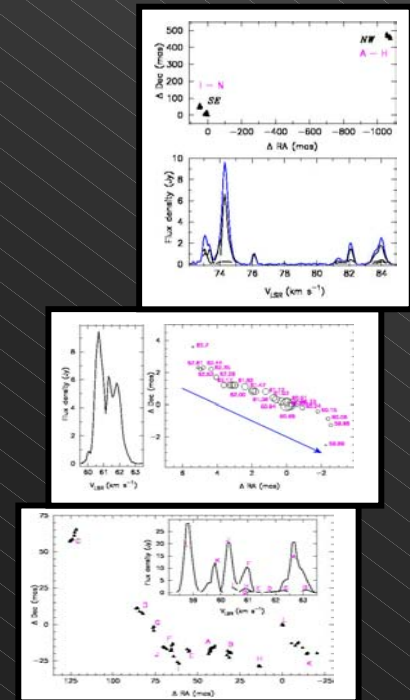


Methanol masers in environments of three massive protostars

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Introduction:

Methanol masers at 6668.519 MHz, first detected by Menten (1991)

- are associated with the massive early type stars still embedded in their parental molecular clouds,
- their high brightness enable us to investigate structures at mas scales (a few hundreds of AU at the distances of a few kpc),
- show different morphology (linear, elongated, pair, complex and simple).

Our project:

- unbiased survey of the Galactic plane with the Torun telescope (Szymczak et al. 2002),
- astrometry of newly detected sources (30) using the MkII - Cm baseline of MERLIN,
- EVN mapping of the milliarcsecond scale structure of masers.



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**Astronomy
&
Astrophysics**

6.7 GHz methanol masers at sites of star formation

A blind survey of the Galactic plane between $20^\circ \leq l \leq 40^\circ$ and $|b| \leq 0.52$

M. Szymczak, A. J. Kus, G. Hrynek, A. Kępa, and E. Pazdński



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Observations:



- three star-forming regions: **G33.64-0.21**, **G35.79-0.17**, **G36.11+0.55**,
- 8 June 2003,
- 7 antennas of EVN,
- J1907+0.127 – a phase calibrator for all three targets,
- the cycle time between a target and a phase-cal: 5.5 min + 3.5 min,
- a spectral bandwidth of 2 MHz divided into 1024 channels (100 km/s and 0.09 km/s),
- rms = 7 – 10 mJy/beam.

Phase – referencing problem:

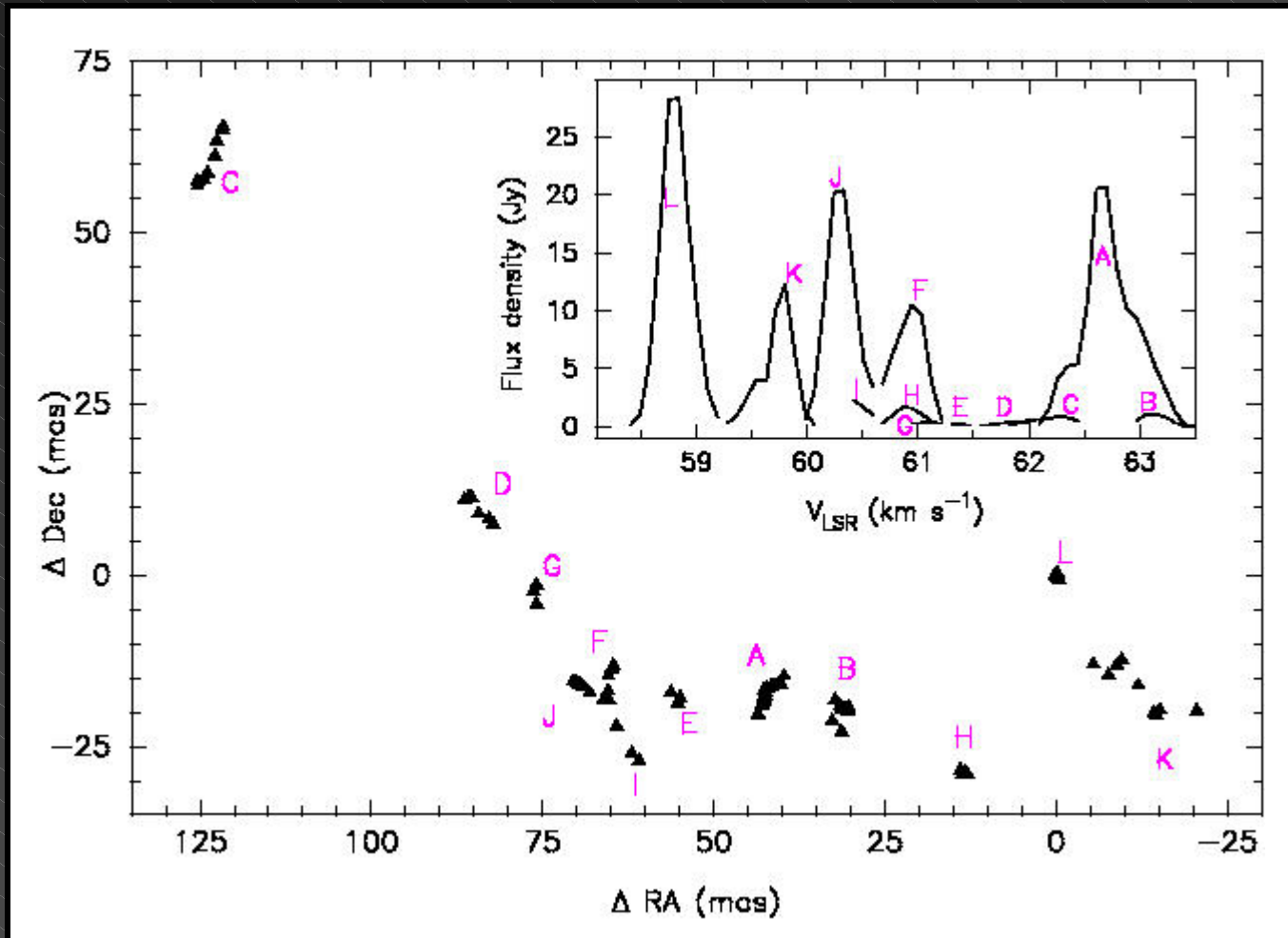
- FRMAP (AIPS),
- Declination of sources from +0.5 to + 3.1 deg,
- the phase–calibrator (J1907+0.127) 3 deg apart from masers,
- useful data only from 4 antennas (Cm, Eb, Mk II, On),
- poor coverage of the uv-plane for N – S baselines.



Results from MERLIN: accuracies better than 0.6" in Ra and 4" in Dec.

