

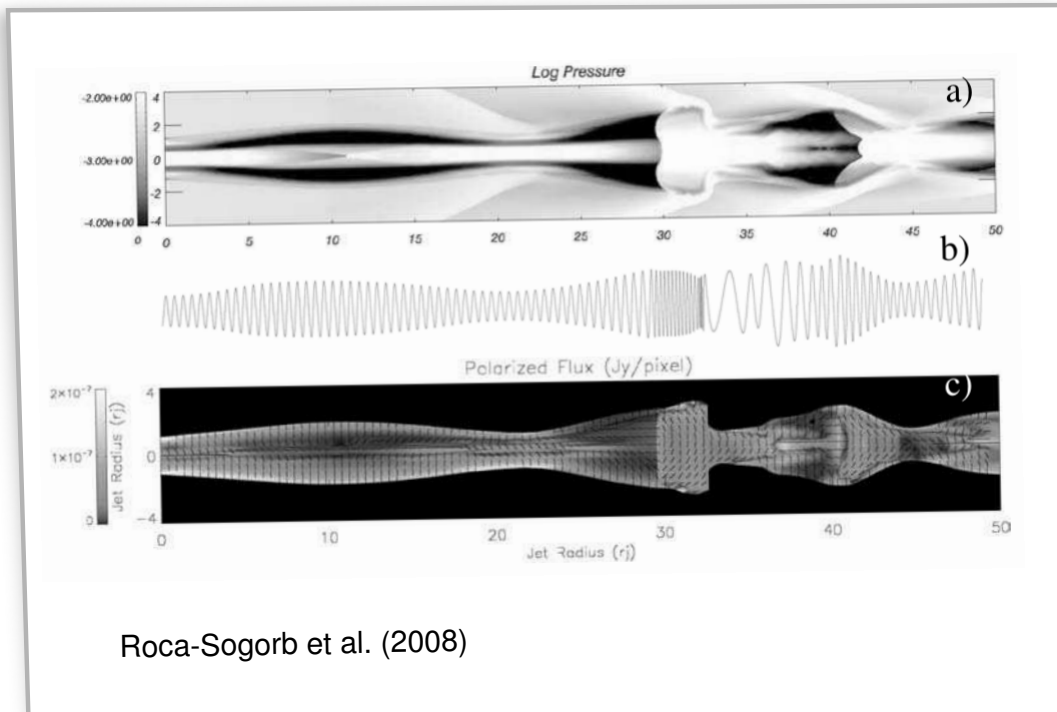
VLBA polarimetry monitoring of 3C 111 as a tool to probe AGN jet physics on parsec scales

T. Beuchert, M. Kadler, M. Perucho, C. Großberger, R. Schulz,
I. Agudo, C. Casadio, D. Gabuzda, J.L. Gómez, M. Gurwell,
D. Homan, Y.Y. Kovalev, M.L. Lister, S. Markoff, S.N. Molina,
A.B. Pushkarev, E. Ros, T. Savolainen, T. Steinbring, C. Thum,
J. Wilms

2017 June 15

Polarised Emission from Astrophysical Jets 2017, Ierapetra

Motivation



Roca-Sogorb et al. (2008)

Cawthorne et al. (2009)

Myserlis et al. (2016)

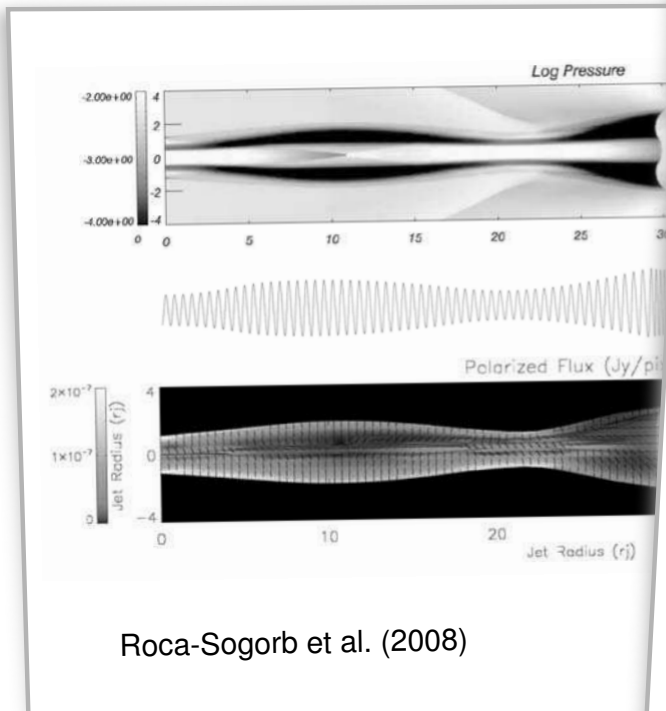
TEMZ model: Marscher (2014); MacDonald & Marscher (2016)

RAISHIN code: Mizuno et al. (2006,2011,2015); Gomez et al. (2016)

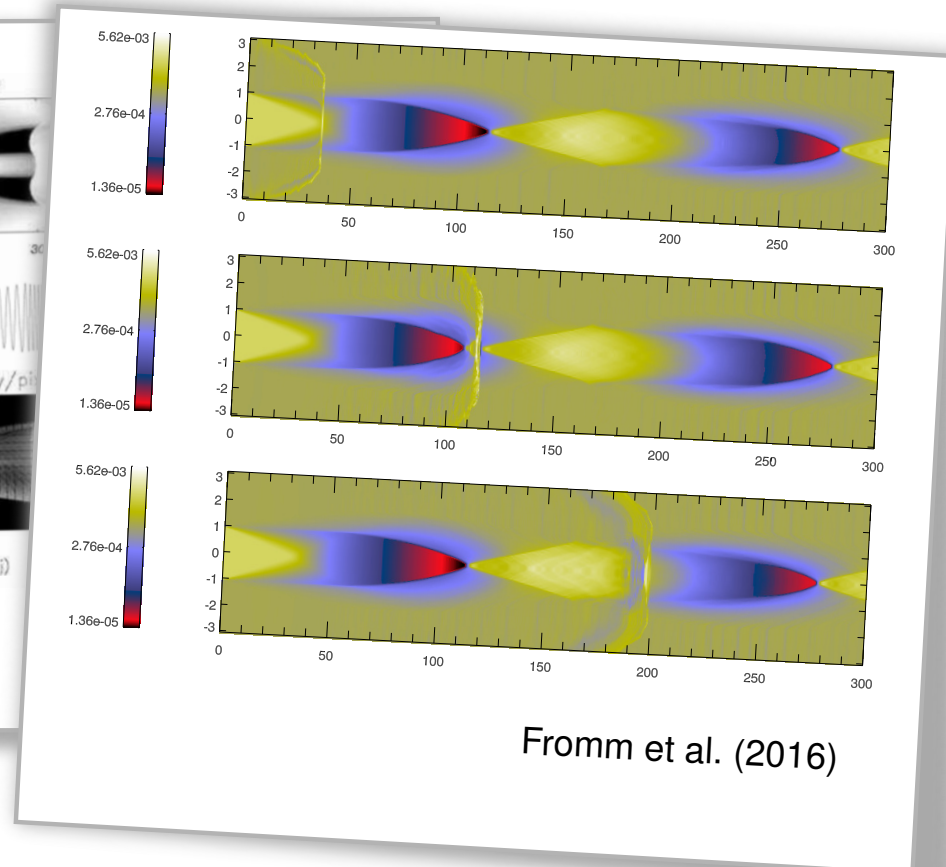
Porth et al. (2011)

talks and papers, e.g., by A. Fuentes, C. Fromm, K.I. Nishikawa

Motivation



Roca-Sogorb et al. (2008)



