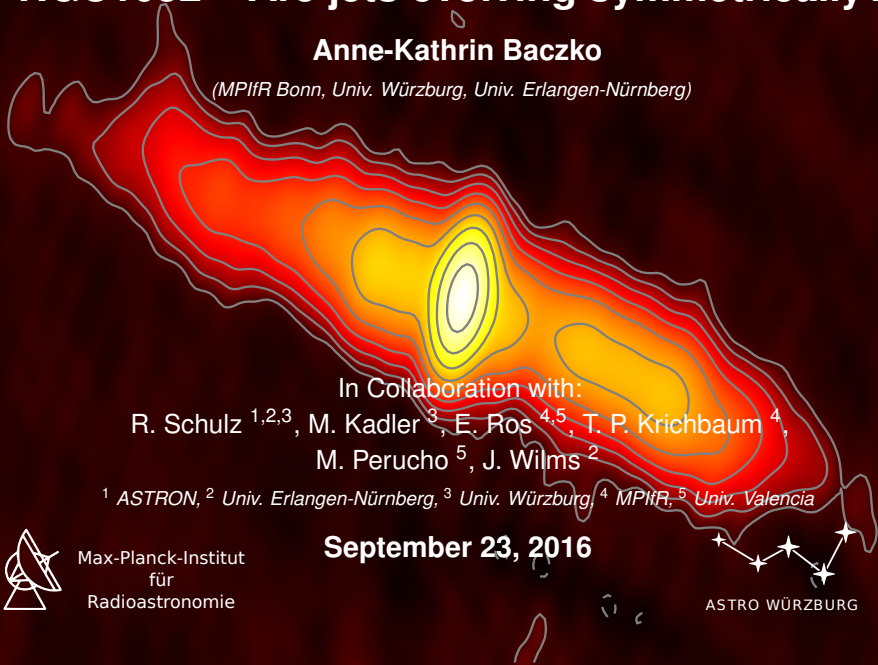


# NGC1052 – Are jets evolving symmetrically?

Anne-Kathrin Baczko

(MPIfR Bonn, Univ. Würzburg, Univ. Erlangen-Nürnberg)



In Collaboration with:

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M. Perucho<sup>5</sup>, J. Wilms<sup>2</sup>

<sup>1</sup> ASTRON, <sup>2</sup> Univ. Erlangen-Nürnberg, <sup>3</sup> Univ. Würzburg, <sup>4</sup> MPIfR, <sup>5</sup> Univ. Valencia

September 23, 2016



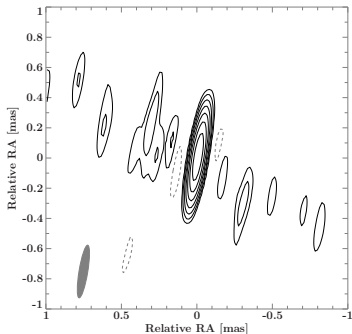
Max-Planck-Institut  
für  
Radioastronomie



ASTRO WÜRZBURG

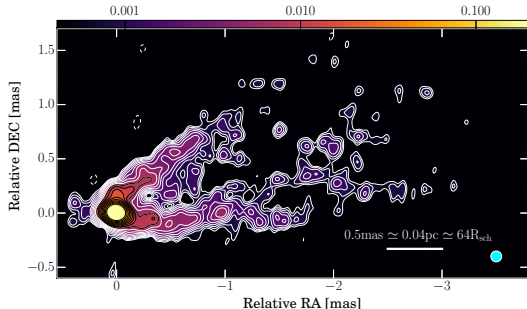
	NGC1052	M87
Distance	$\sim 20$ Mpc	$\sim 16.7$ Mpc
BH mass	$M \sim 10^{8.2} M_{\odot}$	$M \sim 10^{9.8} M_{\odot}$ (*)
Inclination angle	close to $90^{\circ}$	$15 - 25^{\circ}$ (**)

(\*) Gebhardt & Thomas 2009 (*ApJ* 700,1002), (\*\*) Acciari et al. 2009 (*Science* 325,444)



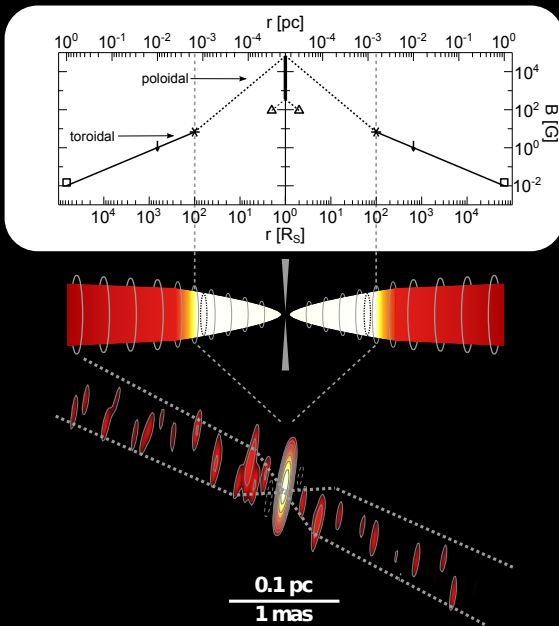
Baczko et al. 2016 (*A&A* 593, A47)