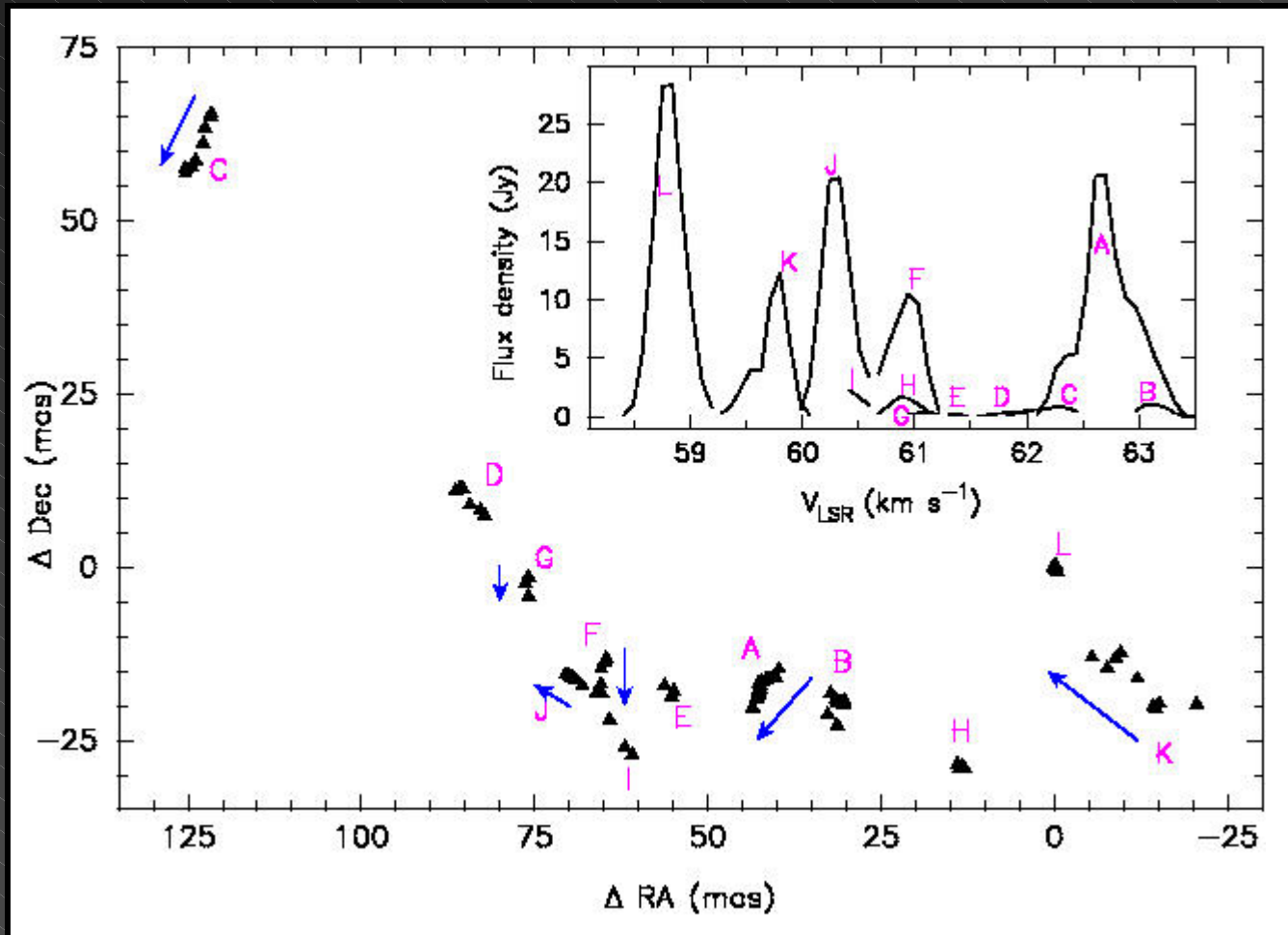
Source	RA (h m s)	Dec (o ' ")	Err RA (")	Err Dec (")
G33.64-0.21	18 53 32.551	+00 32 06.525	0.3	4
G35.79-0.17	18 57 16.911	+02 27 52.900	0.6	3
G36.11+0.55	18 55 16.814	+03 05 03.720	0.2	1.4