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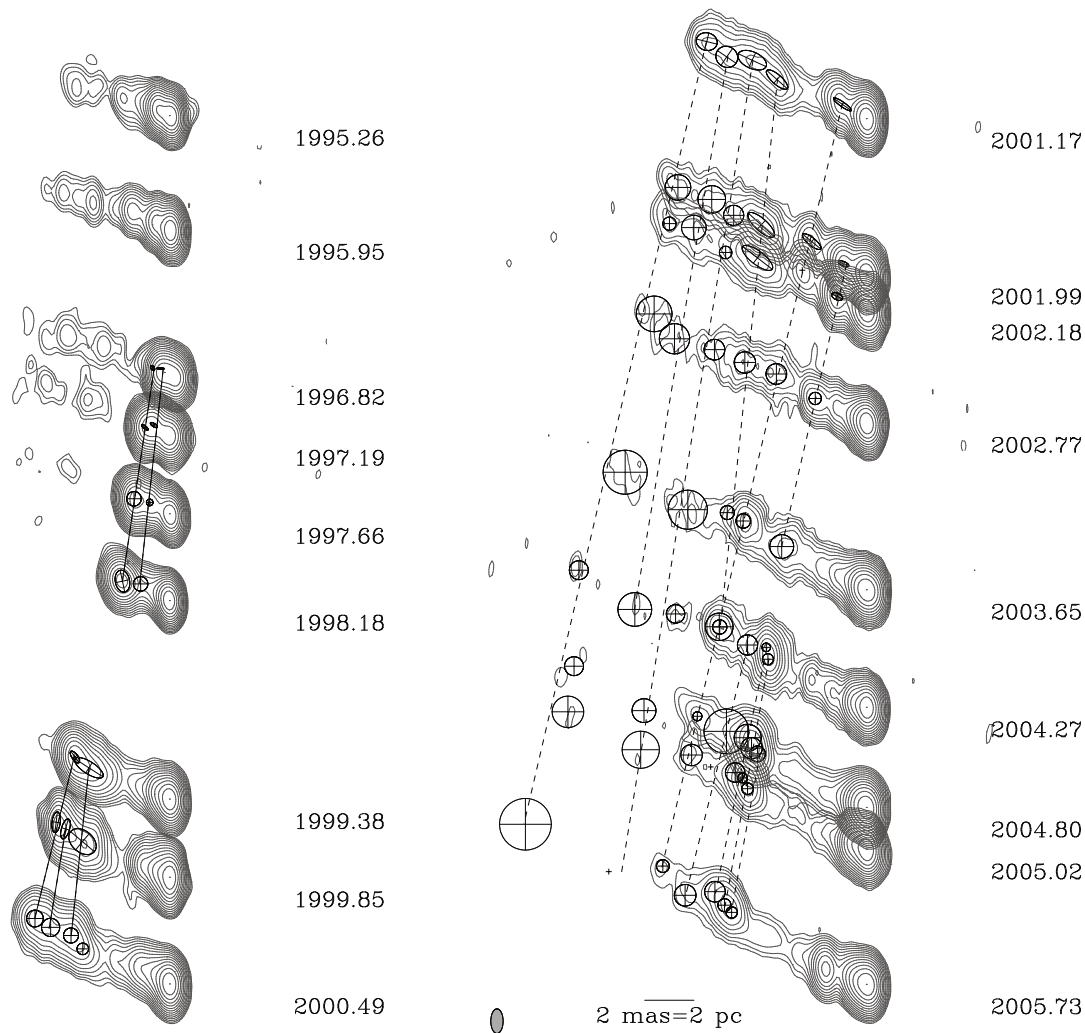
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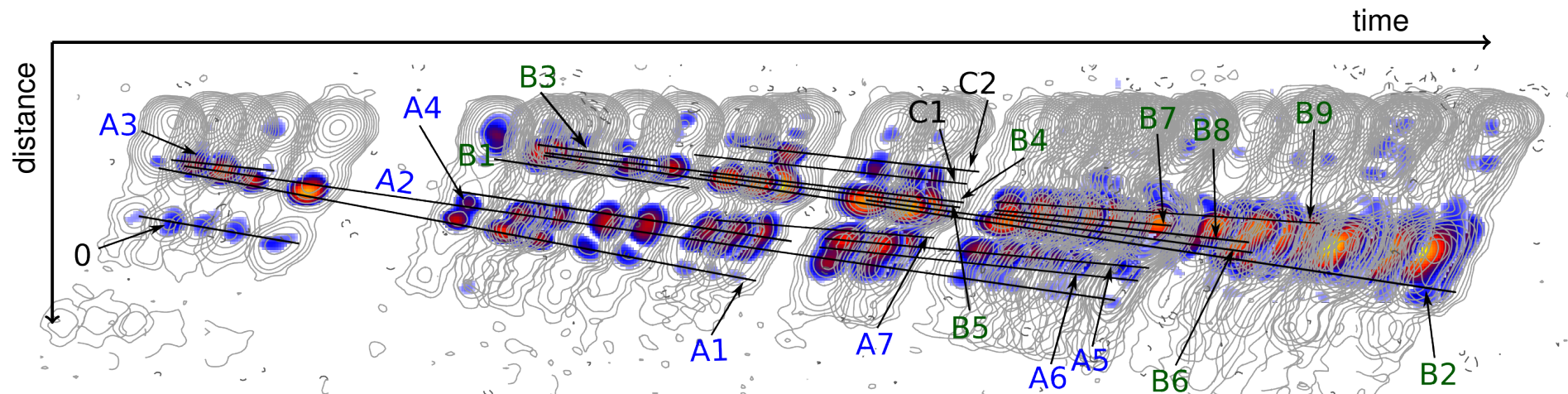
Previous work



Kadler et al. (2008)
Perucho et al. (2008)

- 10 years, 18 epochs
- 7 epochs with polarimetry data
- great study of kinematics and jet physics

Continued MOJAVE monitoring at 15 GHz

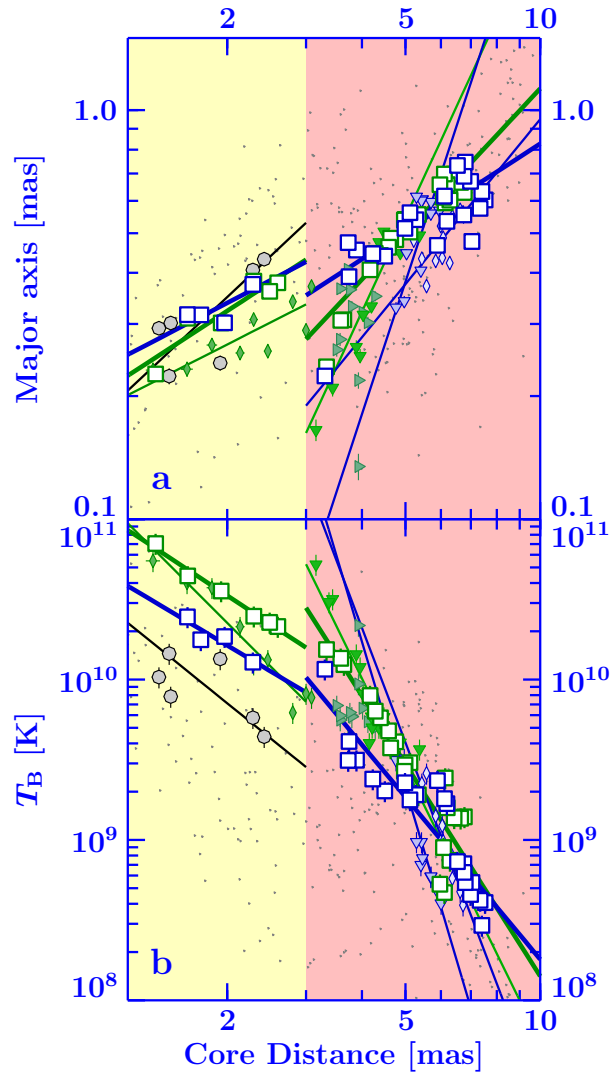


- 36 epochs in 5 years
- most dense sampling of polarized flux
- study complex jet-intrinsic dynamics with polarimetry

Beuchert et al., 2017, in prep.

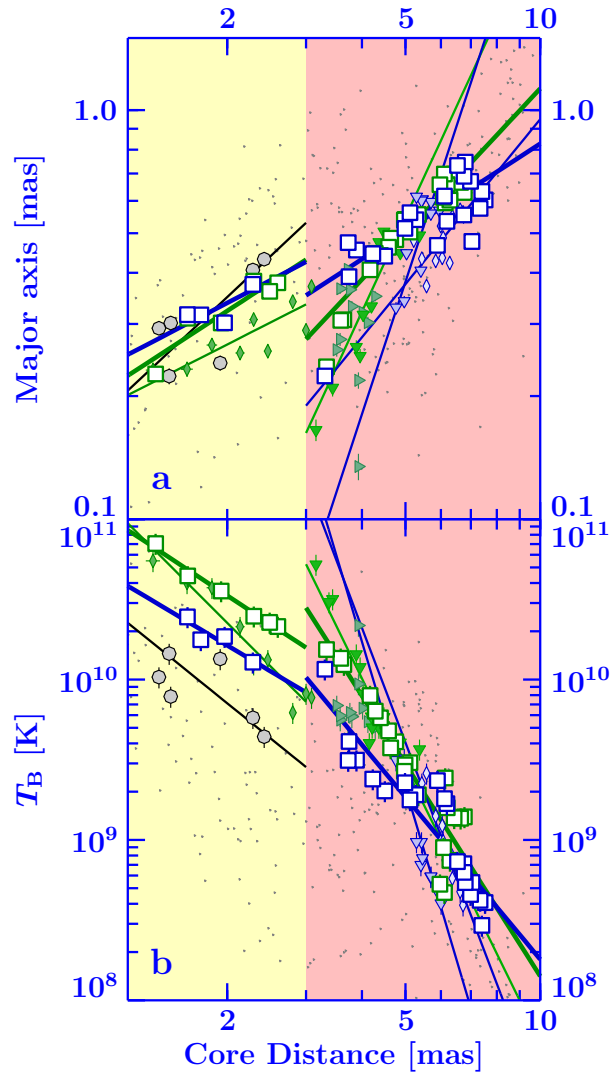
Peculiar behavior at ~ 3 mas

Beuchert et al., 2017, in prep.



Peculiar behavior at ~ 3 mas

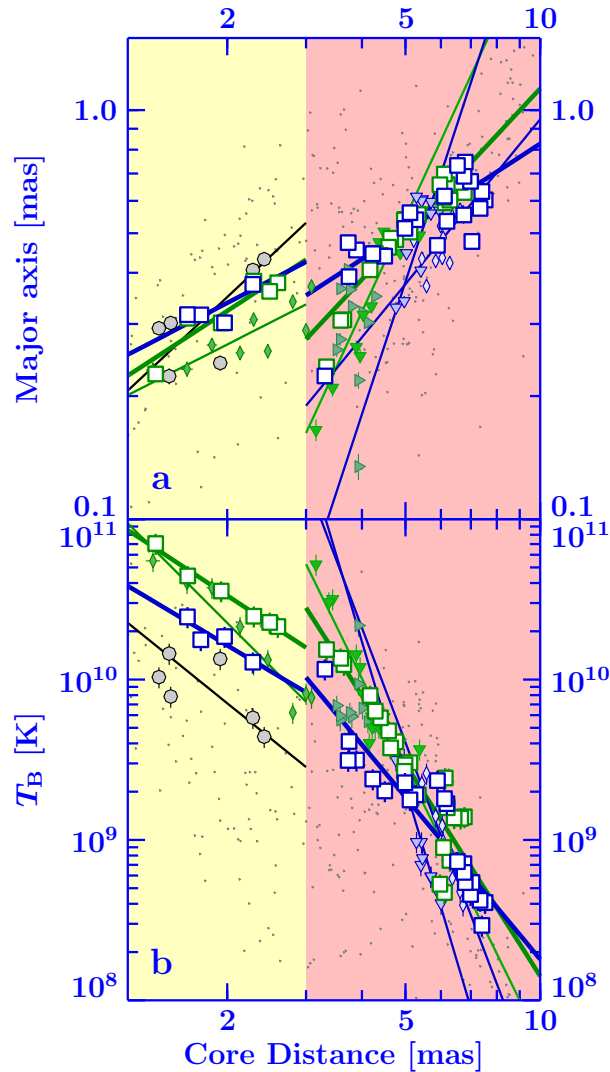
Beuchert et al., 2017, in prep.



