Searching for IDV in the quasar B2005+403

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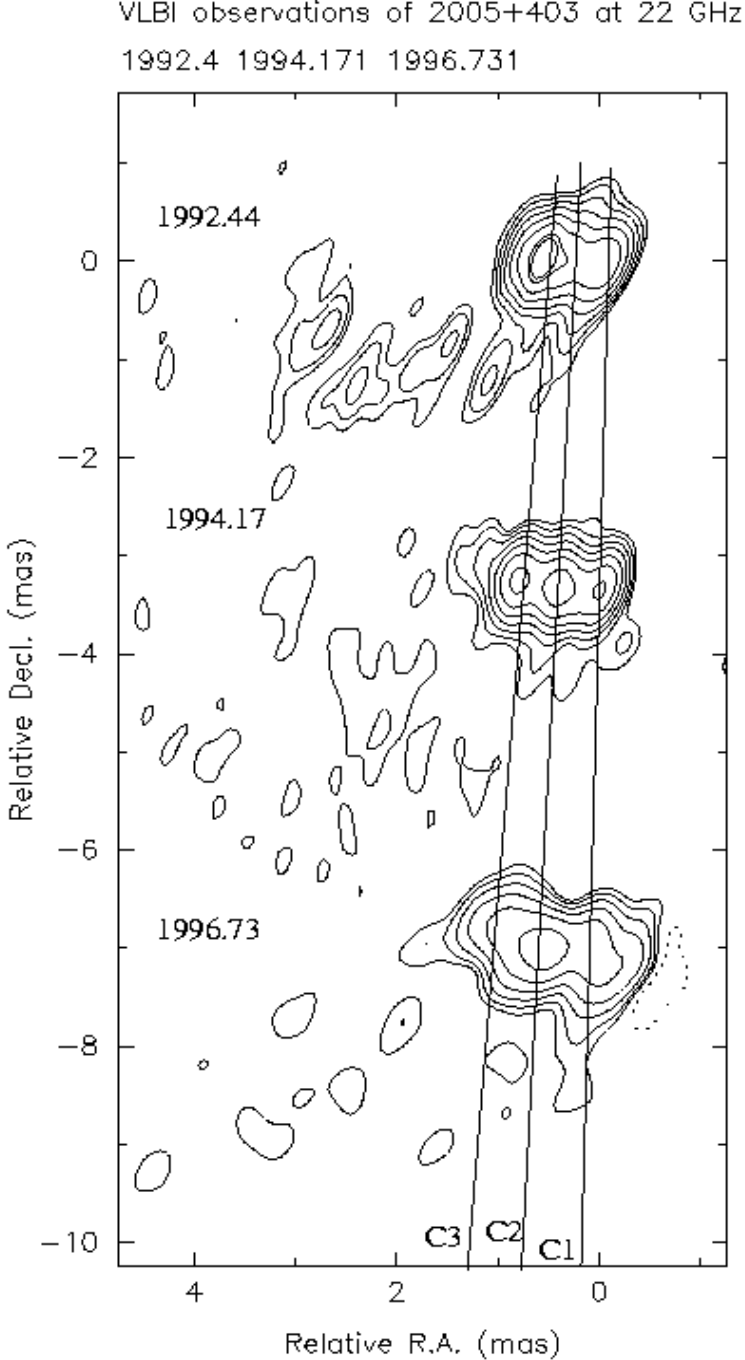
Introducing B2005+403

- Flat-spectrum quasar at z=1.74
- Frequently used as structural calibrator and fringe finder during VLBI observations
- Line of sight passes through the Cygnus region
- Angular broadening measurements and scattering measure calculations were carried out by *Desai & Fey 2001, Mutel et al. 1990, Fey et al. 1989*

VLBI snapshot observations of B2005+403

Epoch	Frequency	Instrument	Origin	Polarization
1992.40	43 GHz	5 stations of EVN	Snapshot	LL
1992.44	22 GHz	8 stations of EVN	Snapshot	LL
1994.17	22 GHz	VLBA (8 stations)+VLA+EVN	Snapshot	LL
1995.27	15 GHz	VLBA	2cm Survey	RR
1995.96	15 GHz	VLBA	2cm Survey	LL
1996.73	43 GHz	VLBA+EB	Snapshot	Full
1996.73	22 GHz	VLBA+EB	Snapshot	Full
1996.73	15 GHz	VLBA+EB	Snapshot	Full
1996.82	5 GHz	8 stations of EVN	Snapshot	LL
1996.83	8 GHz	8 stations of EVN	Snapshot	RR
1997.19	15 GHz	VLBA	2cm Survey	LL
2001.17	15 GHz	VLBA	2cm Survey	LL
2001.98	15 GHz	VLBA	2cm Survey	LL
2003.04	22 GHz	VLBA	Snapshot	Full
2003.04	15 GHz	VLBA	Snapshot	Full

