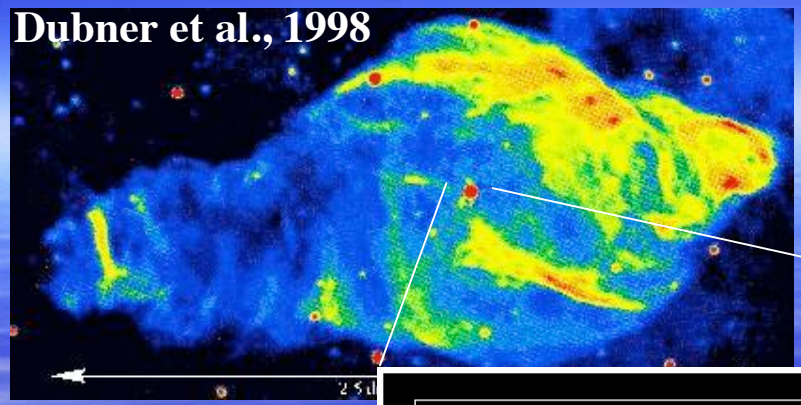
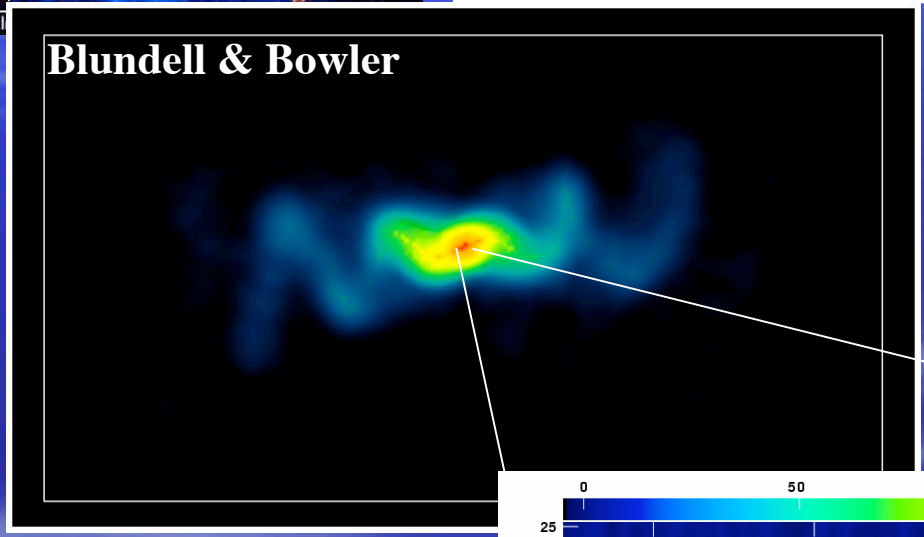
An outburst of SS 433 observed on milliarcsecond scale

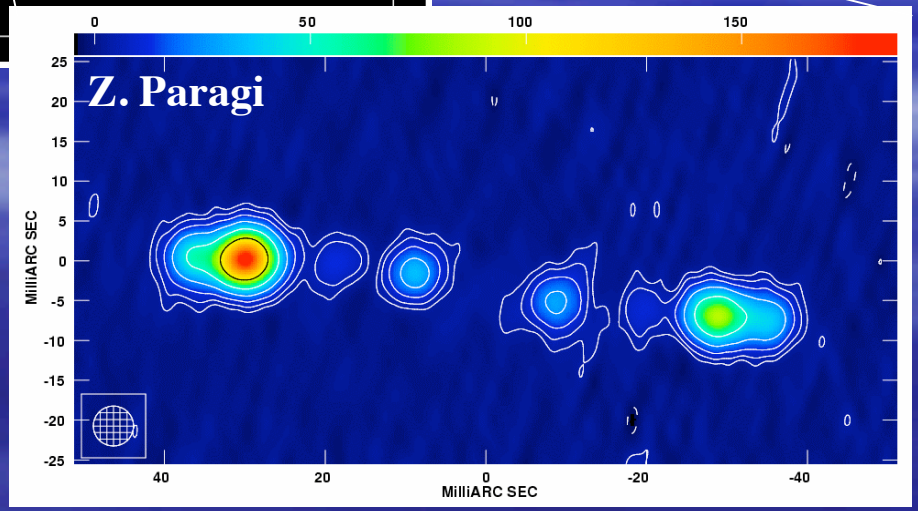
V. Tudose
Z. Paragi, R. Fender, M. Garrett, J. Miller-Jones, S. Trushkin, A. Rushton, R. Spencer, G. Heald, P. Soleri