direct measure of $d \propto r^l$
steepening $\gtrsim 3$ mas

Peculiar behavior at ~ 3 mas

Beuchert et al., 2017, in prep.



direct measure of $d \propto r^l$
steepening $\gtrsim 3$ mas

$$T_B \propto r^s$$

$$s = l + n + b(1 - \alpha)$$

$$d \propto r^l$$

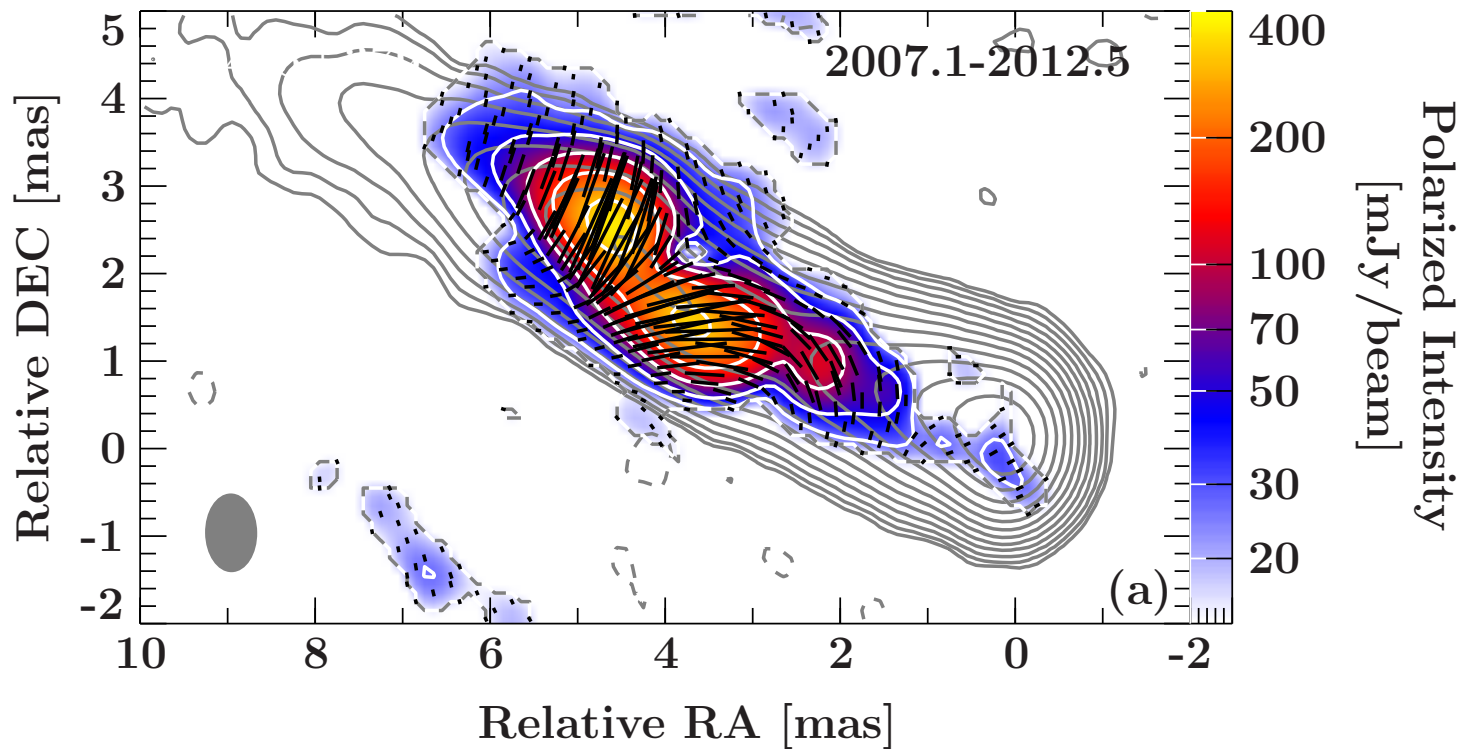
$$B \propto r^{-1} \text{ or } B \propto r^{-2}$$

$$\alpha \sim -1$$

$$N \propto r^n \text{ with } n_{>3 \text{ mas}} < 0$$

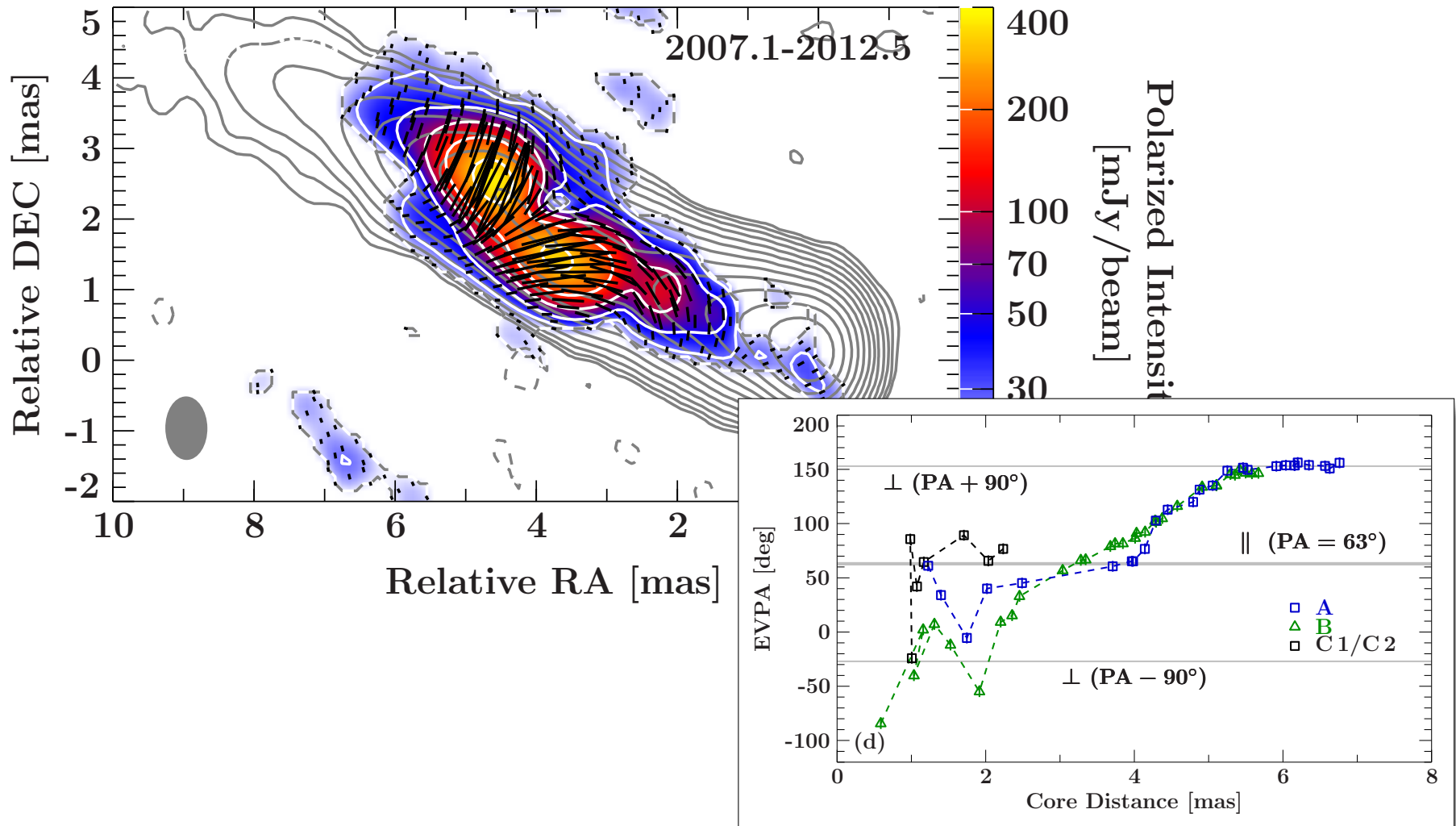
Polarimetry

Beuchert et al., 2017, in prep.



