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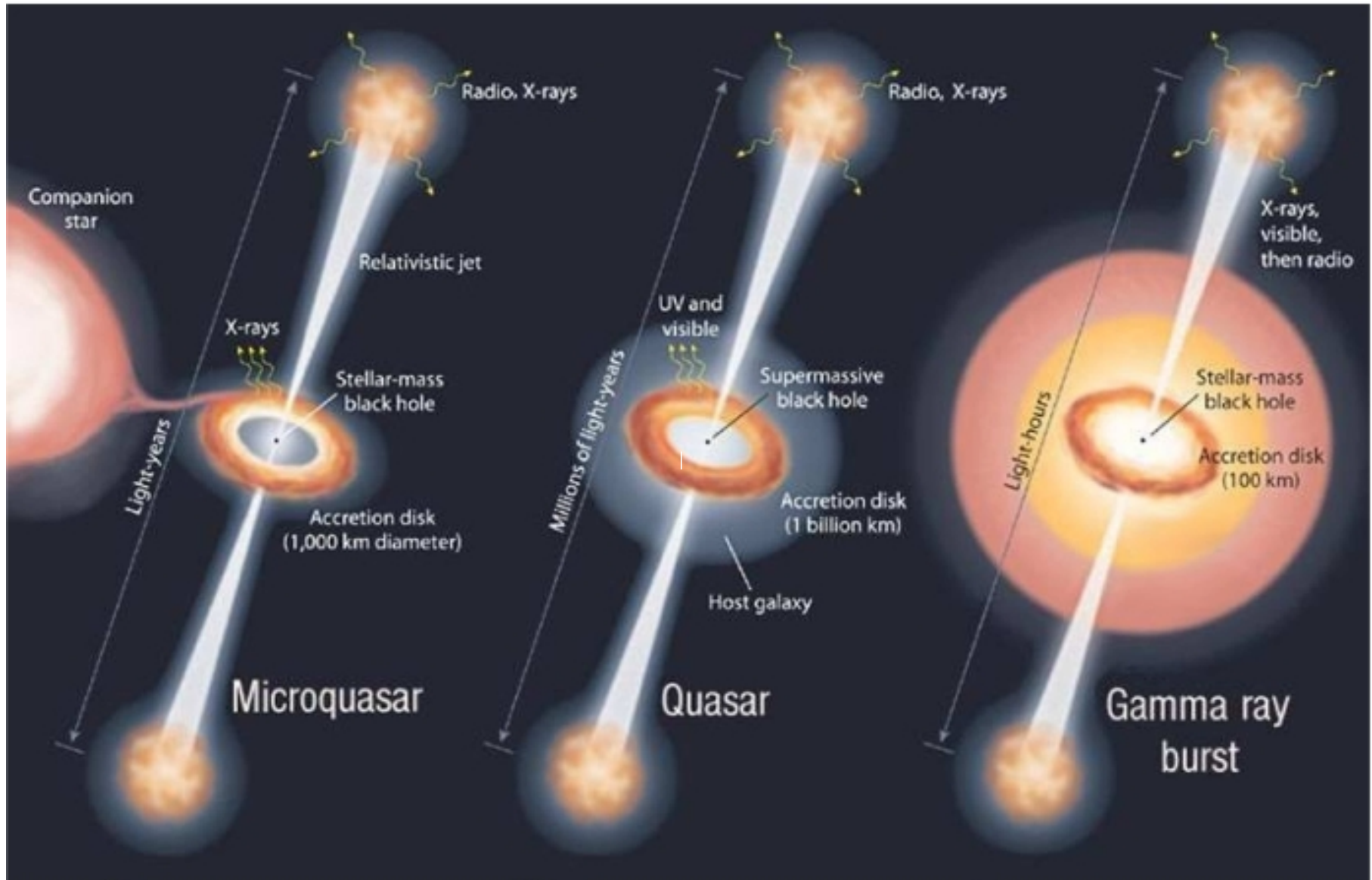
The inflow-outflow connection in the X-ray binary MAXI J1836-194