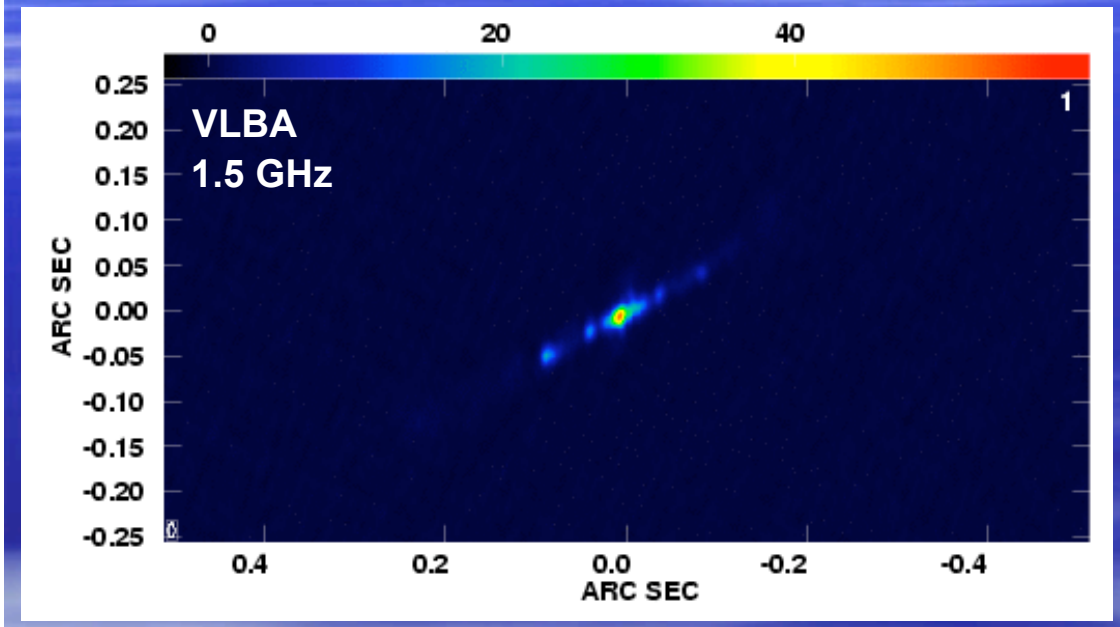
SS 433

- compact object: black hole
- distance ~ 5.5 kpc
- P~13 d
- companion star: A7







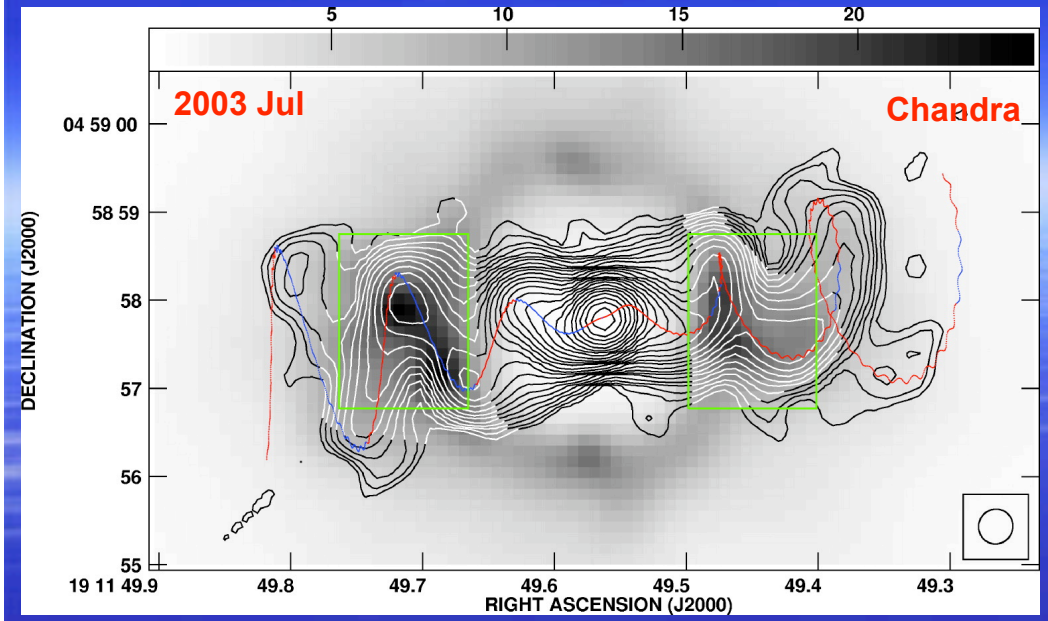


Mioduszewski et al. 2004

42 days

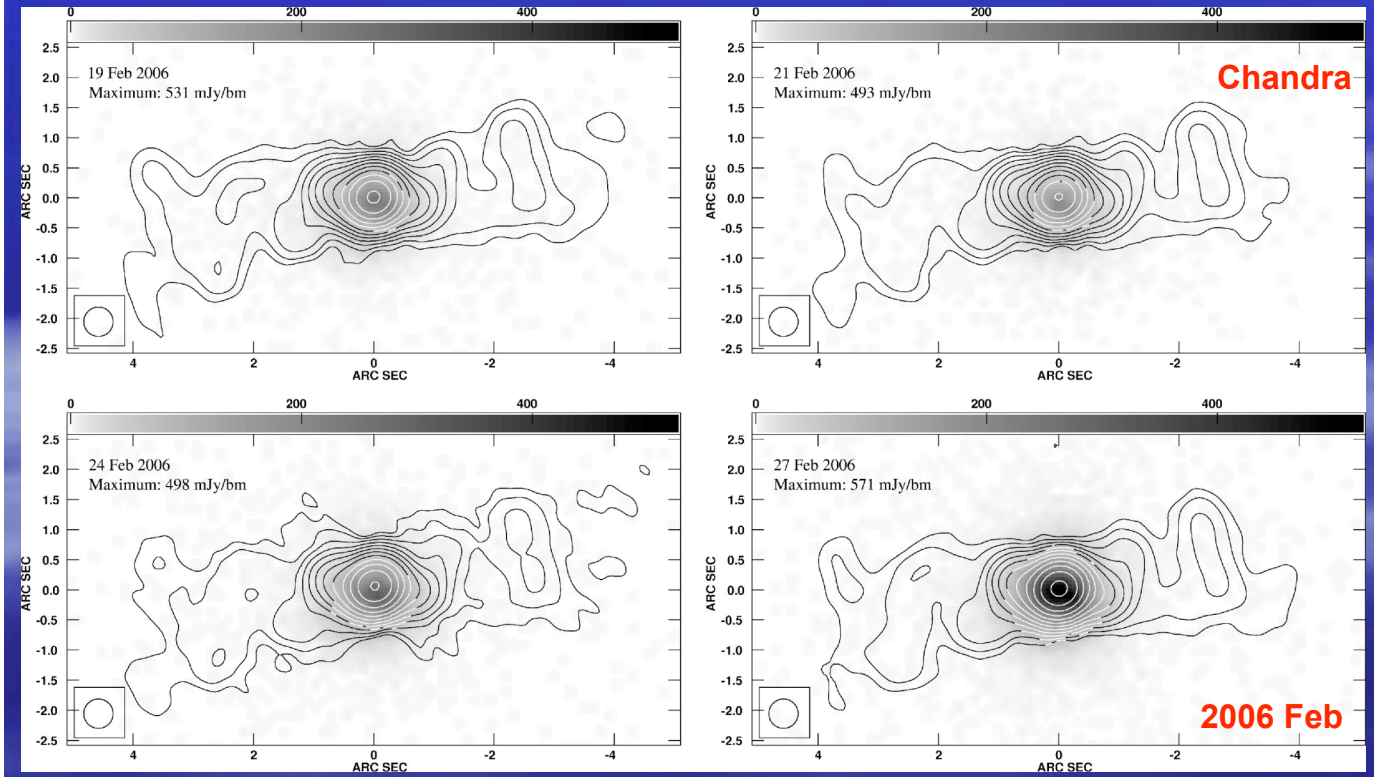
1/4th of the jet precession period

X-ray emission



-variable

-detected in jets sometimes



Miller-Jones et al. 2008

Motivation

- study the dynamics of the ejecta at mas scales
- attempting to detect and study the polarization properties at mas scales
- study the relation between the radio and X-ray emission

Motivation

- study the dynamics of the ejecta at mas scales
- attempting to detect and study the polarization properties at mas scales
- ~~study the relation between the radio and X-ray emission~~