Emission region  $< 200 R_S$



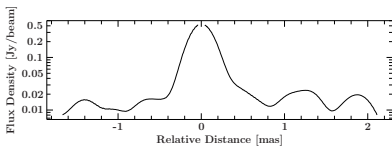
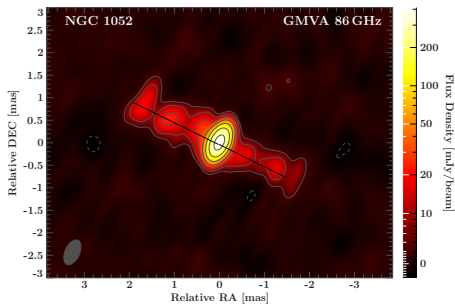
Kim et al. (in prep)

See talk by Jae-Young Kim.

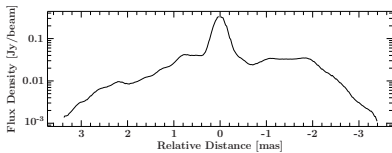
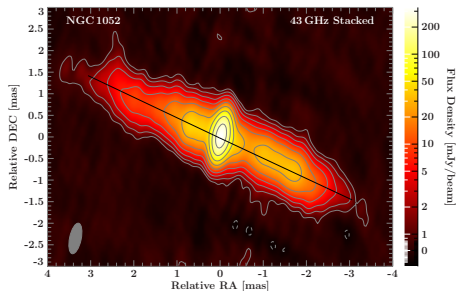


# Similar Morphology: 86 – 43 GHz

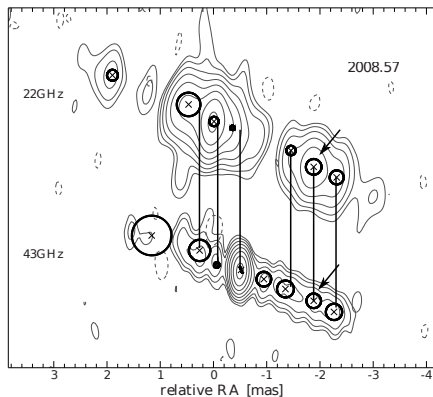
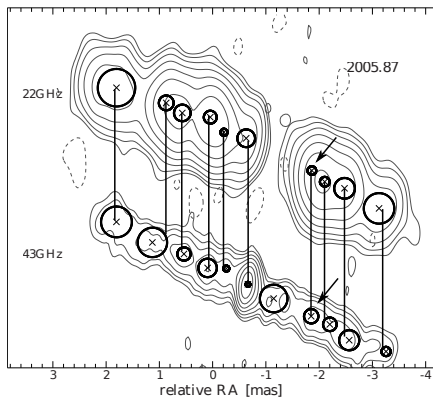
## Tapered image at 86 GHz

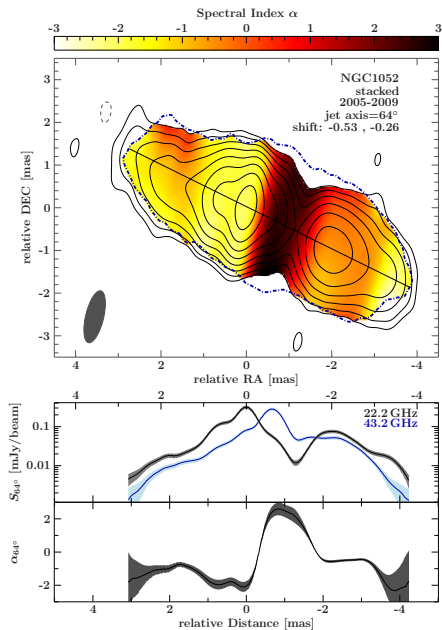


## Stacked image at 43 GHz



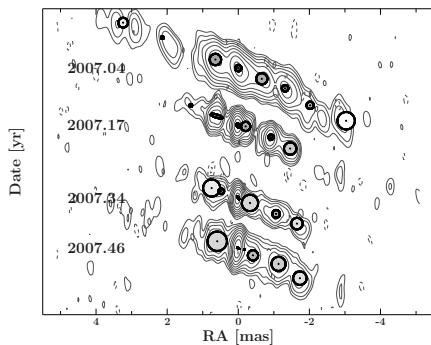
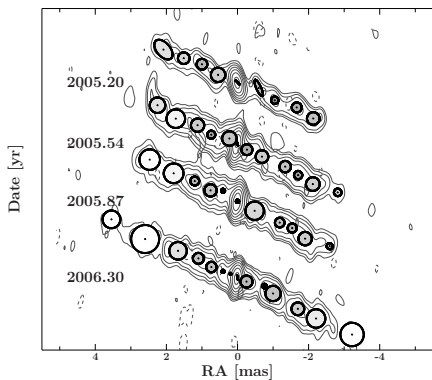
## Alignment: 43 – 22 GHz





