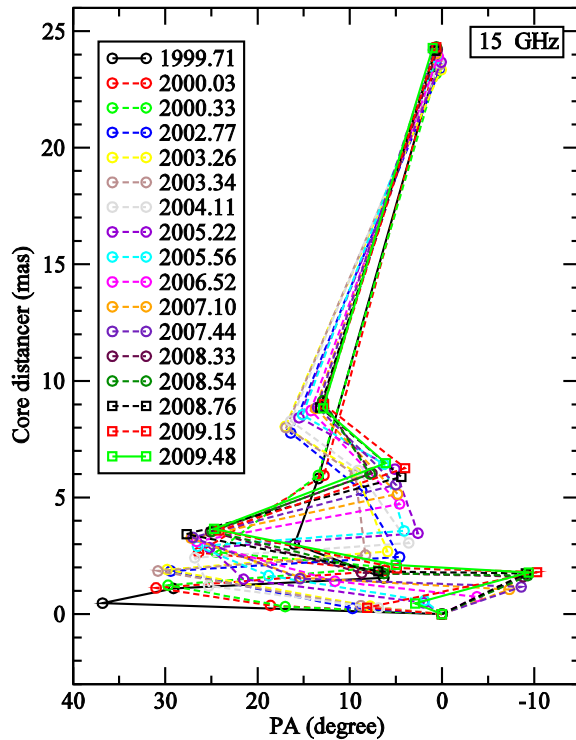
P.A. swing for
comp. *d*, *e*, *h*, and *i*



P.A. keeps nearly constant
for comp. *f*, *g*, *j*

P.A. vs. time

Morphology evolution: jet wobbling



- Visible only in the innermost regions
- Similar to many others, like NRAO150, BL Lac etc.

Summary

- One-sided core-jet structure with spectral evolution
- 2-D position shifts along the jet, some of which are probably due to the core-shift
- Variations of flux density and structure on daily time-scales:
flux density: $m < 4 \%$ for the core and $m < 20 \%$ for the jet;
jet speeds $< 170 c$
- evolving jet ridge line, a consequence of 3-D motion

Thank you !