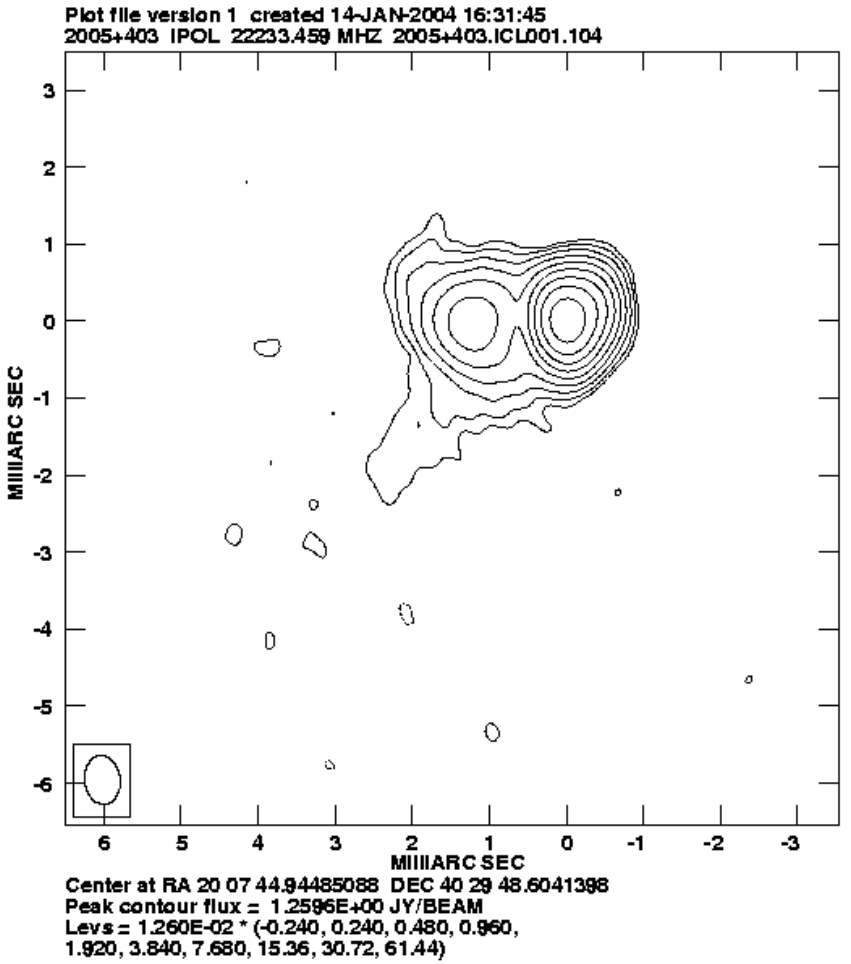


$\beta_{C2} = 4.42 \pm 0.84$

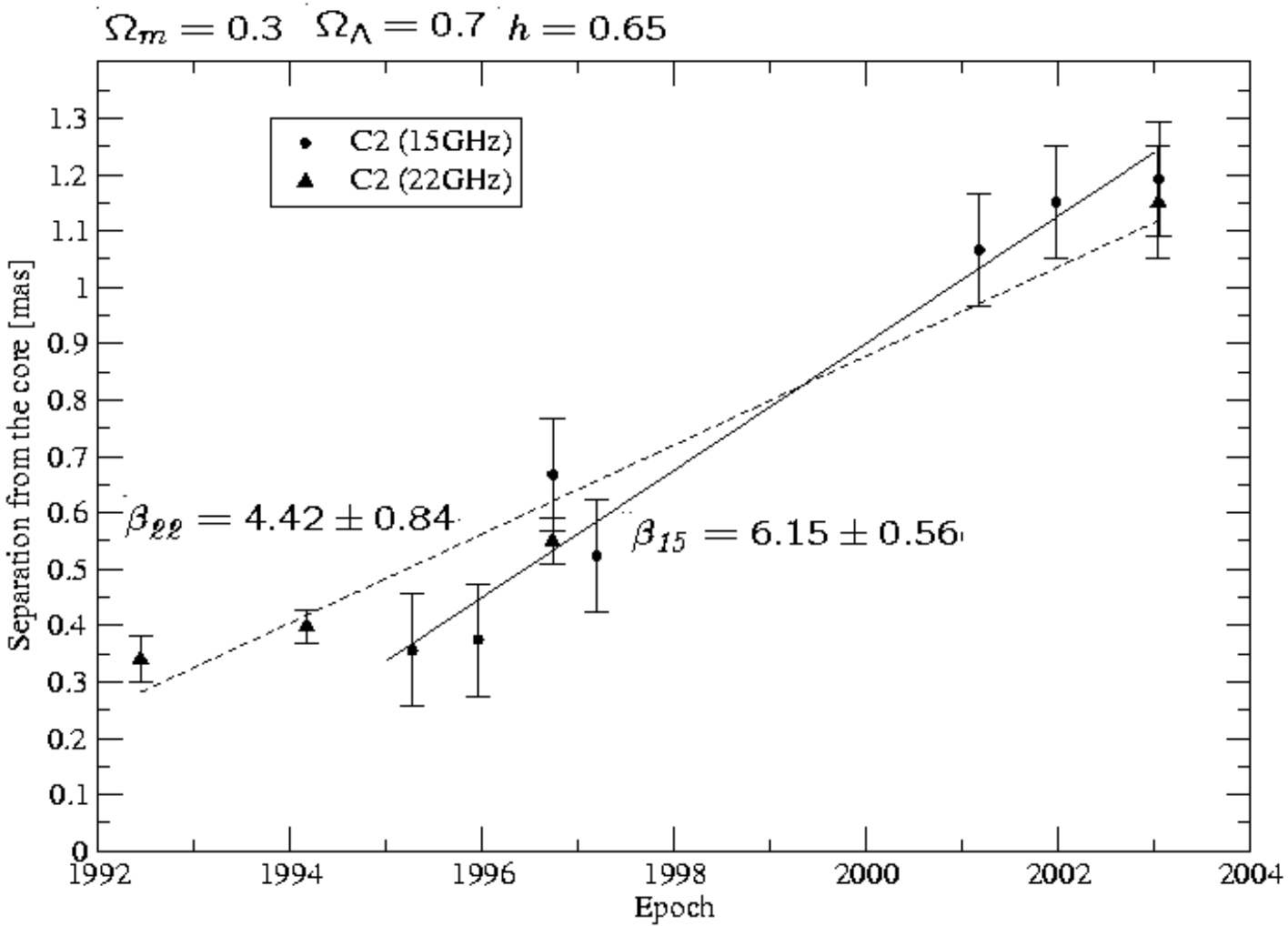