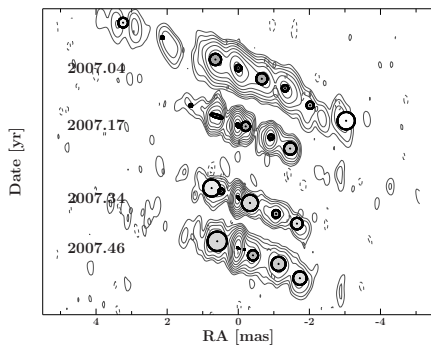
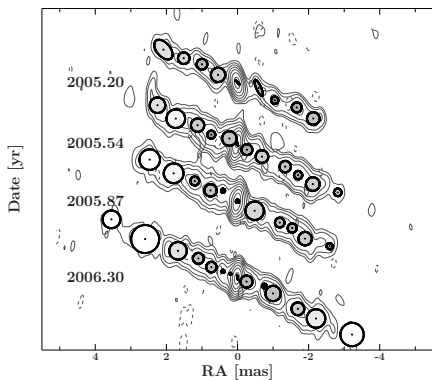
## Detailed analysis at 43 GHz

Examples from 4 years of observation with the VLBA (2005-2009)



## Detailed analysis at 43 GHz

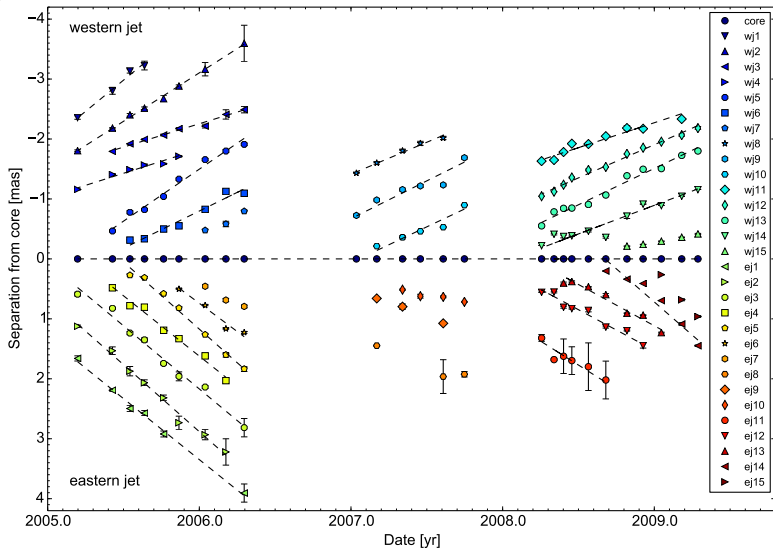
Examples from 4 years of observation with the VLBA (2005-2009)



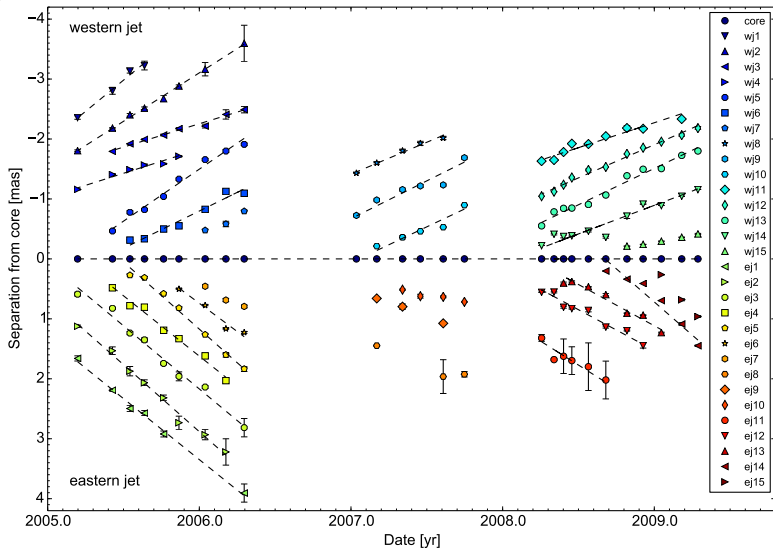
**Source structure changes from symmetric to asymmetric**