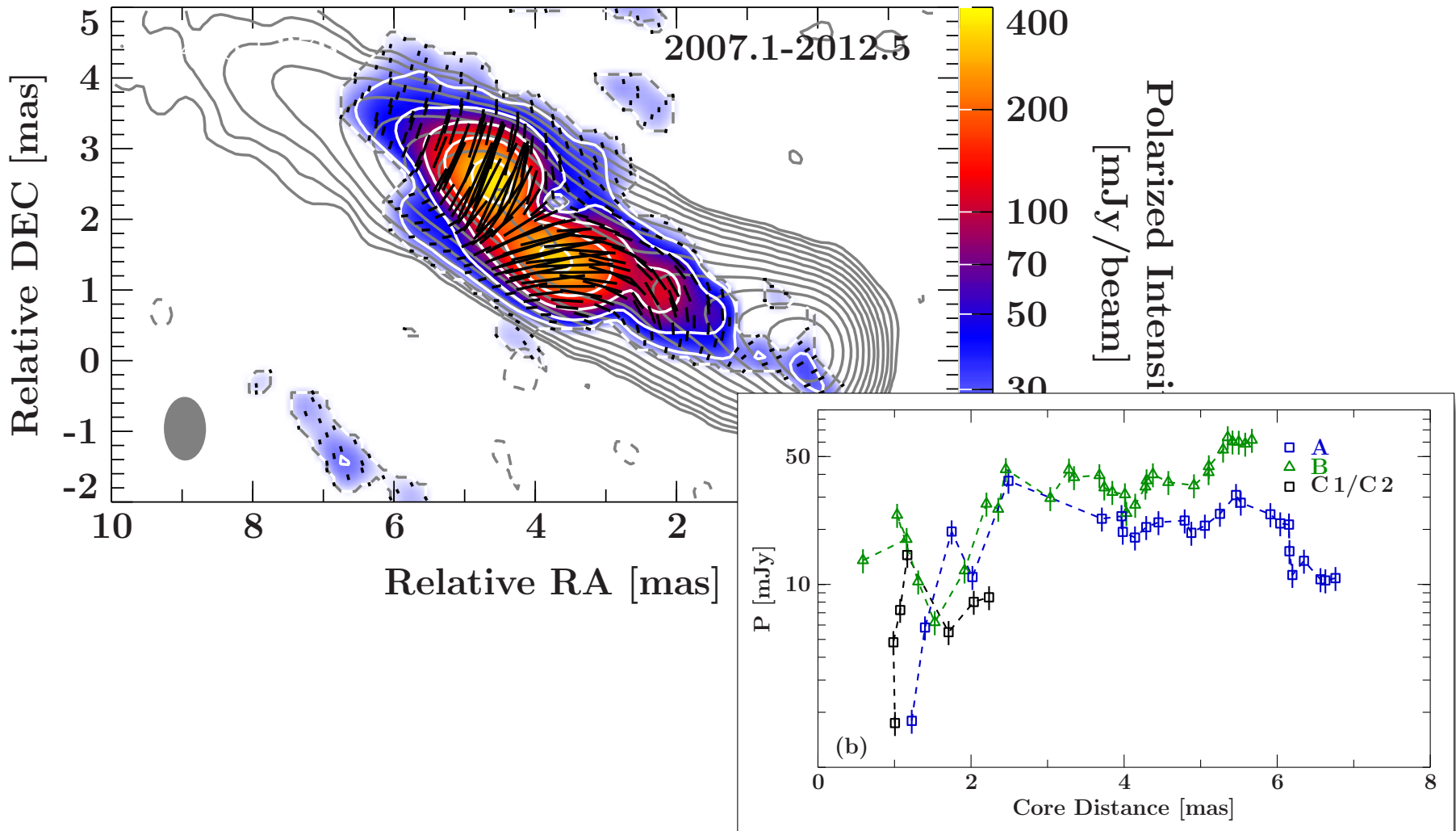
Polarimetry

Beuchert et al., 2017, in prep.

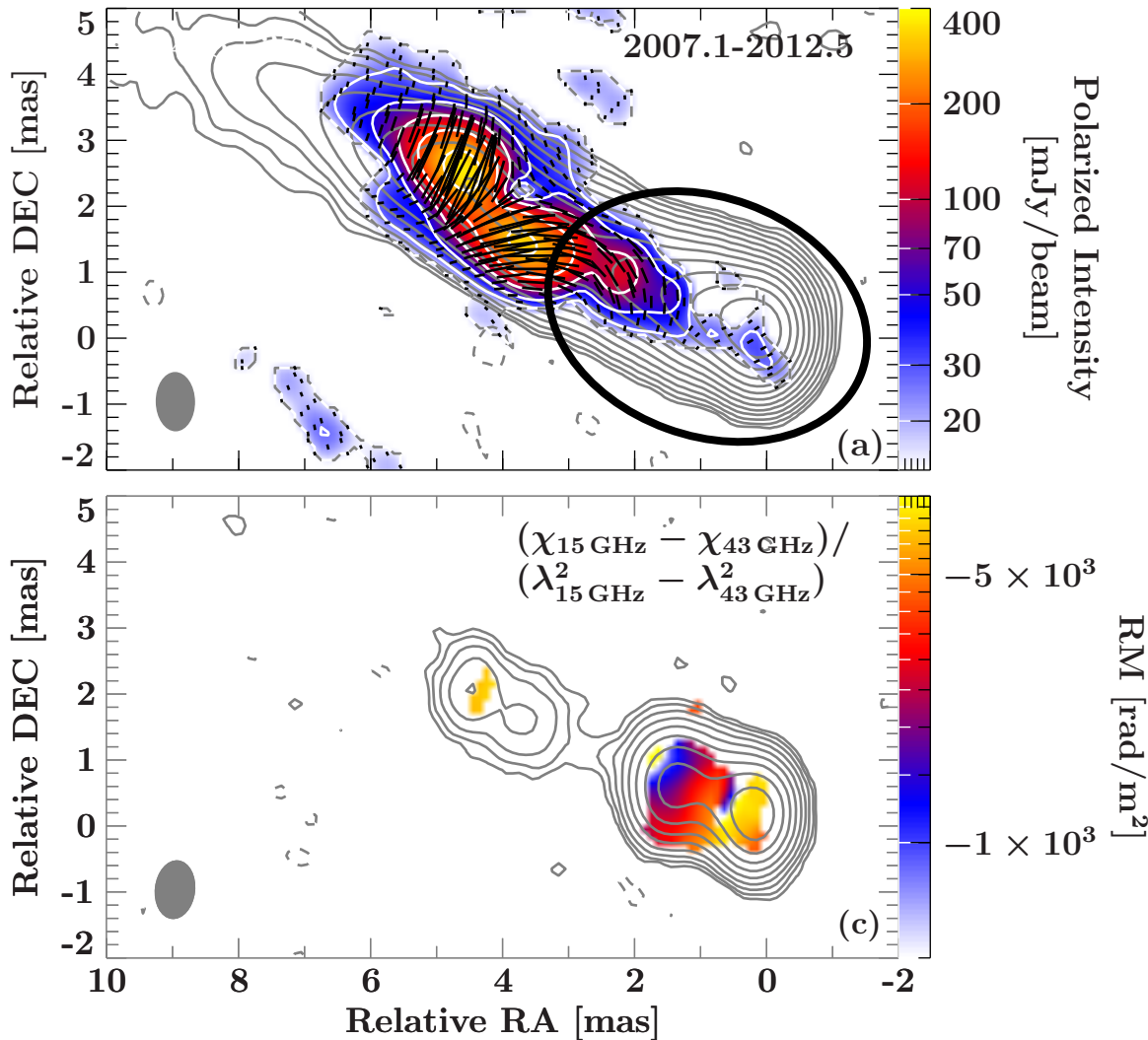


Polarimetry

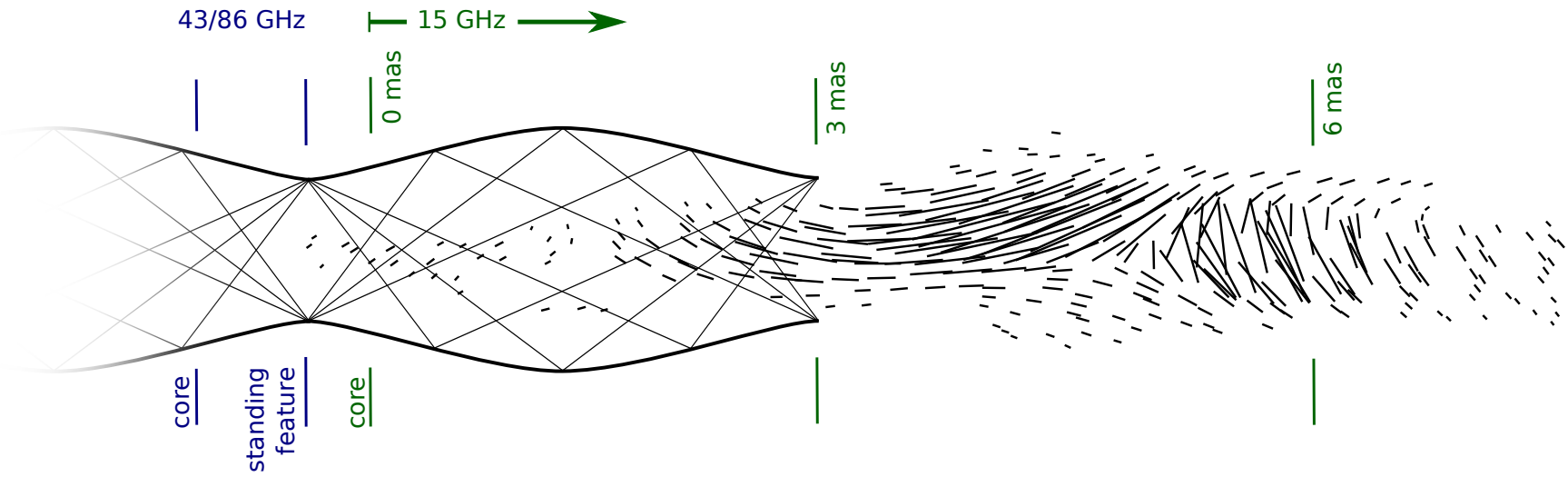
Beuchert et al., 2017, in prep.