$\beta_{C3} = 2.52 \pm 0.4$

11 slides till

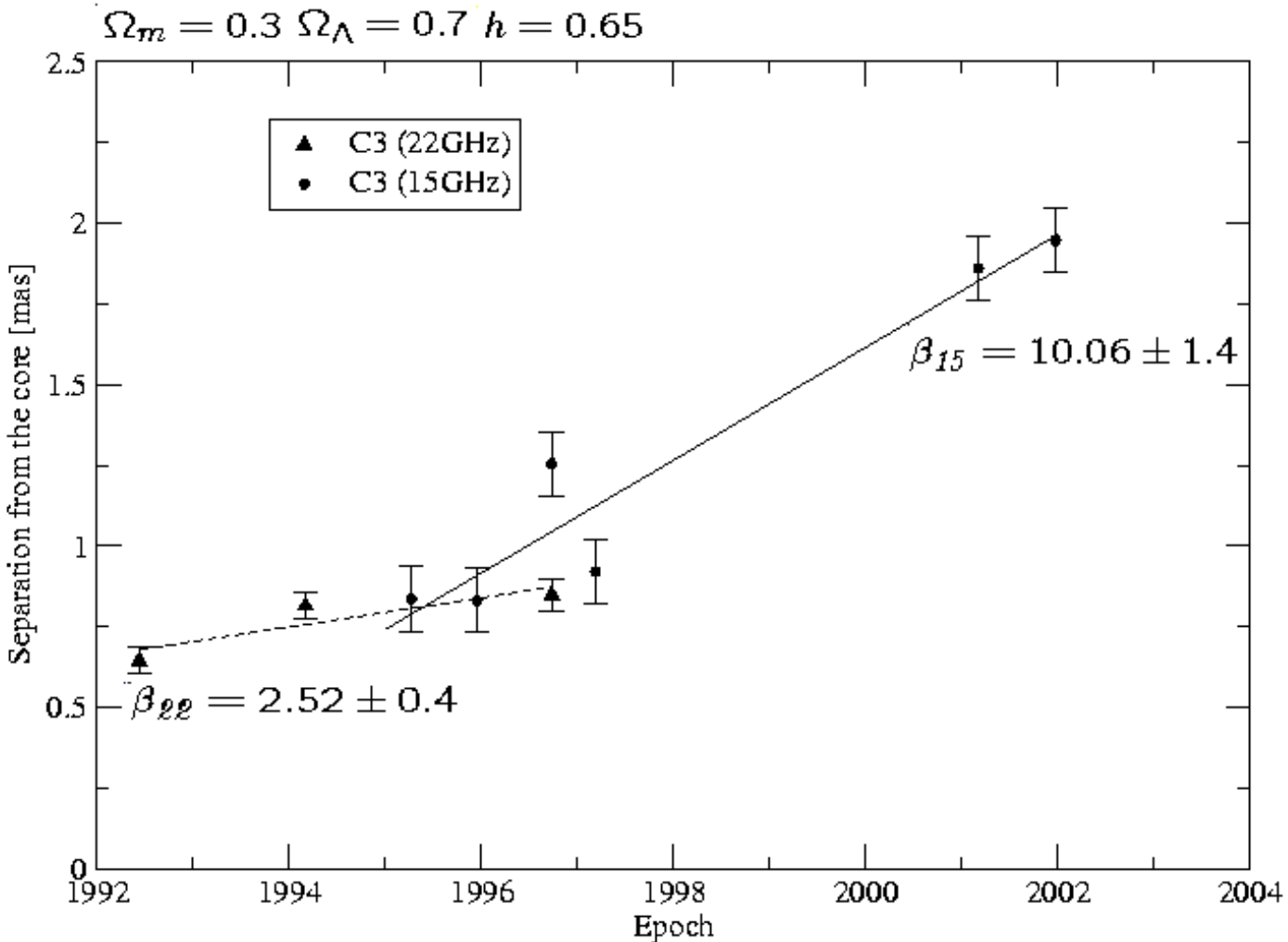
VLBI observation of 2005+403 at 22 GHz 2003.04