## Tracking Moving Emission Features

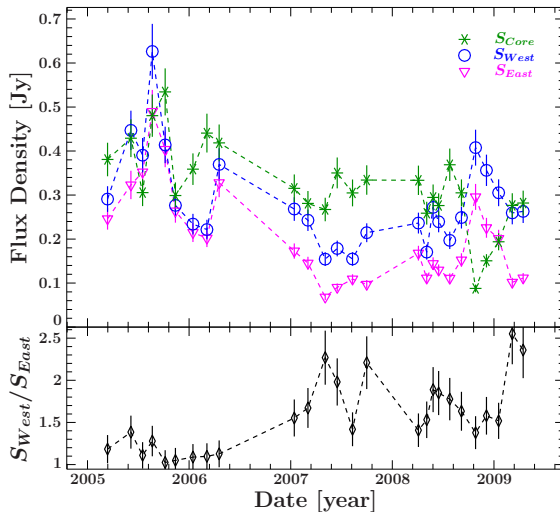


## Tracking Moving Emission Features



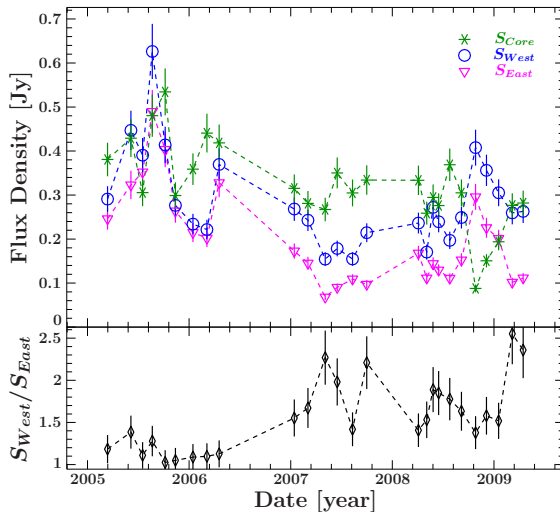
**Mean jet velocities:**  $\beta_{\text{western}} = 0.38 \pm 0.03$ ,  $\beta_{\text{eastern}} = 0.59 \pm 0.03$