Results: G33.64-0.21



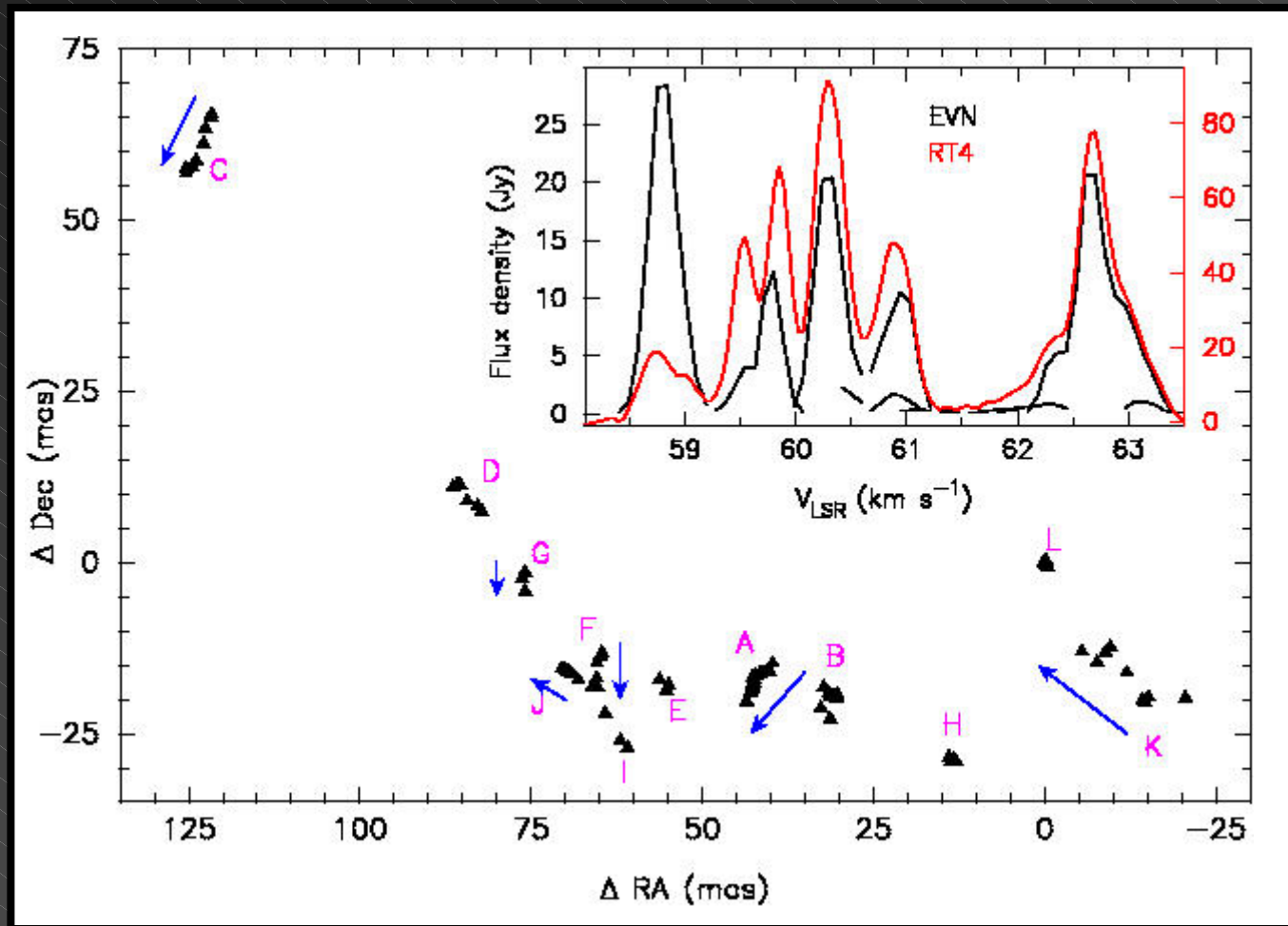
A. Bartkiewicz, M. Szymczak & H.J. van Langevelde: *Methanol masers in environments of massive protostars.*