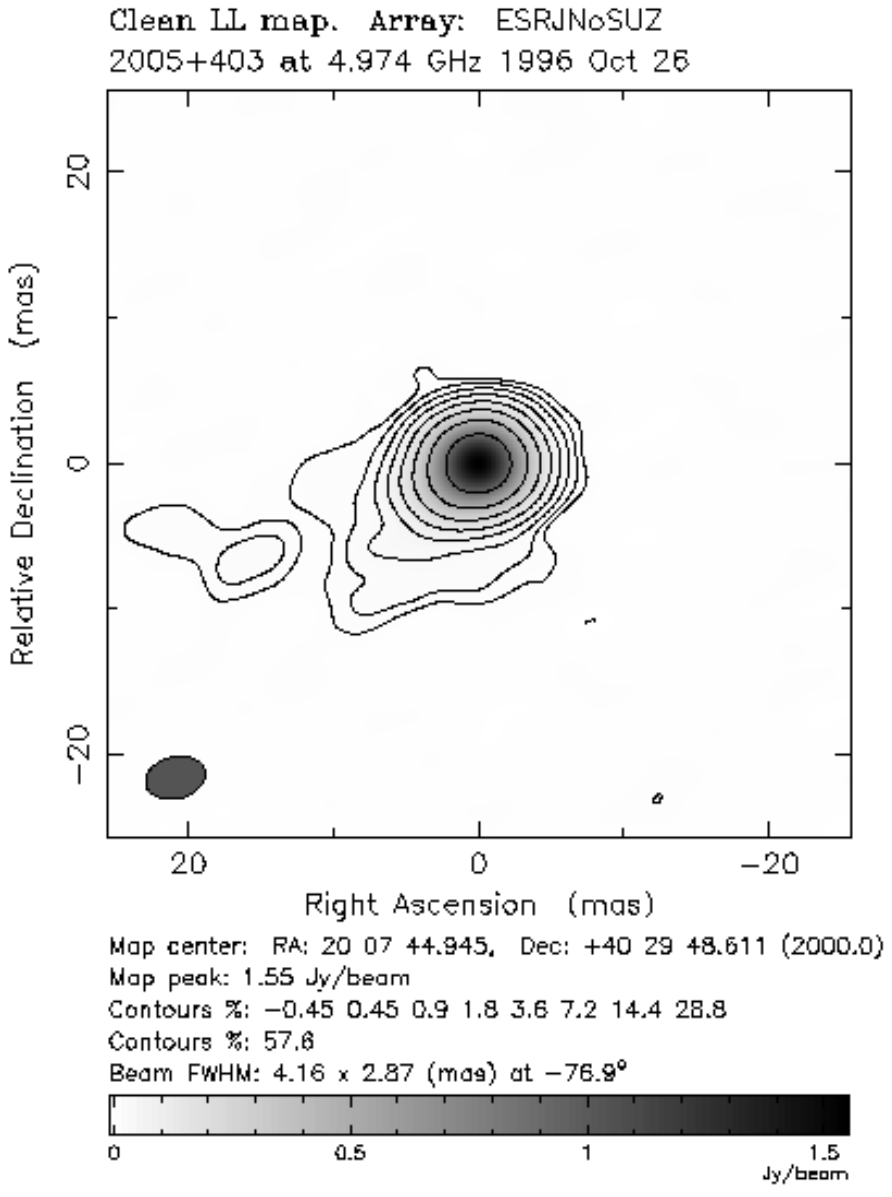
C2 component separation from the core



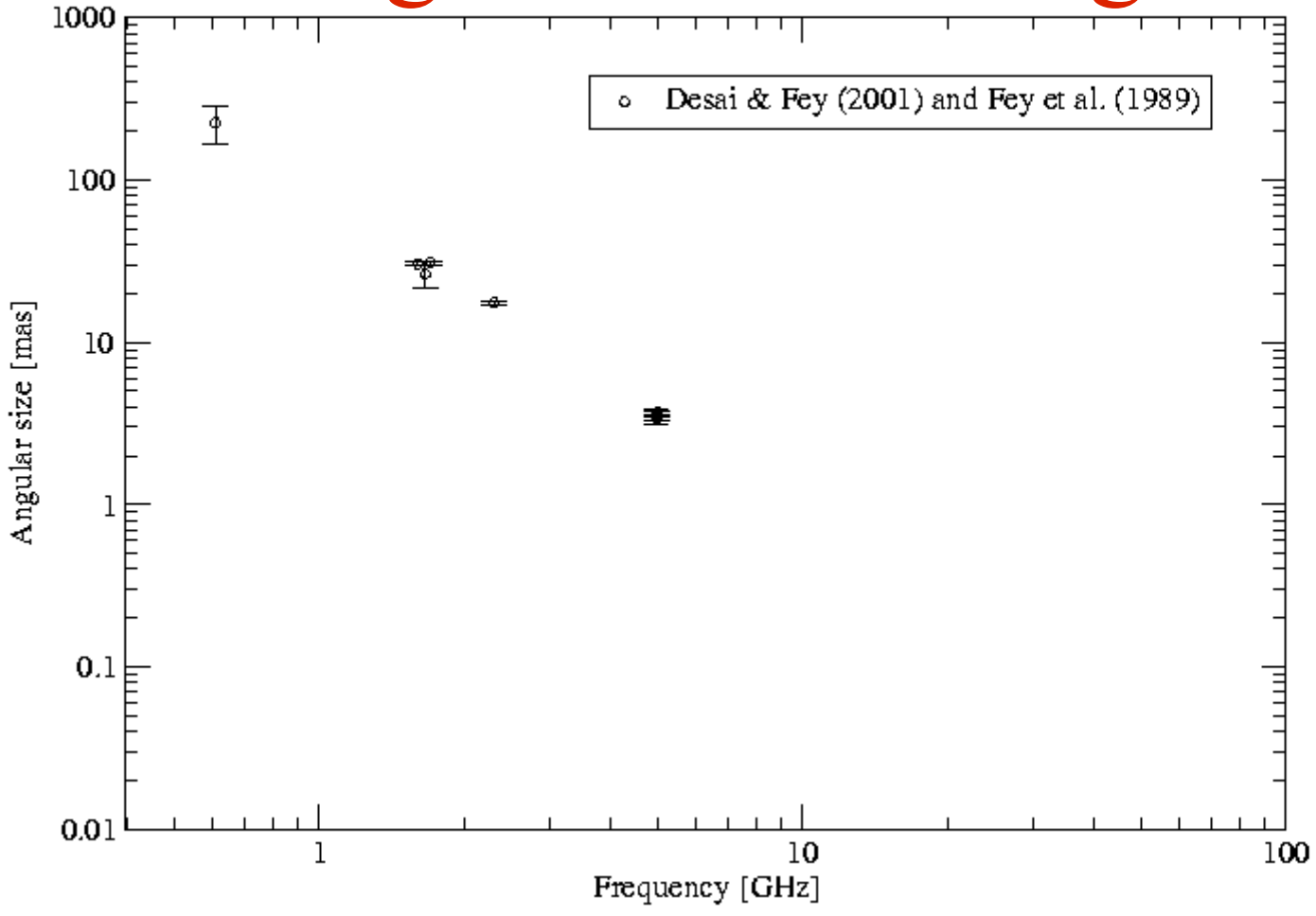
C3 component separation from the core



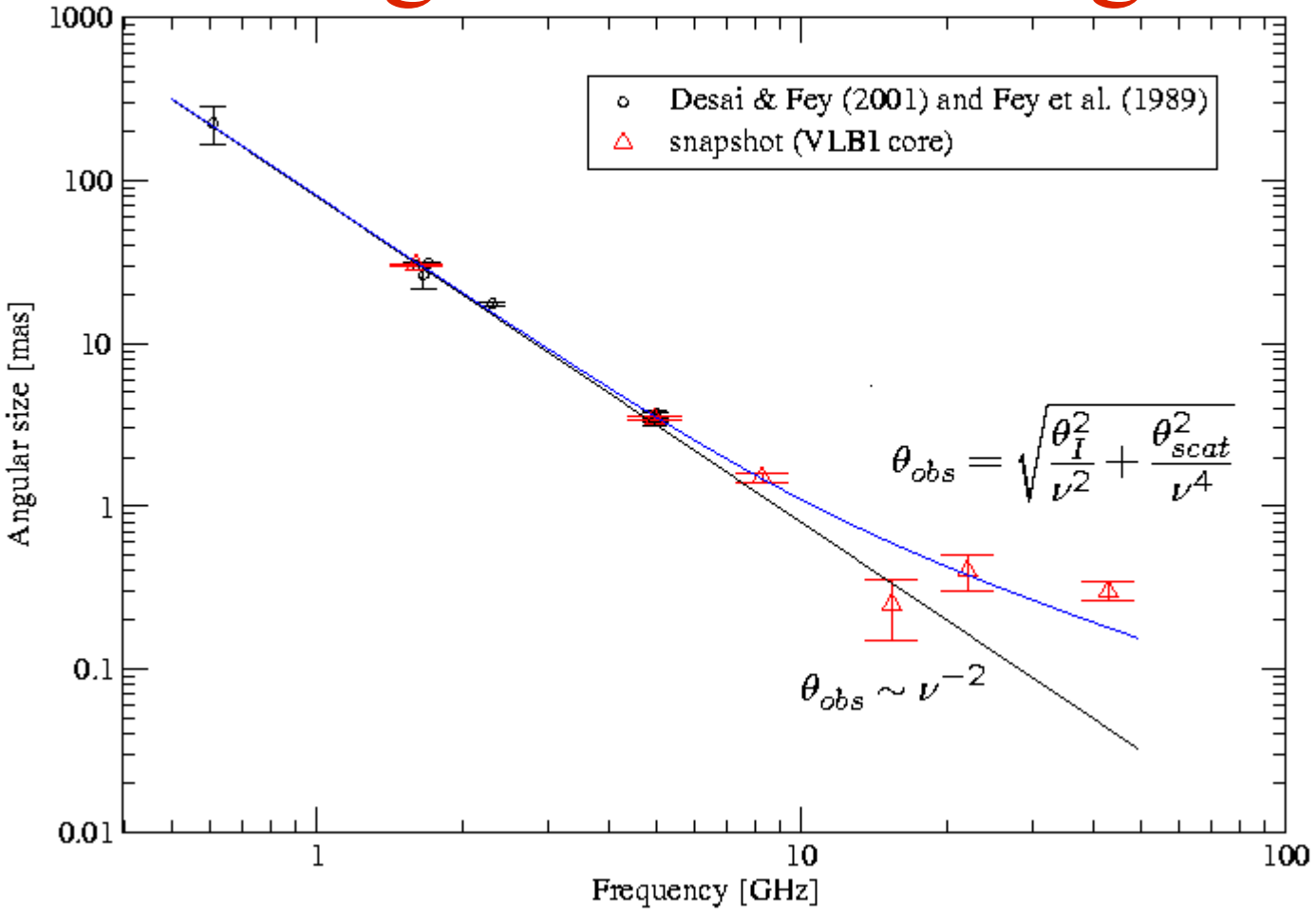
8 slides till