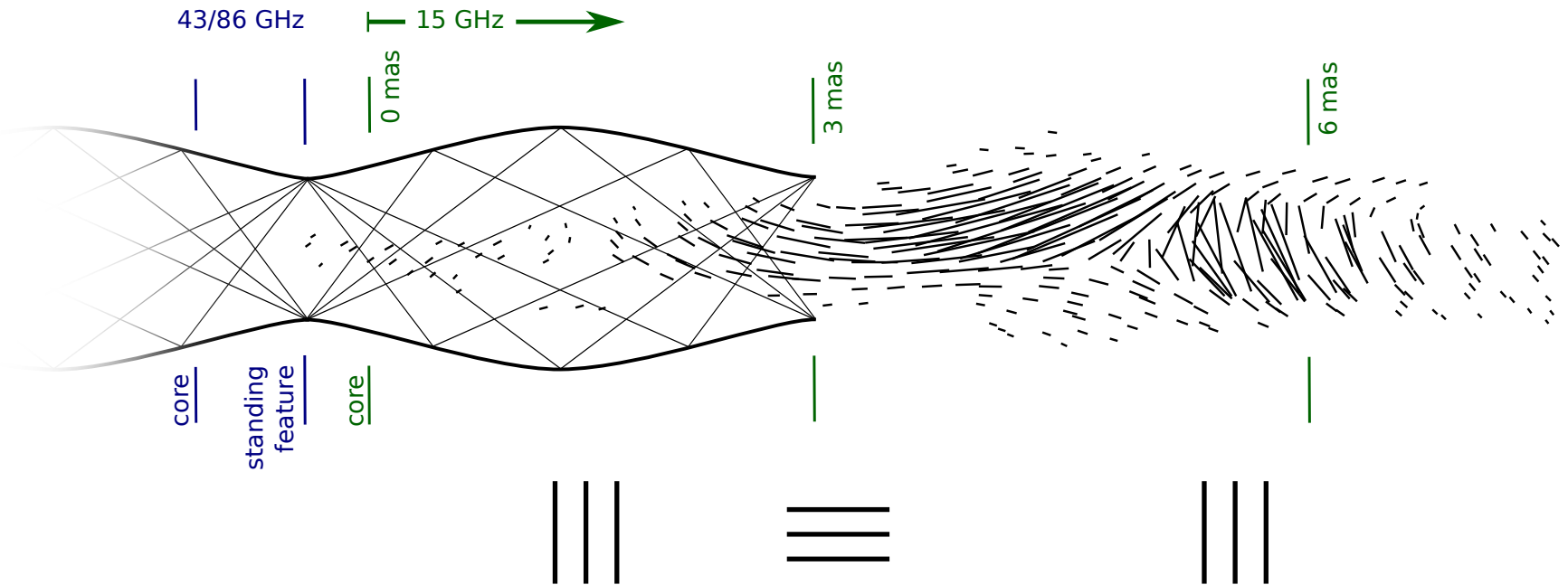


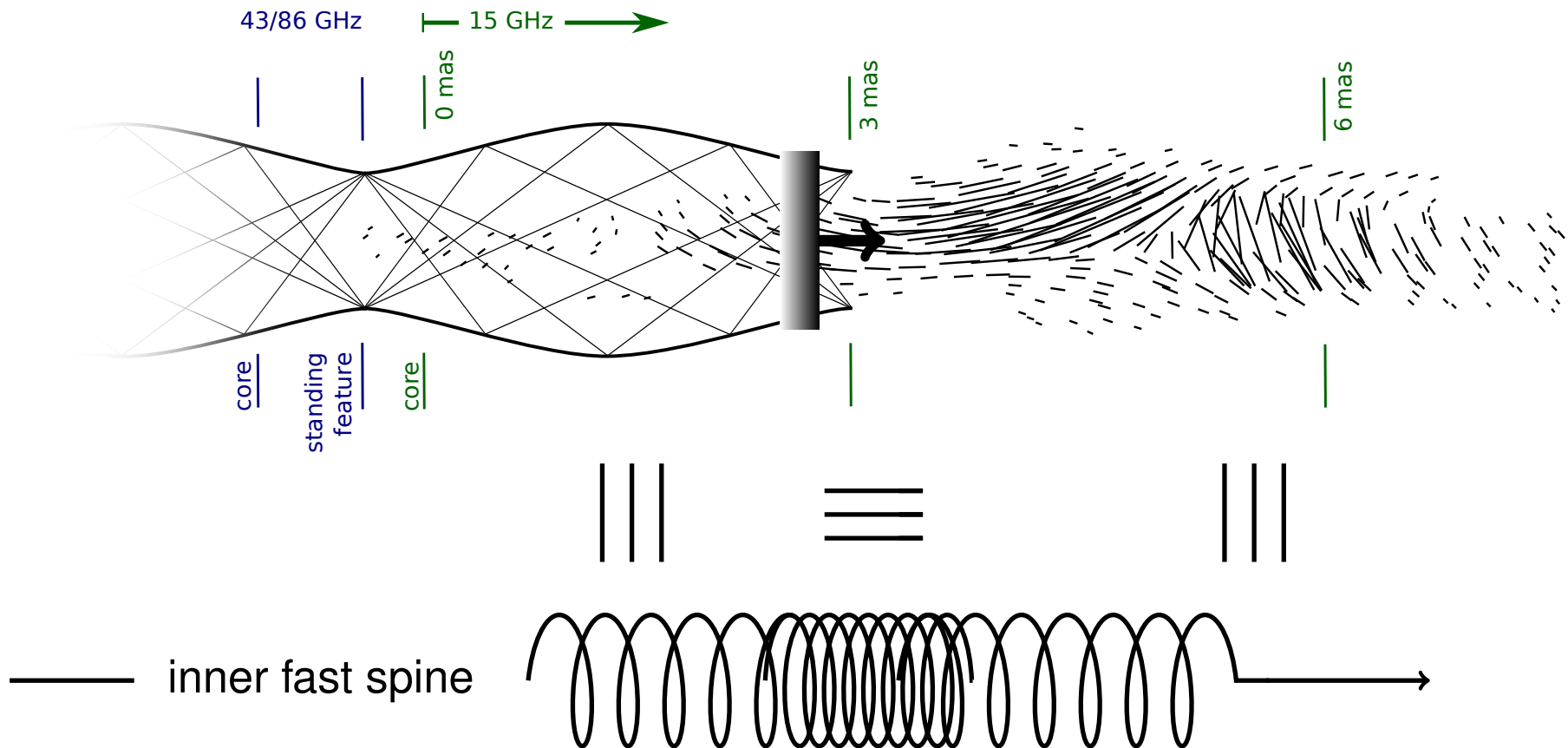
Polarimetry



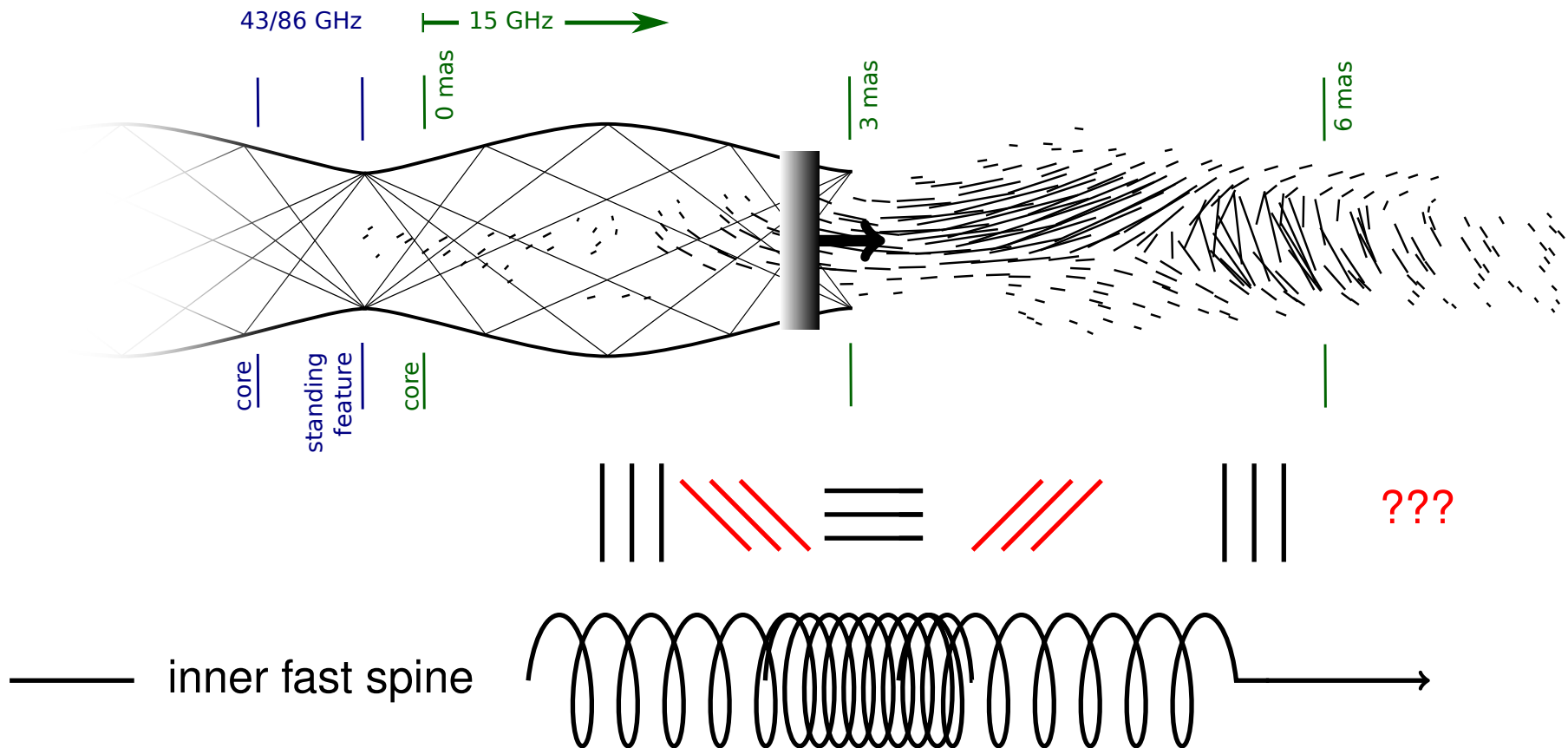
see talks, e.g., by
 T. Savolainen
 S.N. Molina,
 Y.K. Ma,
 T. Hovatta,
 H. Nagai,
 A. Pasetto



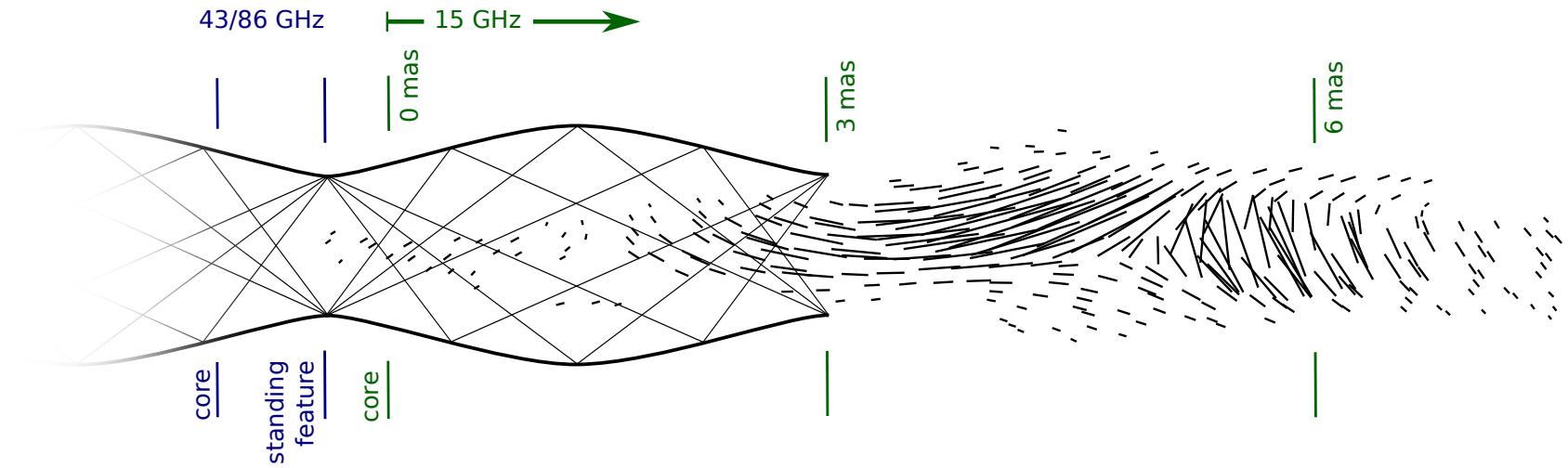




see also Lyutikov et al. (2005), Lyutikov & Kravchenko (2017)