Results: G33.64-0.21



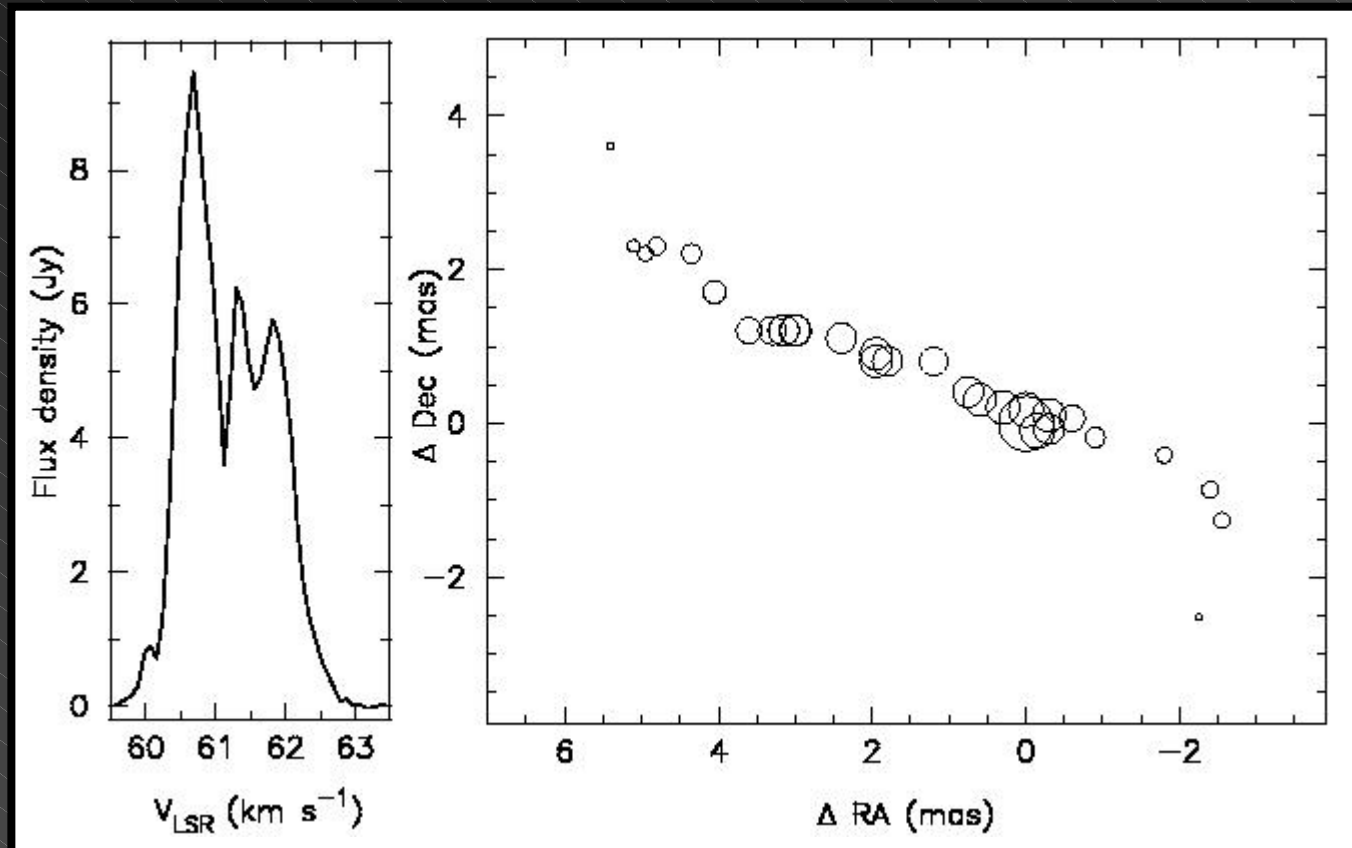
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Results: G33.64-0.21