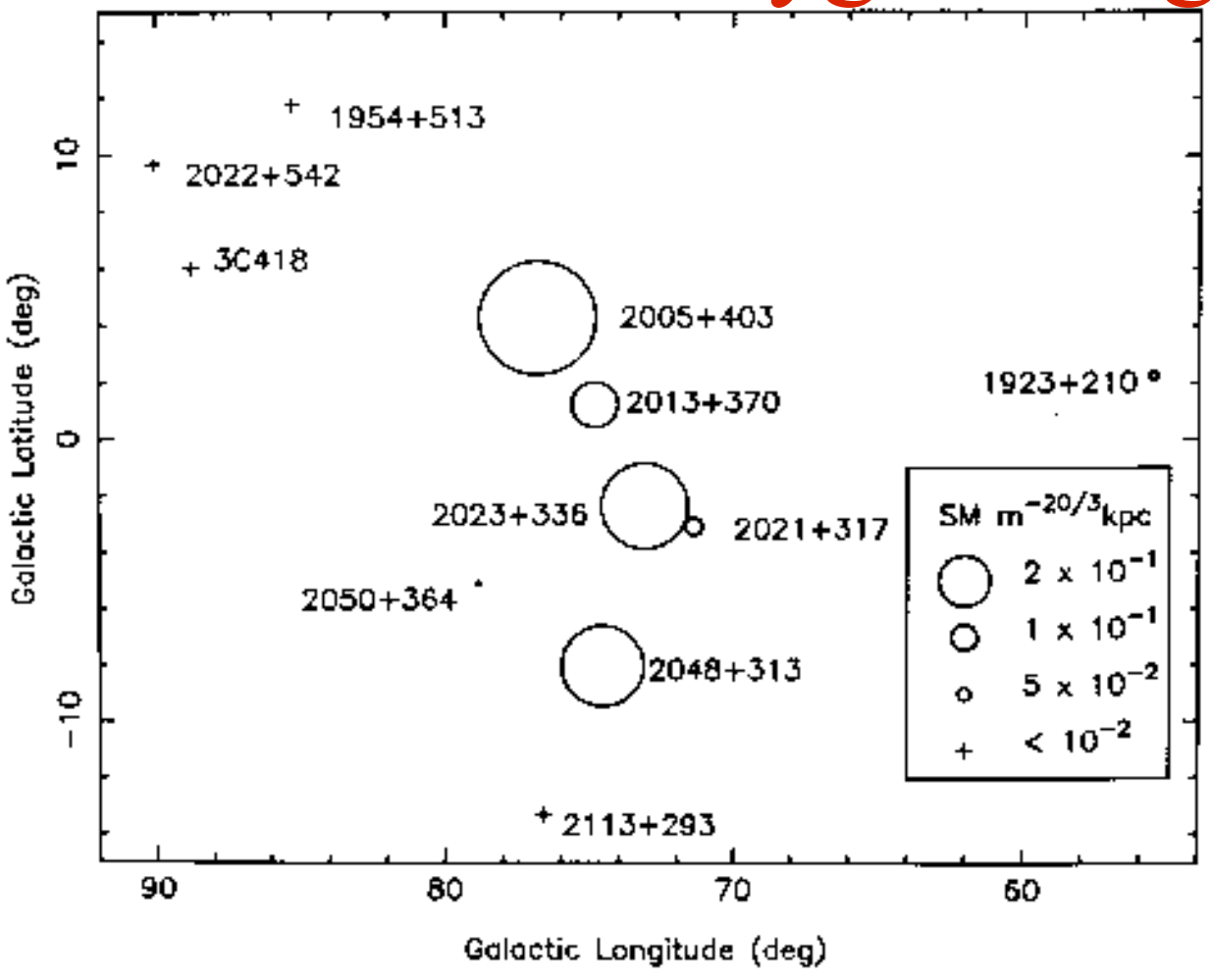
Angular broadening



Angular broadening



SM values in the Cygnus region



Fey, A.L., Spangler, S.R., Mutel, R.L., 1989, Apj, 337, 730

Details of the target sources

Source name	Flux density at 5 GHz	ID	Redshift	Angular broadening