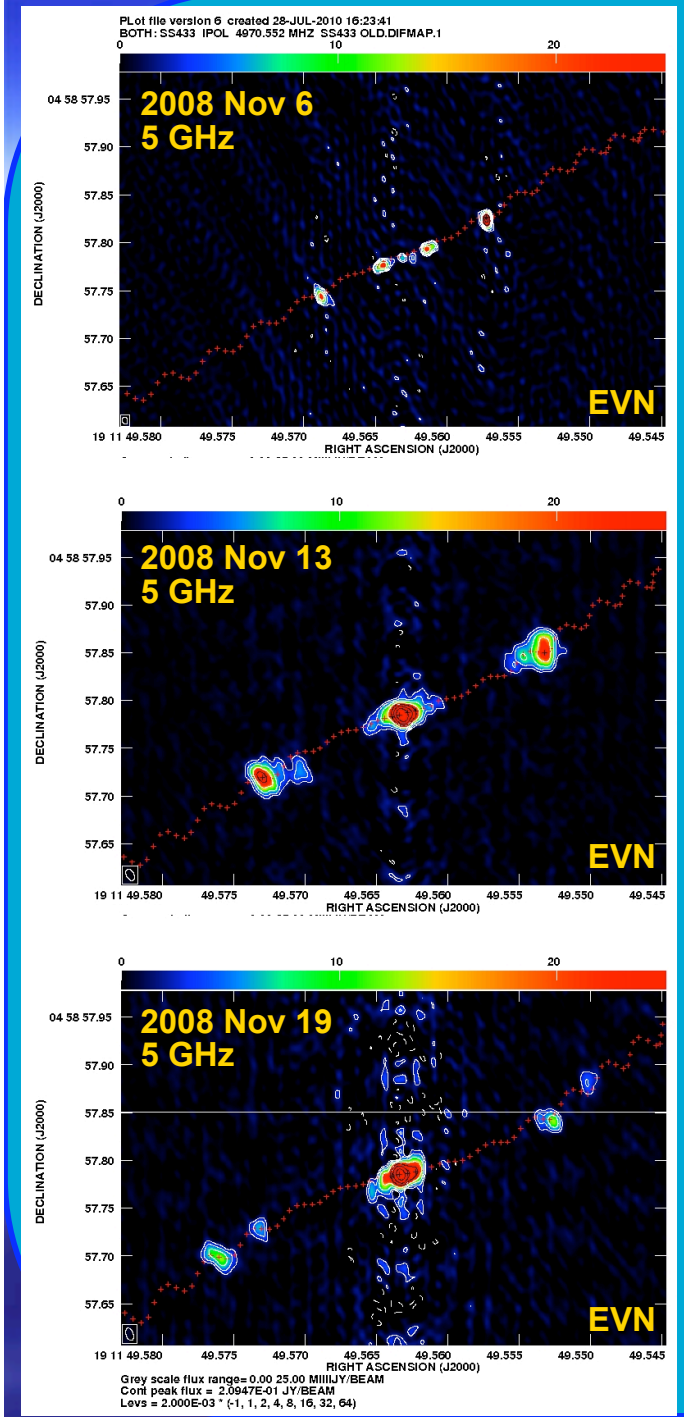
EVN

~~VLA~~

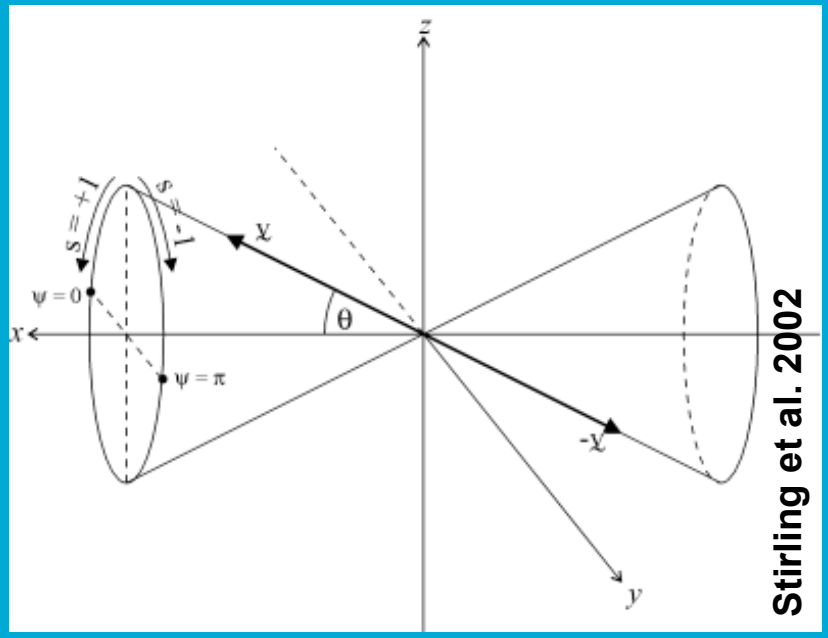
~~Chandra~~

days

~ 3 months



The kinematic model



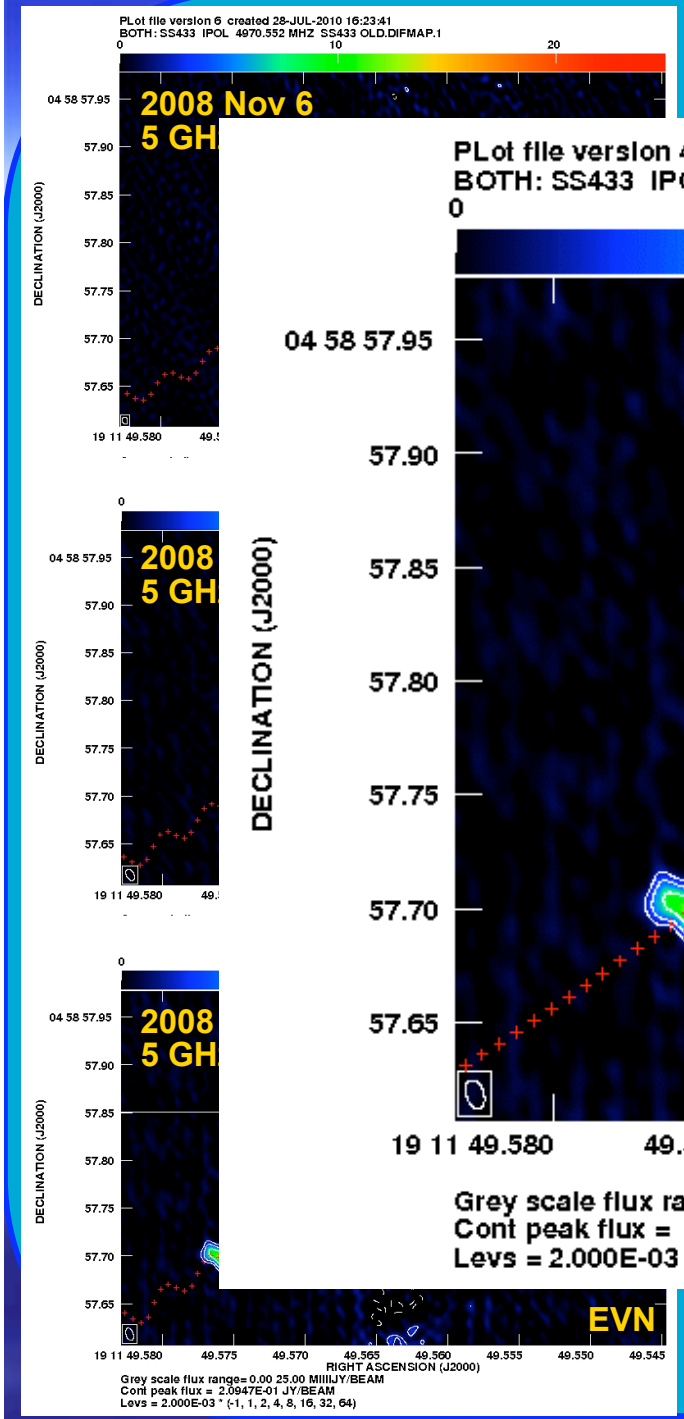
Precession

Inclination	i=78.83 deg
Cone angle	θ=19.85 deg
Position angle	χ=98.2 deg
Phase reference	ψ_0=MJD 48615.5
Period	P=162.5 d
Ejection velocity	v=0.2602 c

Nutation

5.8d Amplitude	0.00382
5.8d Period	5.838 d
5.8d Phase reference	MJD 43588.0
6.3d Amplitude	0.00655
6.3d Period	6.290 d
6.3d Phase reference	MJD 43587.4