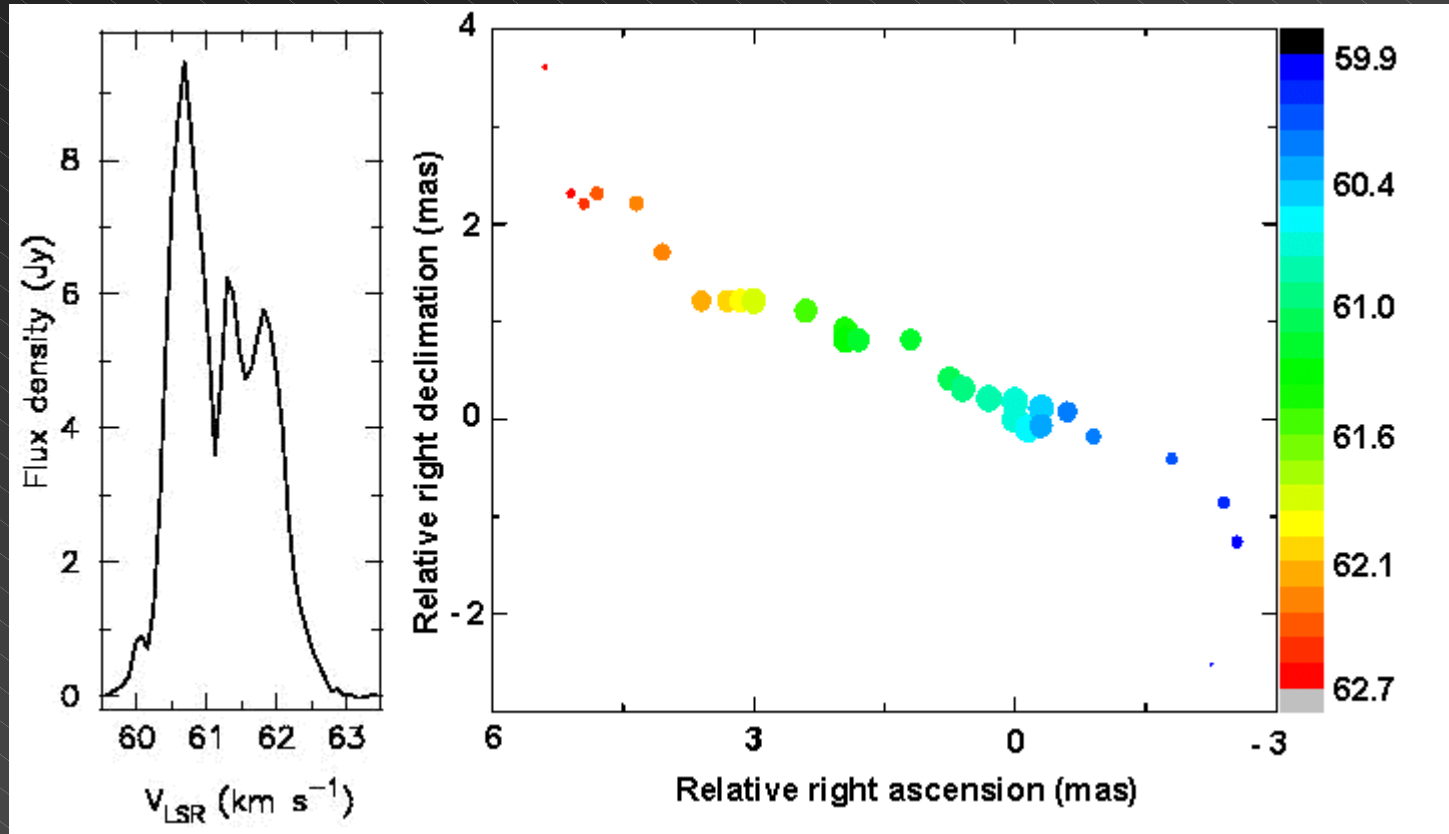


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Results: G35.79-0.17

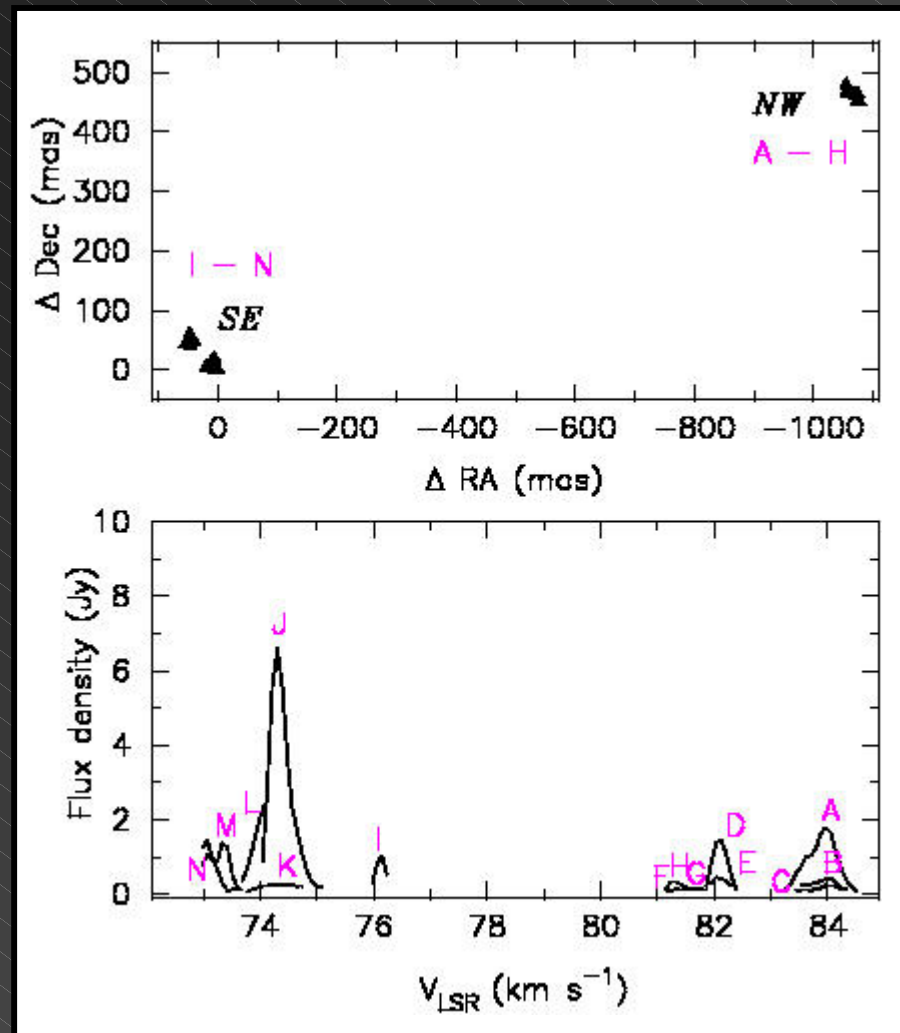