## Flux Density ratio



top: Core & jet flux densities  
 bottom: Ratio: western to eastern flux density

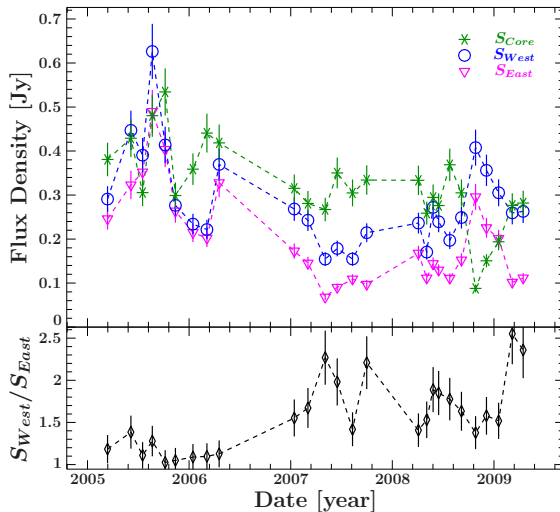
## Flux Density ratio



top: Core & jet flux densities  
 bottom: Ratio: western to eastern flux density

**The flux of the western jet is higher than that of the eastern jet**

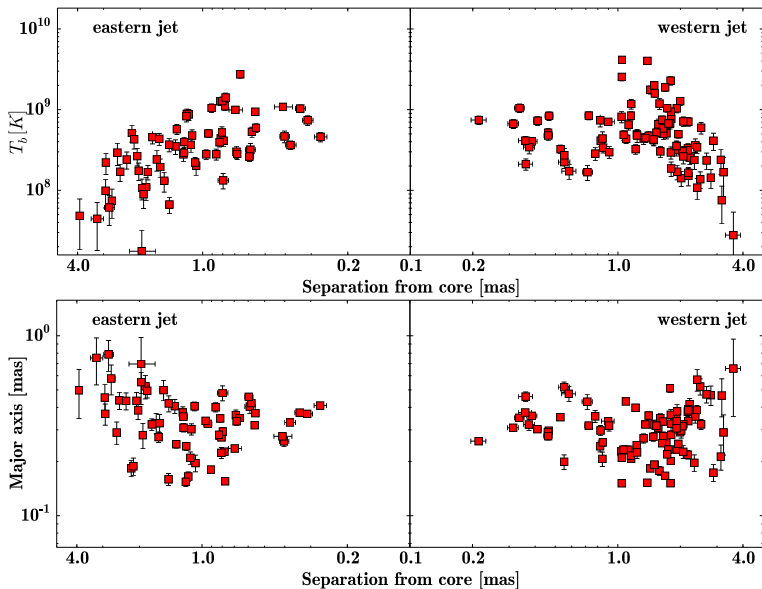
## Flux Density ratio



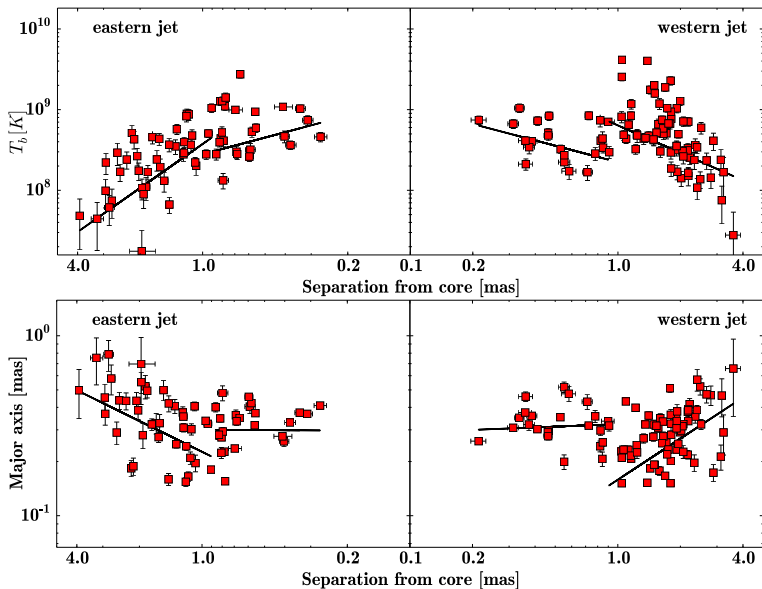
top: Core & jet flux densities  
 bottom: Ratio: western to eastern flux density

**The flux of the western jet is higher than that of the eastern jet**

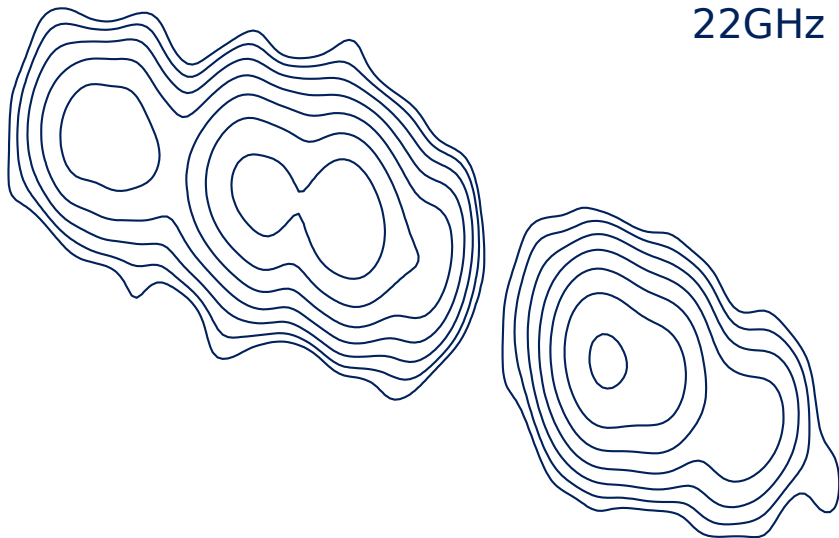
**Flux ratio of western to eastern jet changes**