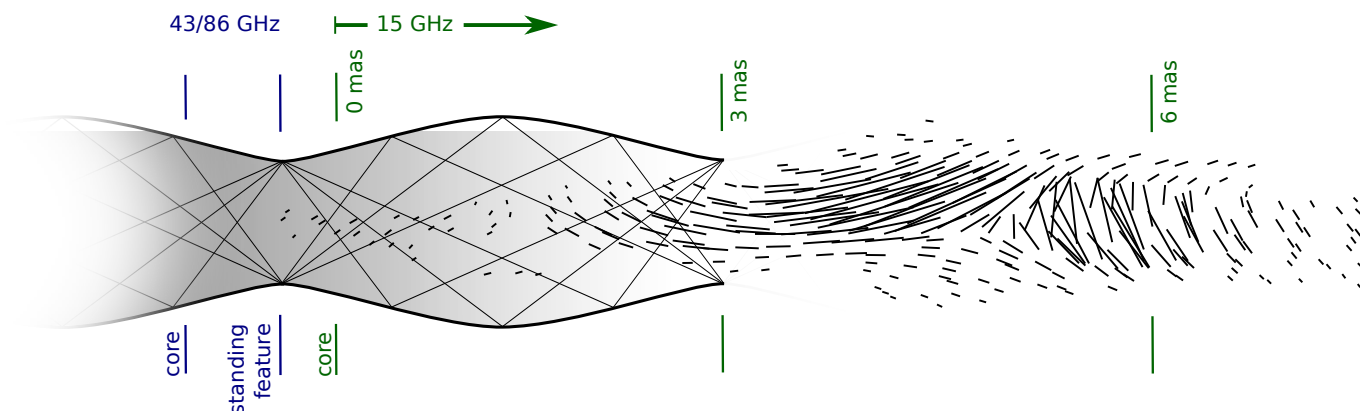
Wait for RMHD shock-shock simulations
 Kink? → talk by K. Nalewajko; Zhang et al. (2016)
 RM gradient?



e.g., Laing (1980,1981), Wardle (1998)

Take-home messages

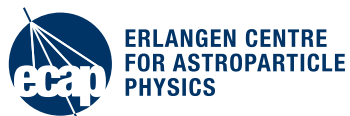
- Unprecedented well resolved long-term monitoring of the total and linearly polarized emission in 3C 111 at 15 GHz
- Indications for a recollimation at ~ 3 pc
- Large and smooth ($\gtrsim 180^\circ$) EVPA rotation over 6 mas / 20 pc deprojected distance
- Observational reference for future (G)RMHD simulations of shock-shock interactions with full radiative output including polarization



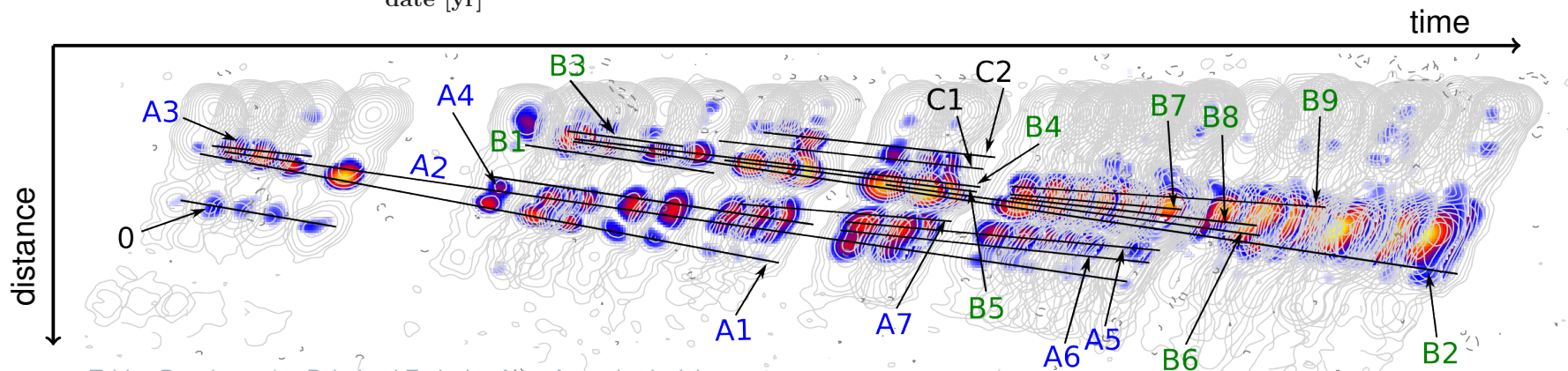
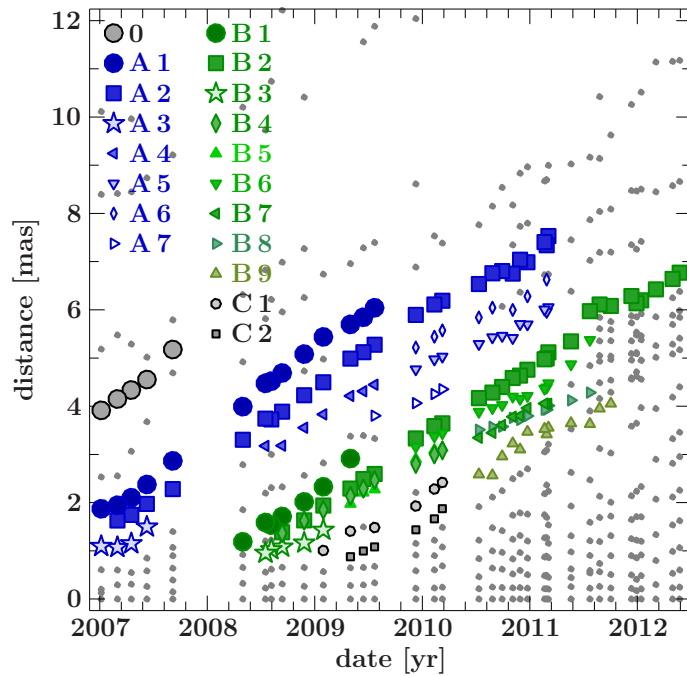


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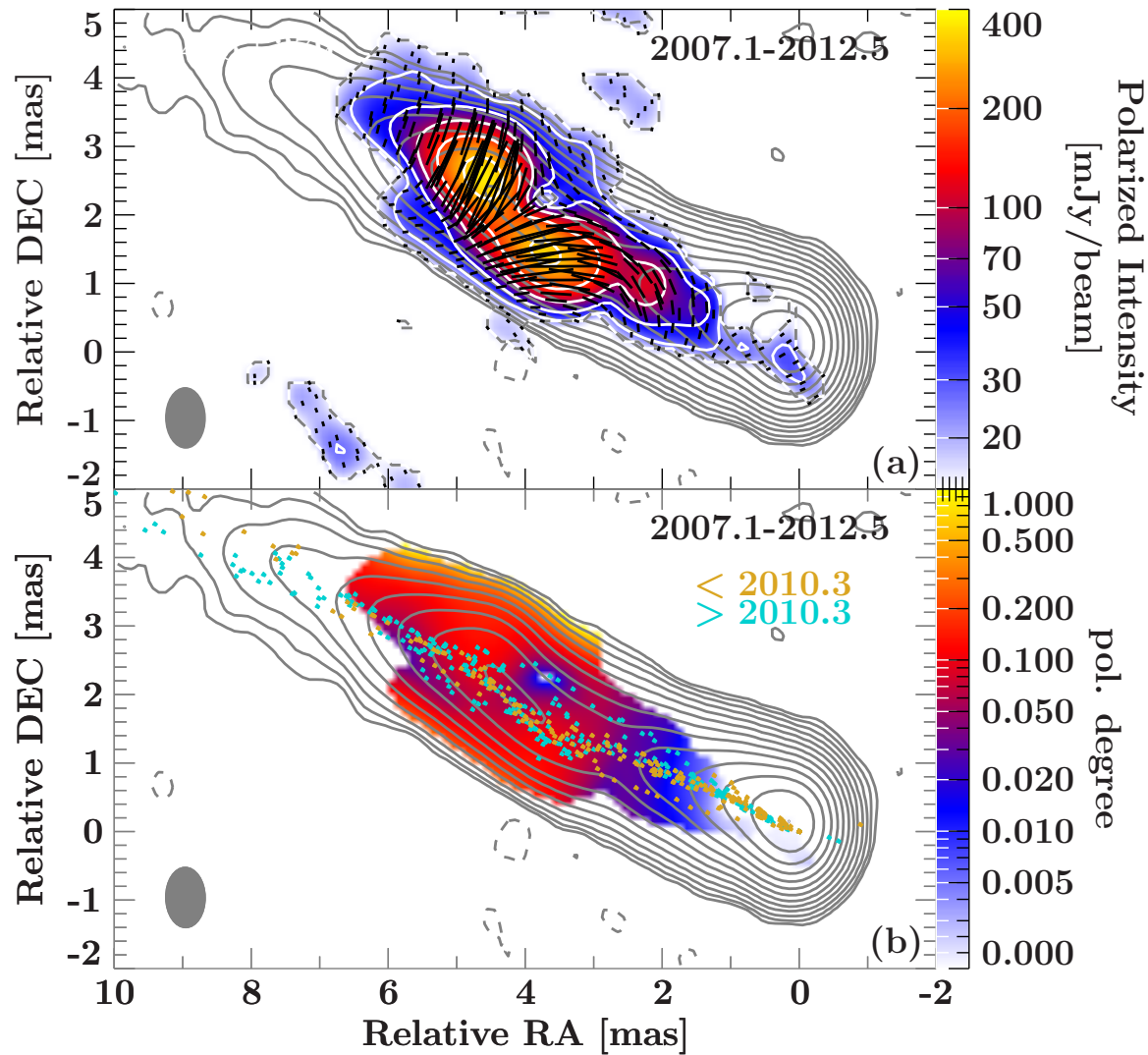
Backup