Results: G35.79-0.17



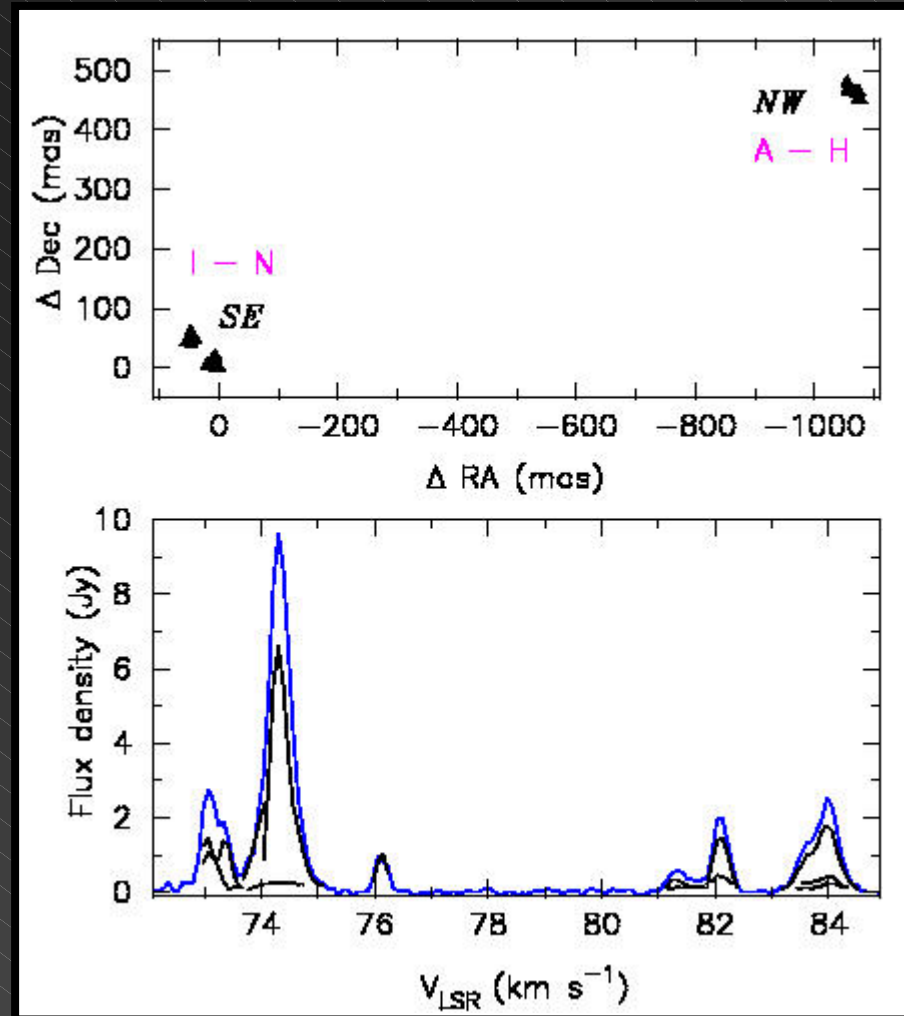
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Results: G36.11+0.55