B1954+513	1.6 Jy	QSO	1.23	
B2005+403	3.7 Jy	QSO	1.74	✓
B2008+332	1.1 Jy	Radio source		✓
B2021+317	2.9 Jy	Radio source		✓
B2022+542	1.1 Jy	Radio source		
B2023+336	2.1 Jy	BL	0.21	✓
B2048+313	0.7 Jy	QSO	3.2	✓
B2113+293	1.2 Jy	QSO	1.51	

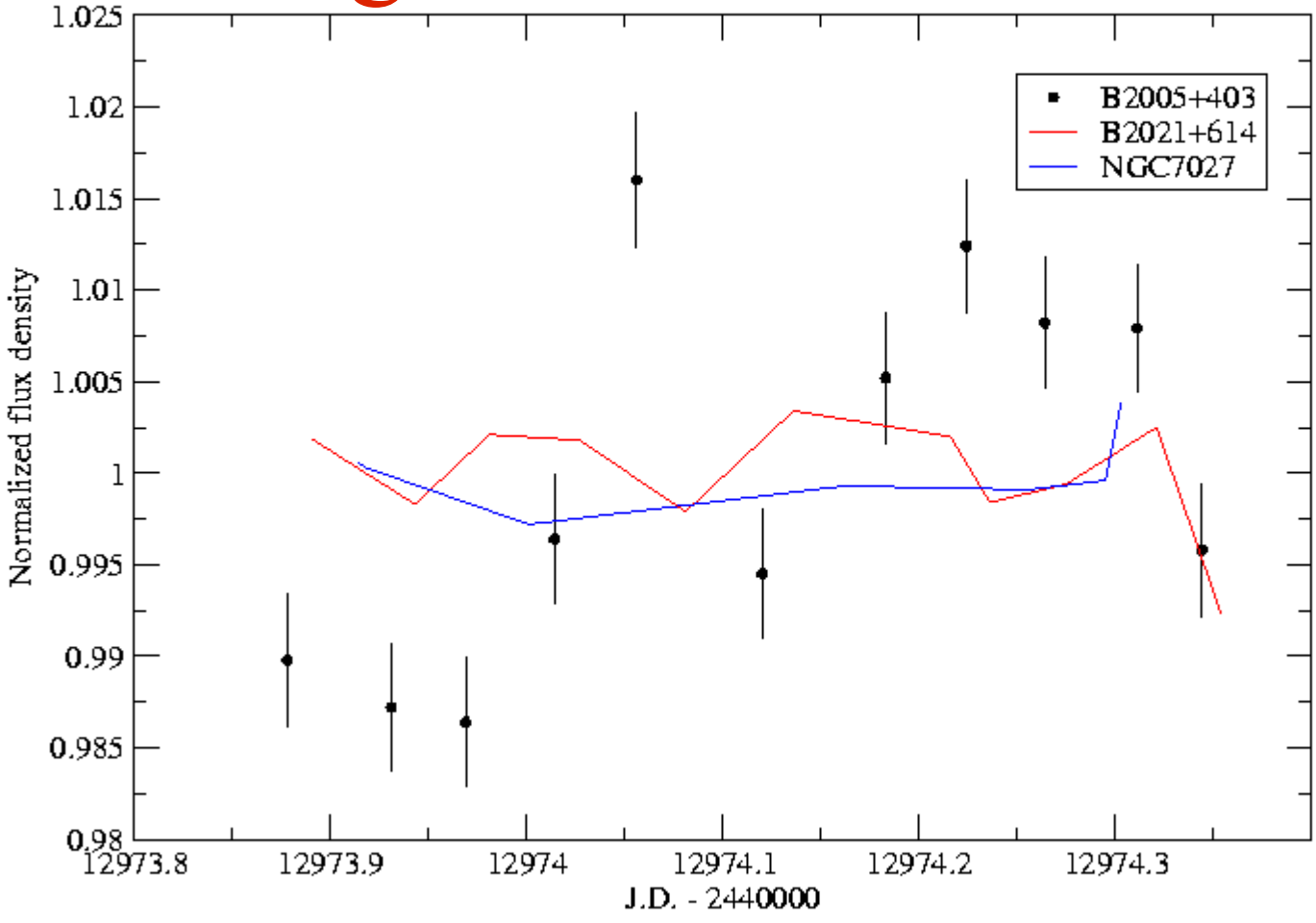
Flux density measurements with the Effelsberg 100-meter telescope

- 8 sources and 4 calibrators
- 12-hour-observations at 6 cm and at 18 cm
- Flux density measurements with cross-scans