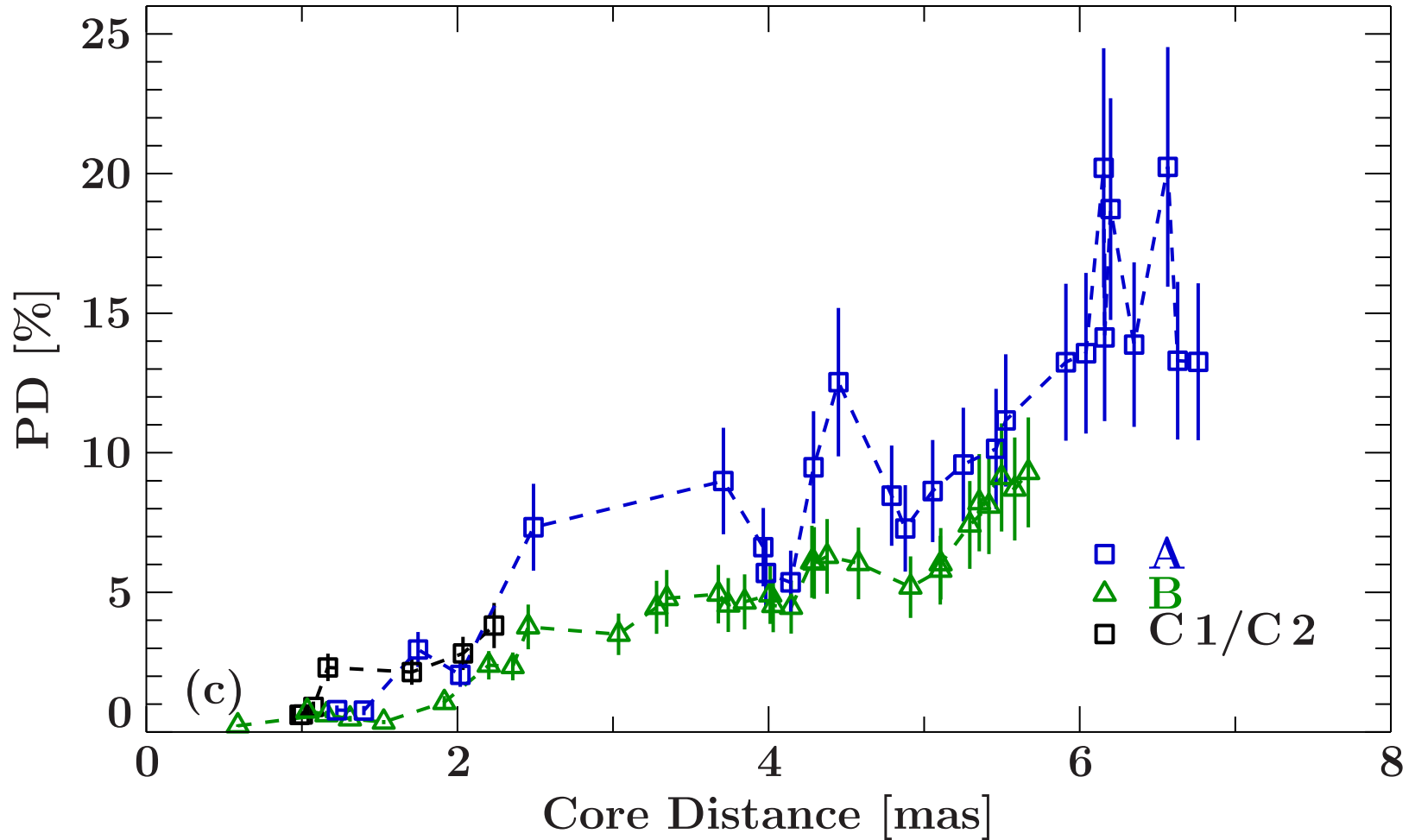
Kinematics



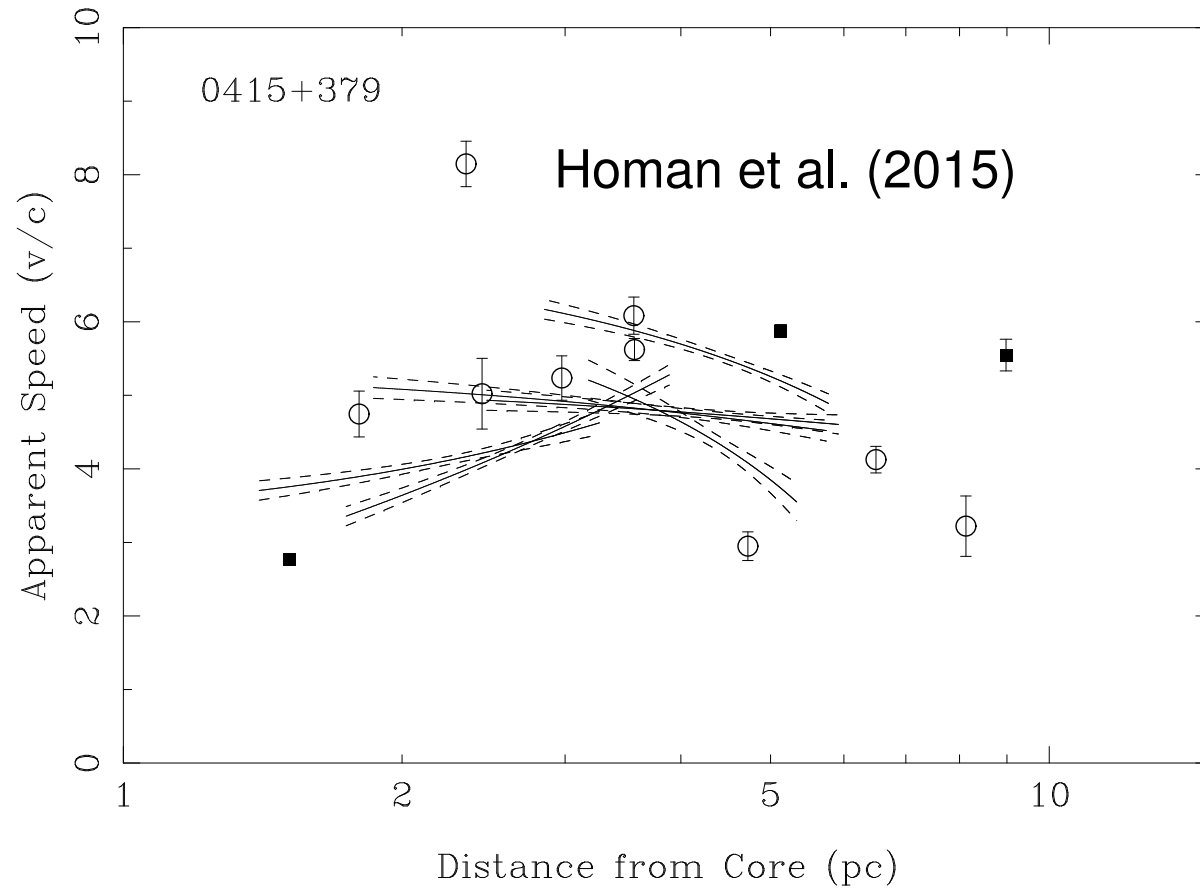
Kinematics



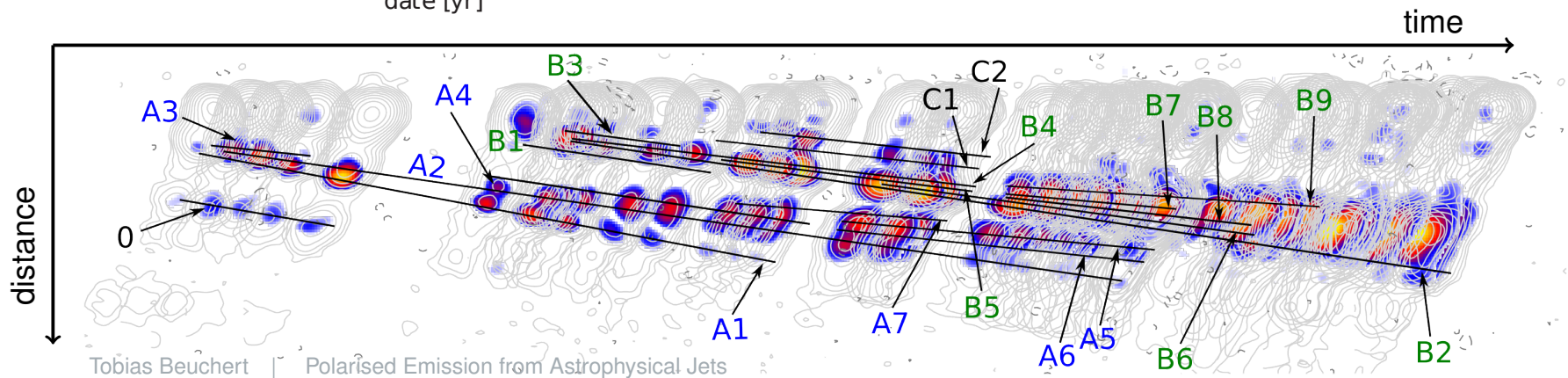
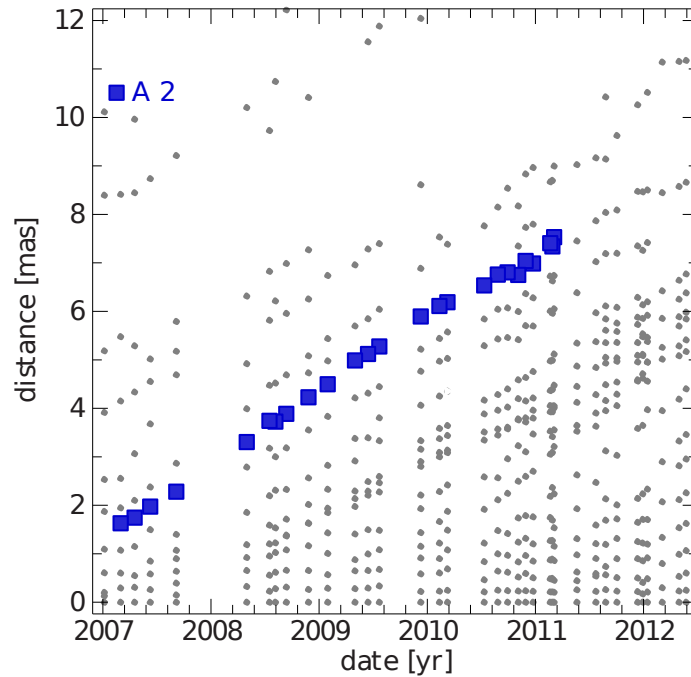
Kinematics