$T_B$  and opening angle gradient

# $T_B$ and opening angle gradient



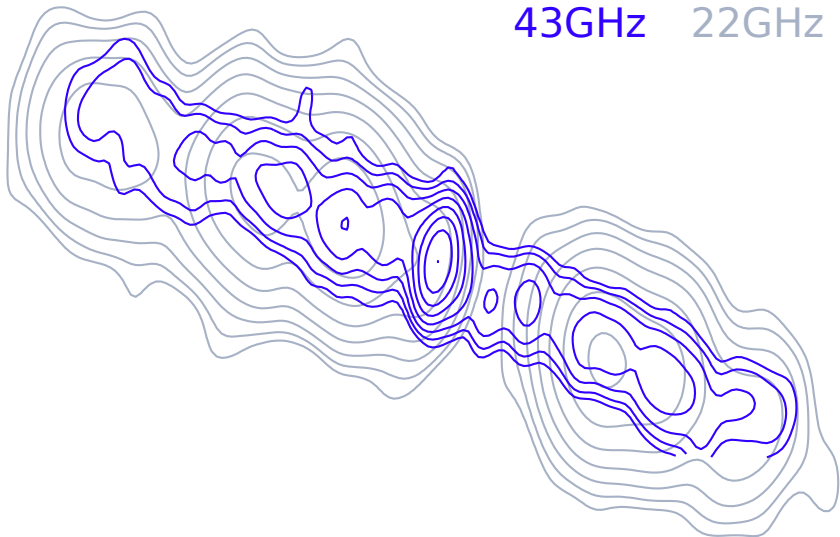
## Summary and Outlook



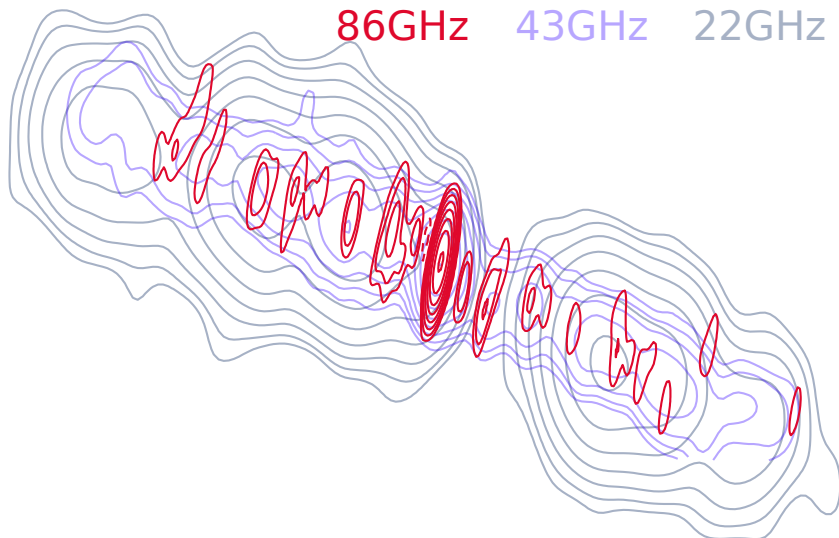


## Summary and Outlook

43GHz 22GHz

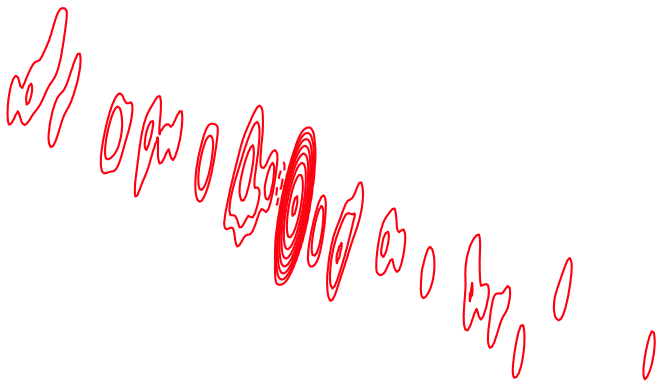


## Summary and Outlook



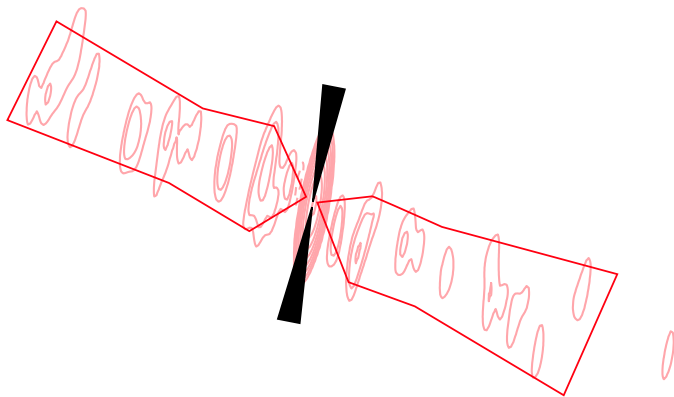