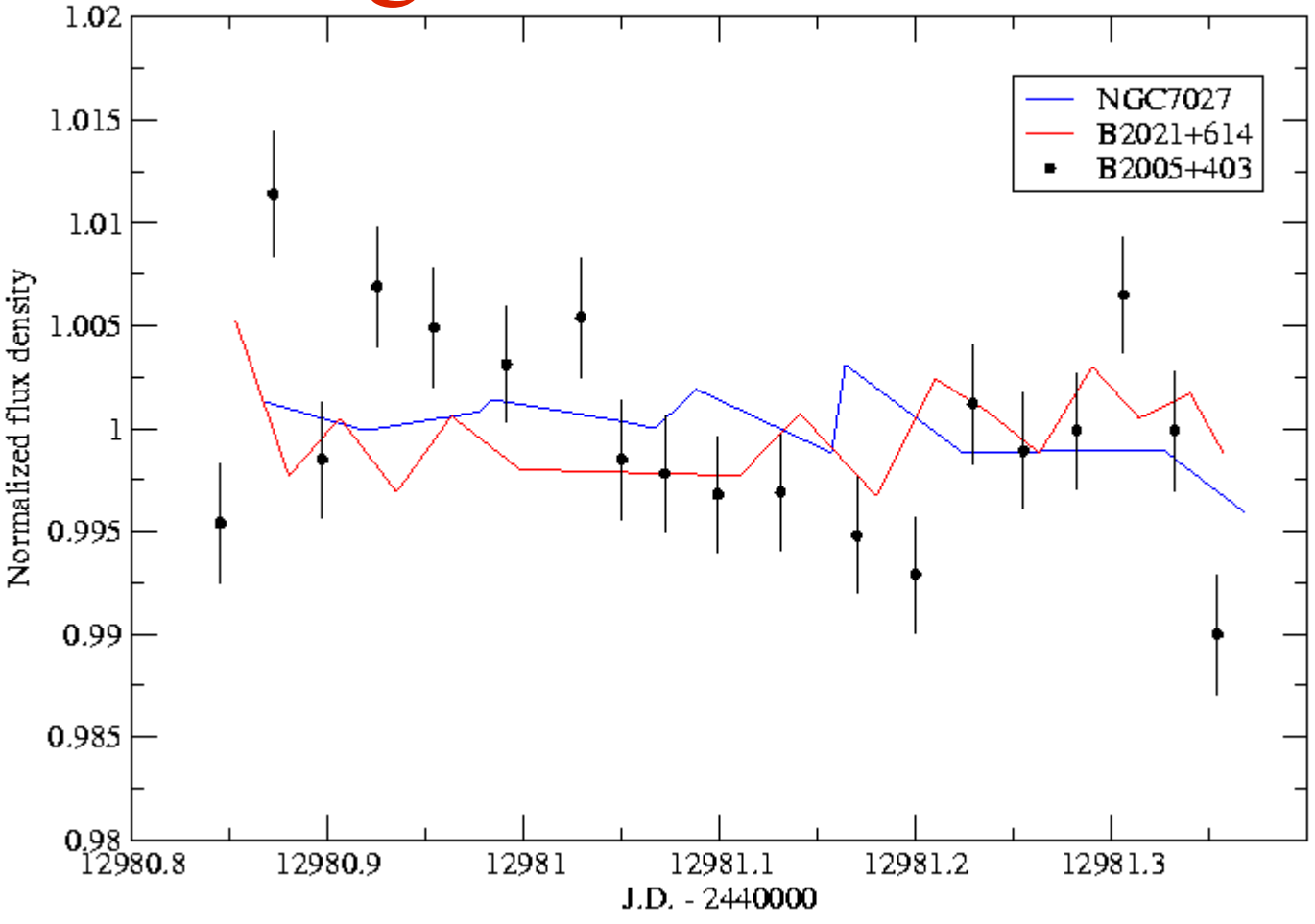
Results

Source name	<S> [Jy]	σ	m [%]	Y [%]	reduced χ2
λ=18 cm, m0=0.3%					
B1954+513	1.46	0.011	0.76	2.06	4.447
B2005+403	2.41	0.024	0.99	2.82	8.497
B2008+332	1.77	0.013	0.76	2.05	4.597
B2022+542	1.04	0.007	0.65	1.70	3.750
B2113+293	0.42	0.003	0.82	2.27	3.719
λ=6 cm, m0=0.24%					
B1954+513	1.07	0.007	0.63	1.75	5.018
B2005+403	2.87	0.015	0.52	1.38	3.413
B2008+332	1.24	0.006	0.52	1.38	3.411
B2022+542	1.01	0.005	0.48	1.26	3.031
B2023+336	1.74	0.010	0.56	1.53	4.003

Lightcurve at 18 cm



Lightcurve at 6 cm



Summary and future work

- ISS affects the image of B2005+403 up to 10-15 GHz
- To know the structural variations, need to observe it at higher frequencies
- IDV is observed in B2005+403 at 6 cm and at 18 cm on a timescale of ~12 hours with amplitudes of ~1.4% and ~3%
- Effelsberg proposal to observe the IDV candidates at three frequencies, with longer timescale, in full polarization
- VLBA-monitoring at 22 and 43 GHz to reveal the remaining secrets