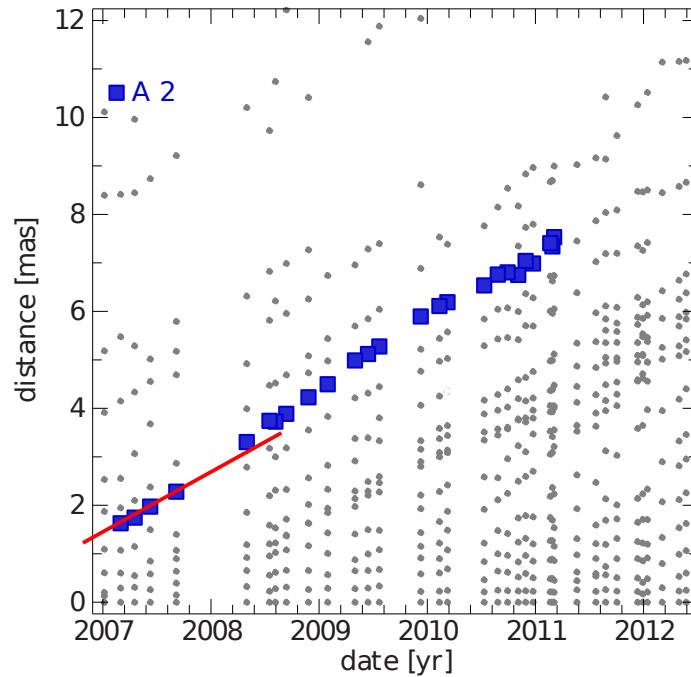
Signs for acceleration in 3C 111



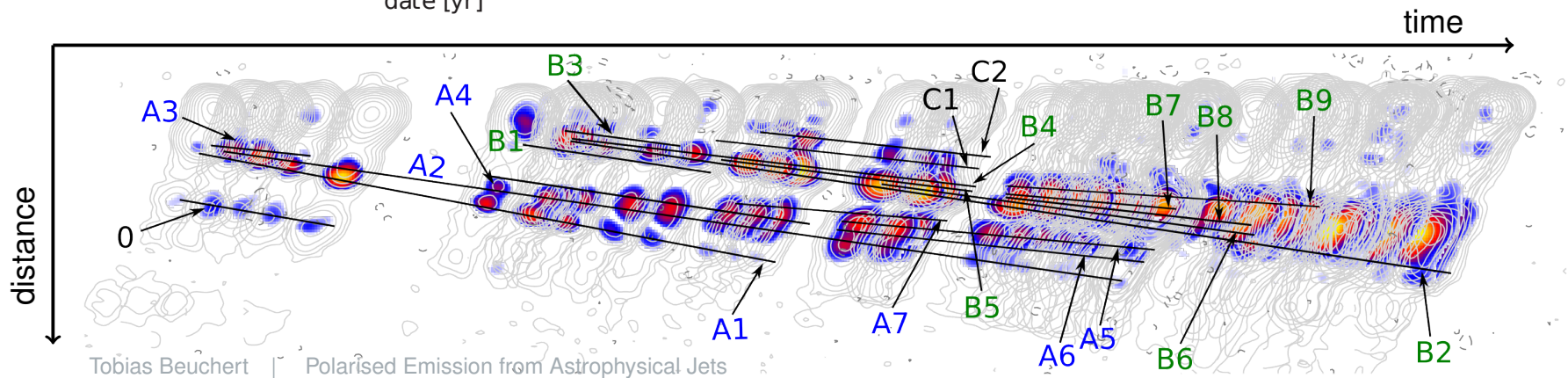
Signs for acceleration in 3C 111



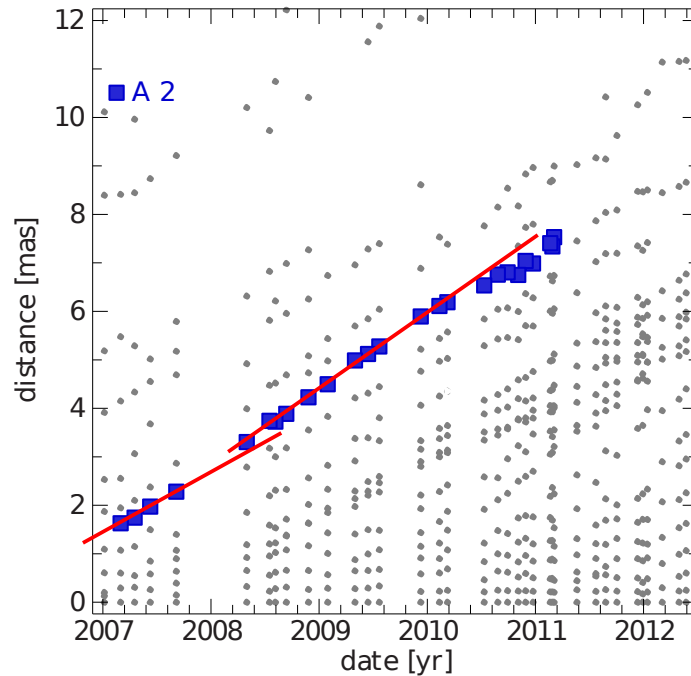
Signs for acceleration in 3C 111



1.3 mas/yr

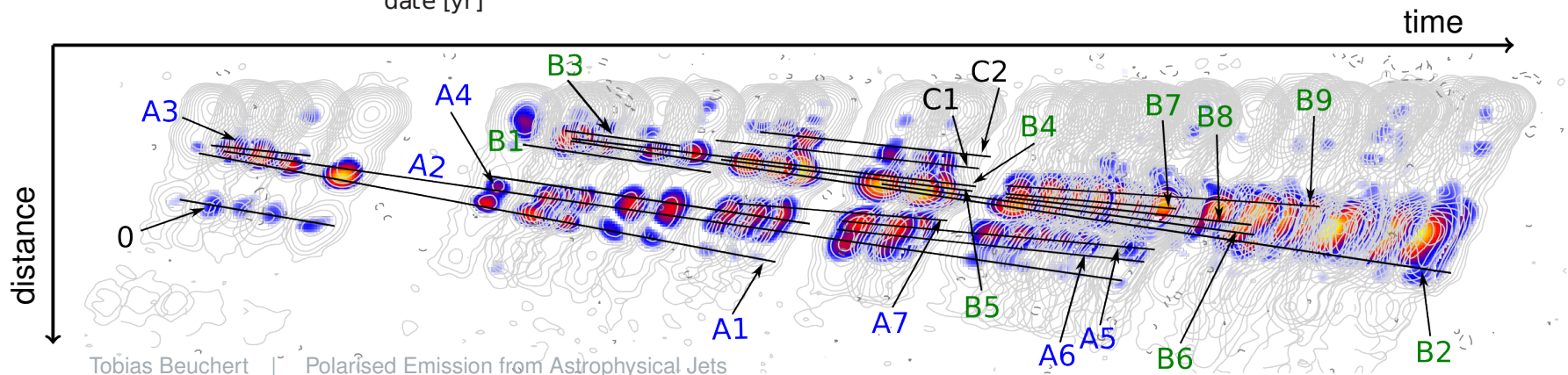


Signs for acceleration in 3C 111

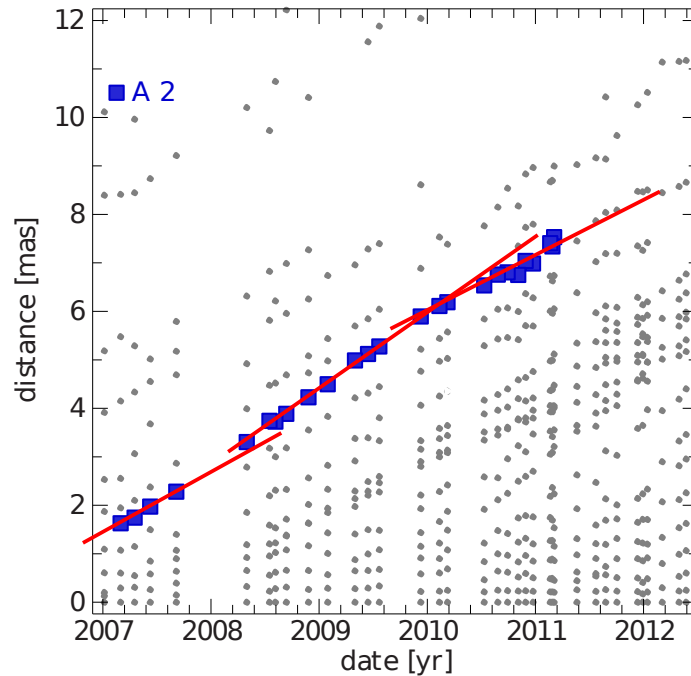


1.3 mas/yr

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Signs for acceleration in 3C 111



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