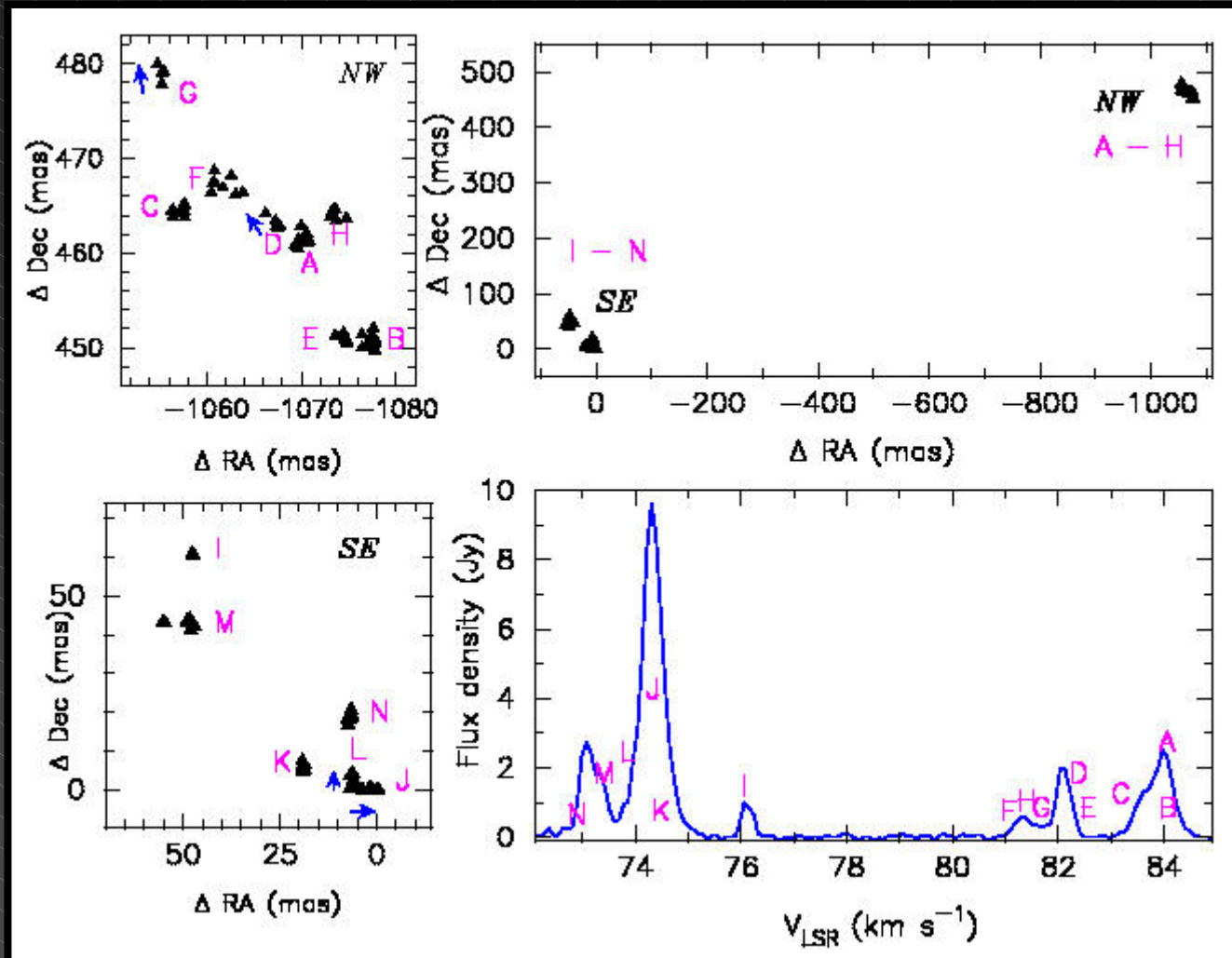
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Results: G36.11+0.55



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Results: G36.11+0.55



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Conclusions:

- we imaged the 6.7 GHz methanol maser emission towards three star-forming region with mas resolutions,
- masers showed linear and arc-like structures,
- internal velocity gradients of maser clusters were roughly perpendicular to the major axis.