The kinematic model



0382

38 d

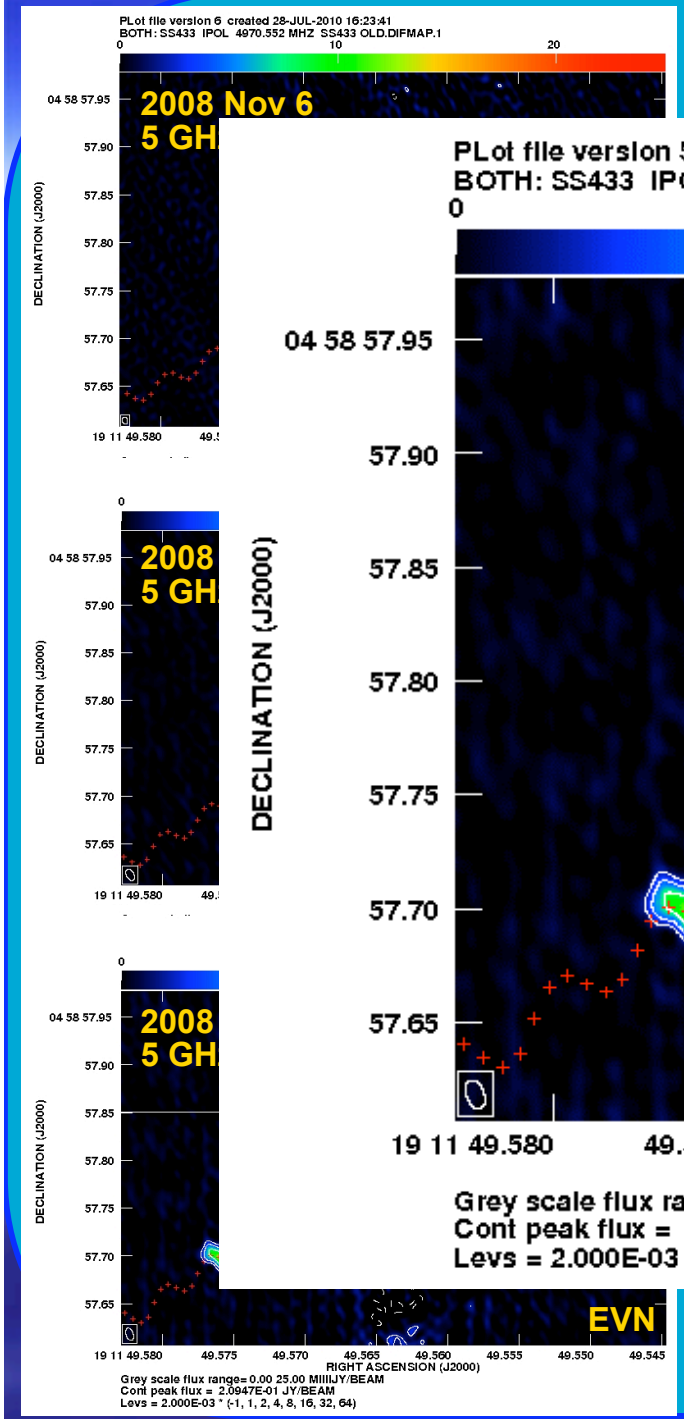
D 43588.0

0655

90 d

D 43587.4

The kinematic model



0382

38 d

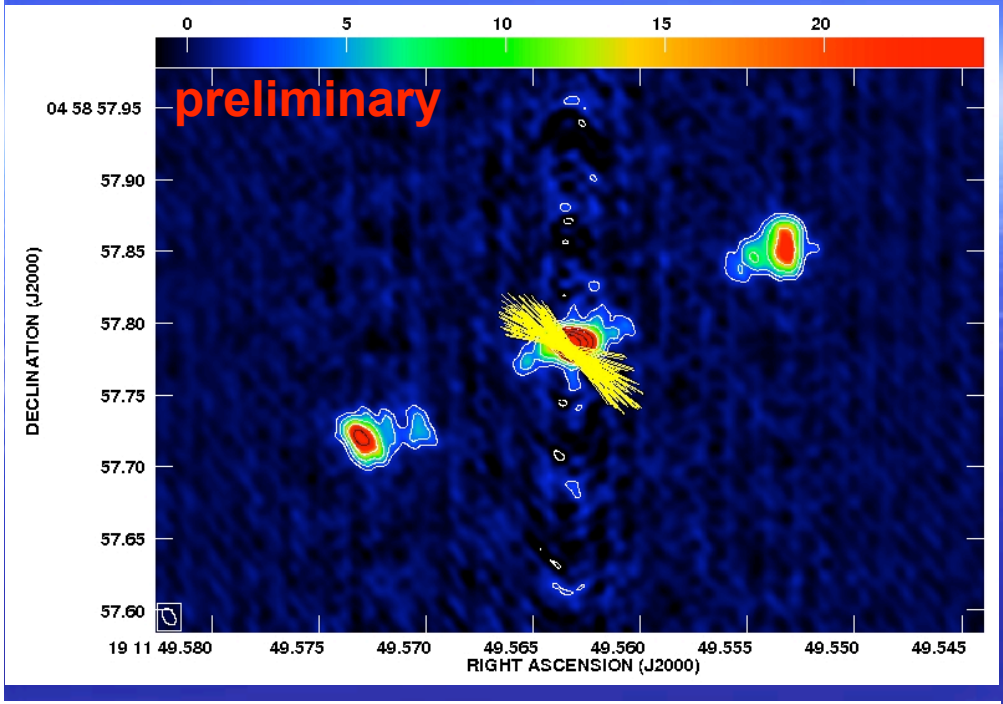
D 43588.0

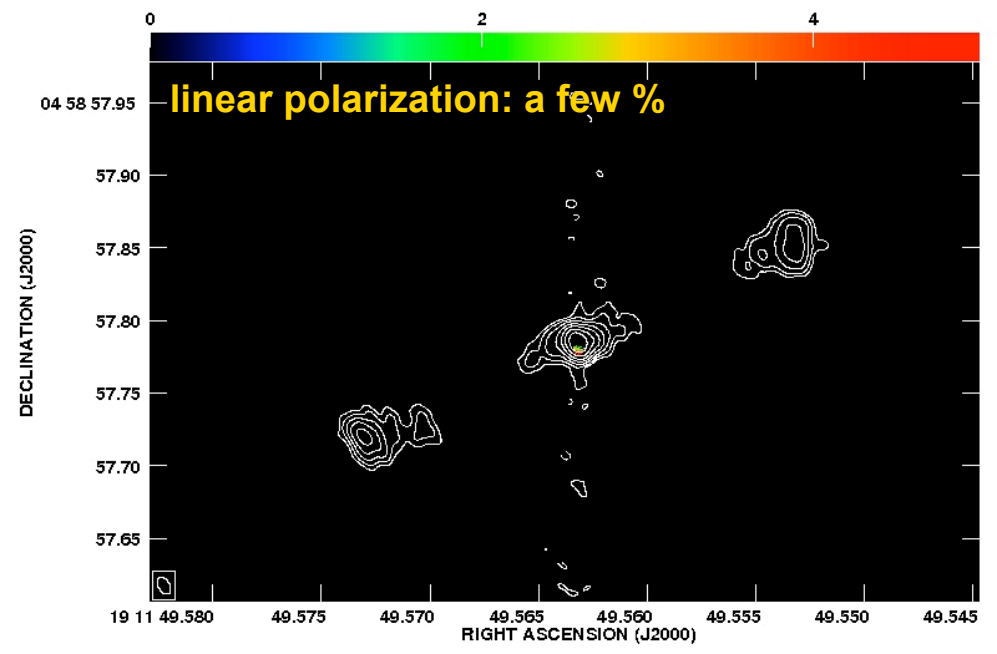
0655

90 d

D 43587.4