## Summary and Outlook

86GHz



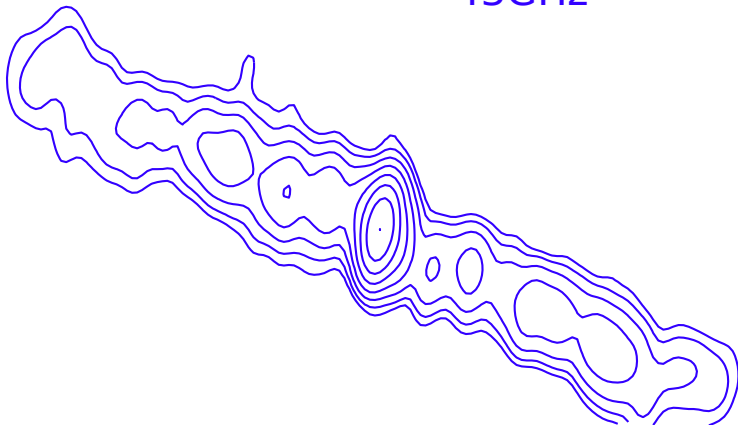
## Summary and Outlook

86GHz



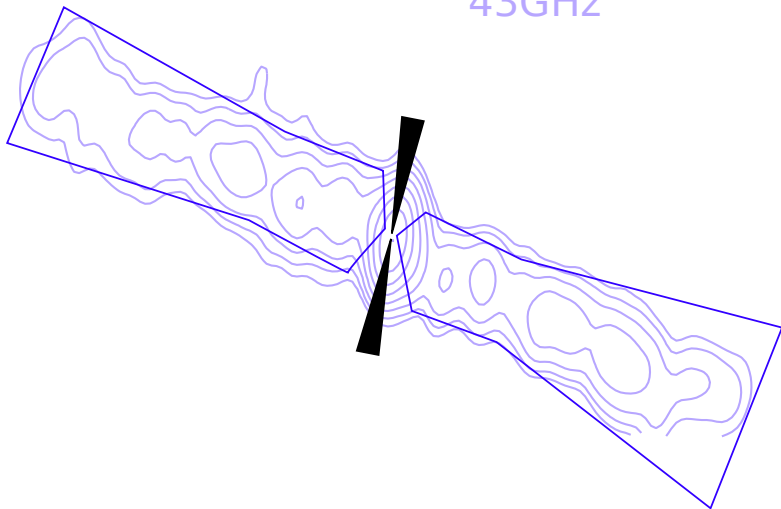
## Summary and Outlook

### 43GHz

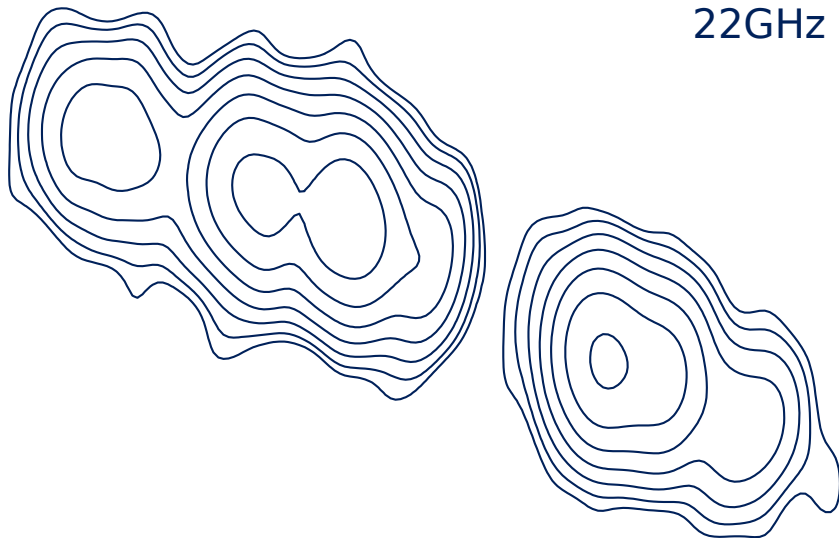


## Summary and Outlook

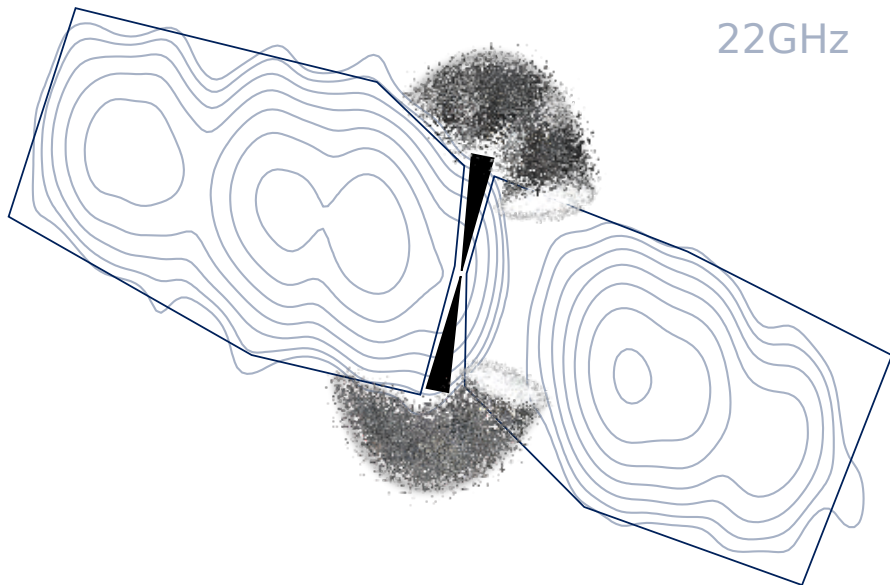
43GHz



## Summary and Outlook

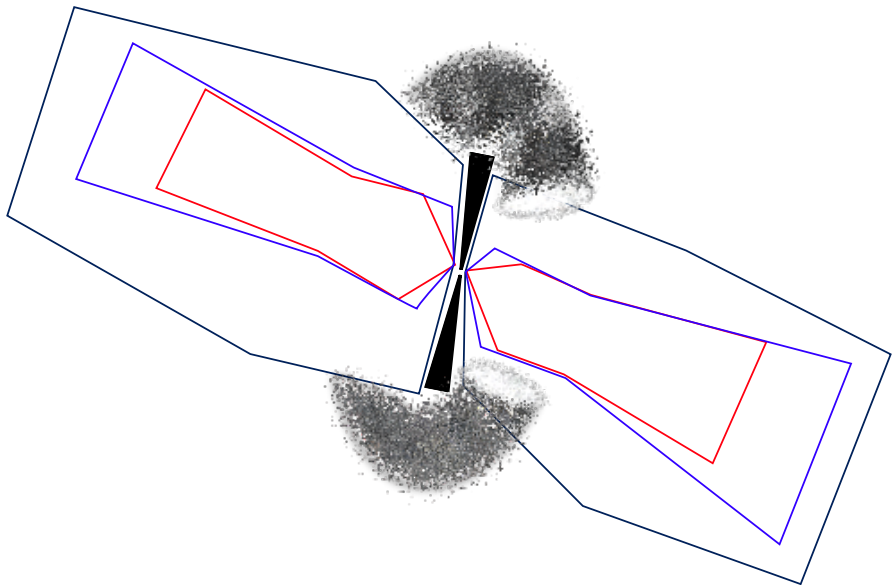