Detection of polarization at mas scales





no absolute PA calibration

no galactic RM correction

first detection of polarization at a few mas scale

the ejected blobs are not polarized

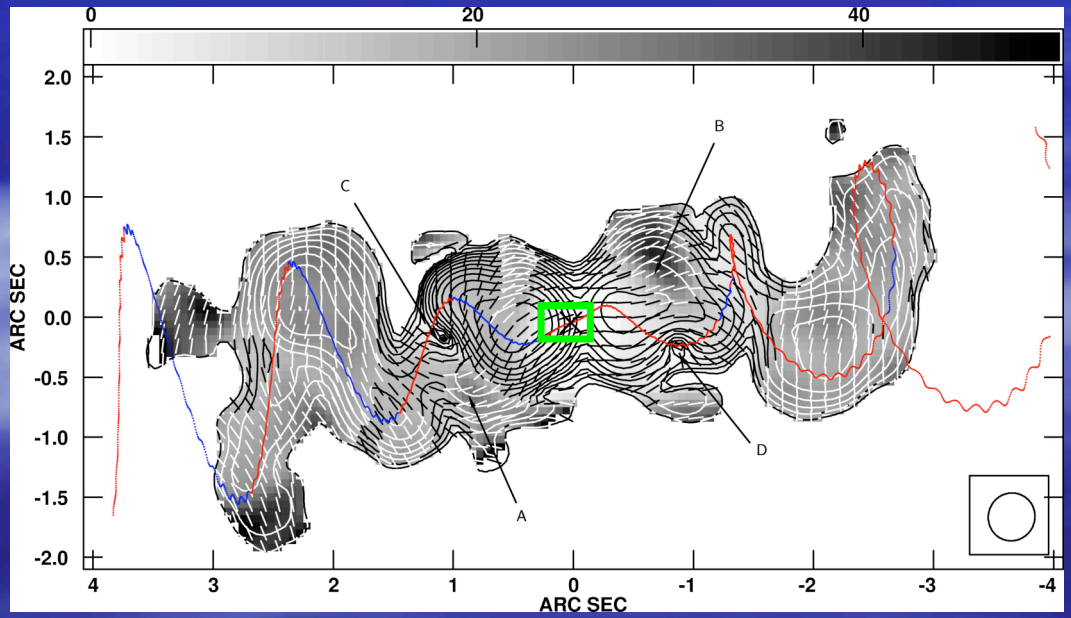
↓

adiabatically expanding blobs ?