## Summary and Outlook

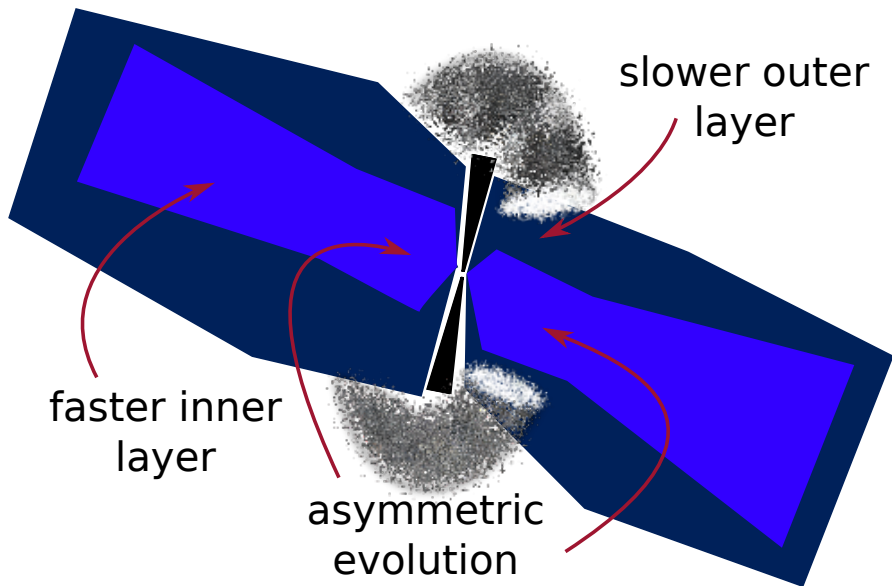




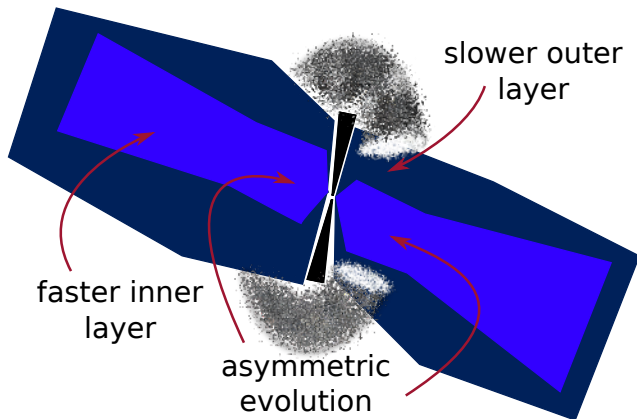
## Summary and Outlook



## Summary and Outlook



## Summary and Outlook



### Coming observations

- This November: RadioAstron + large ground support at 22 GHz
- April 2017: EHT + ALMA at 230 GHz