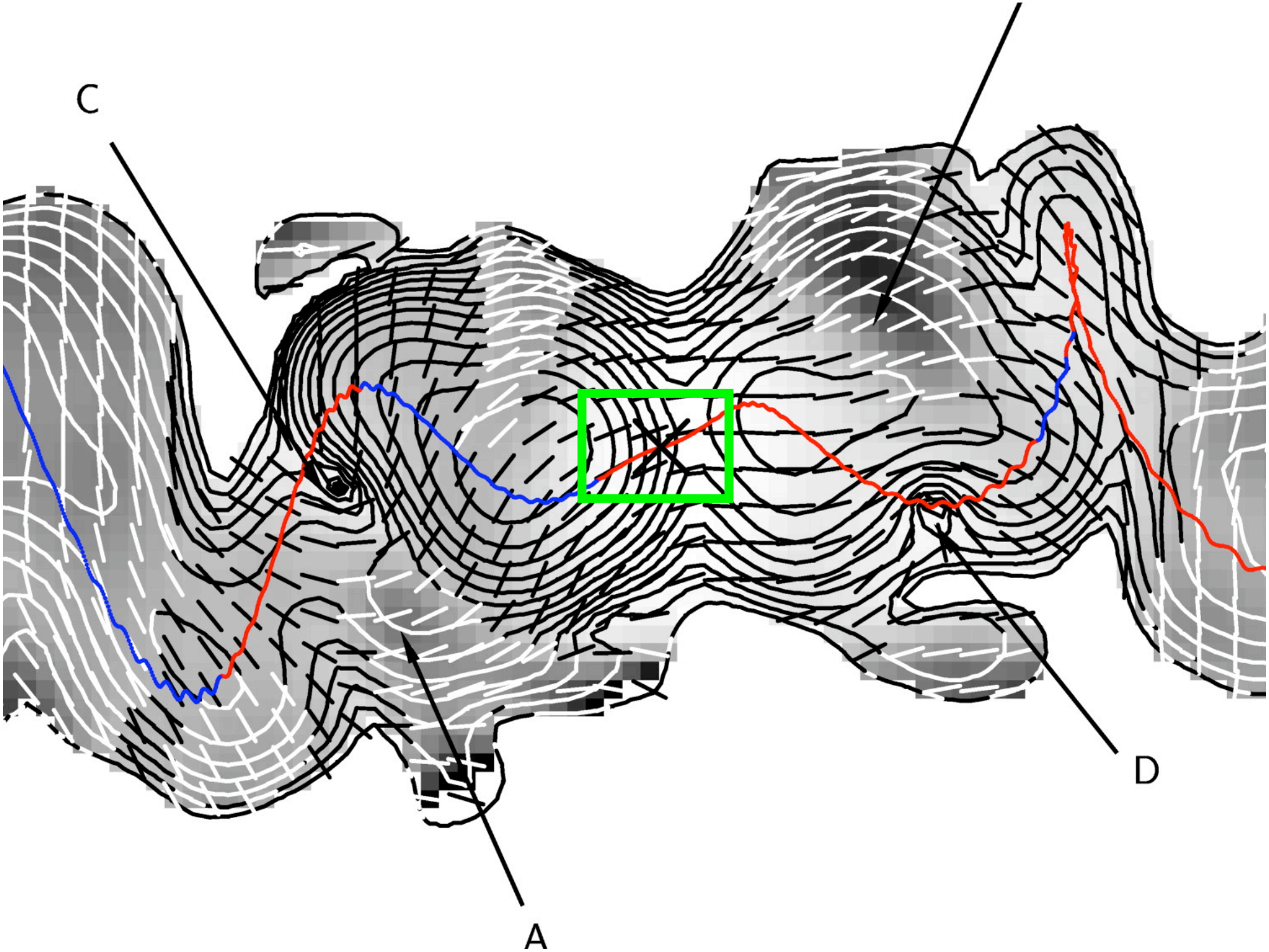
Polarization properties at arcsec scale *relatively* well known

- Depolarization within 1 arcsec of the core
- Close to the core the EVPAs oriented along the jet

velocity field ?
plasma tube ?



Miller-Jones et al. 2008


C
D
A

Conclusions

- First detection of polarization in SS 433 at a few mas scale
- Ejected blobs are not polarized within ~100 mas of the core

  ⟹ adiabatic expansion ?
- The kinematic model describes well the mas scale observations

To do

- Apply RM-synthesis to the data
- Compare the polarization properties at mas and arcsec scales
- Constrain the kinematic model parameters