Thomas Russell

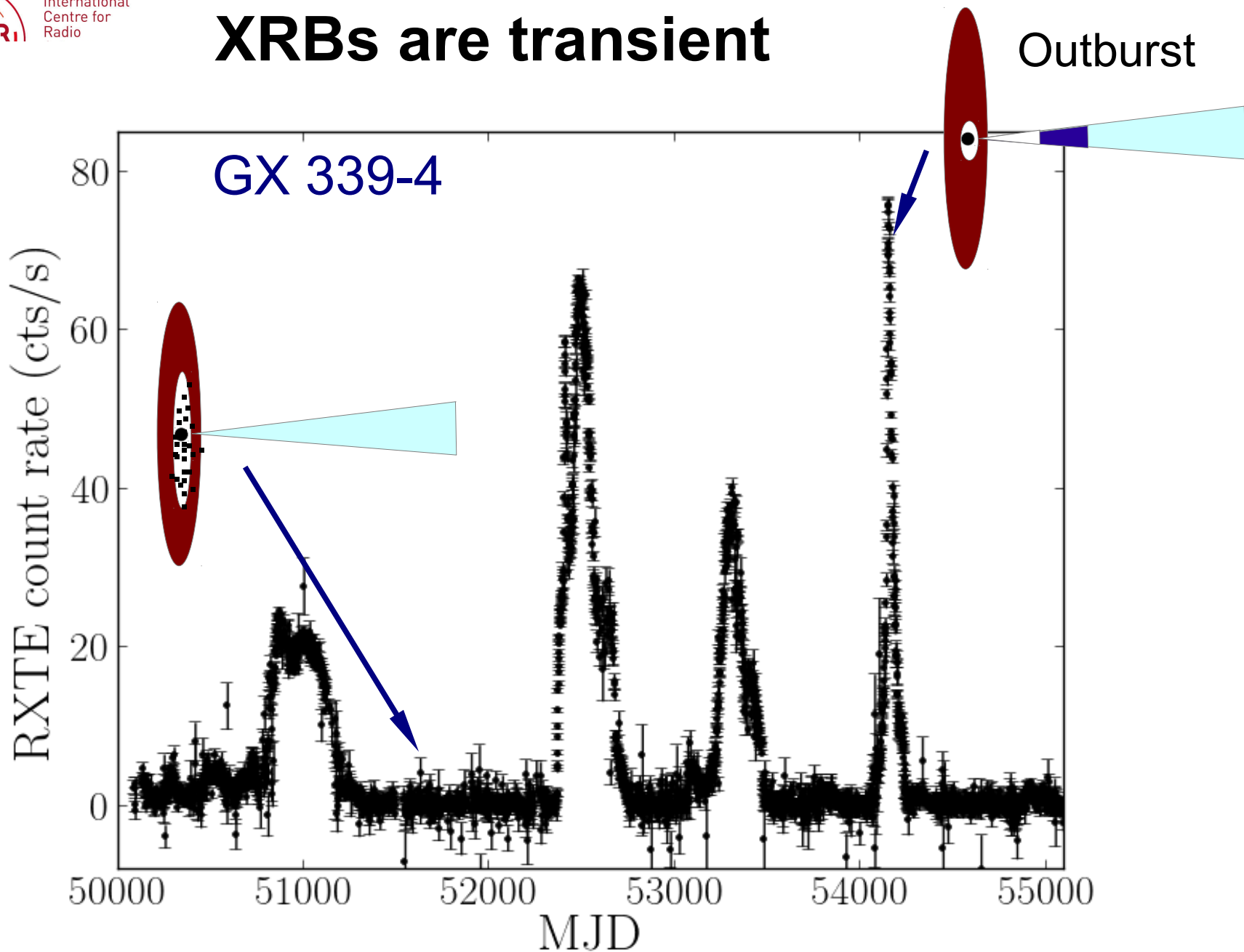
J. Miller-Jones, R. Soria, P. Curran

D. Russell, S. Markoff, D. Altamirano

Jets from accretion flows



XRBs are transient



Outburst

Why are they interesting?

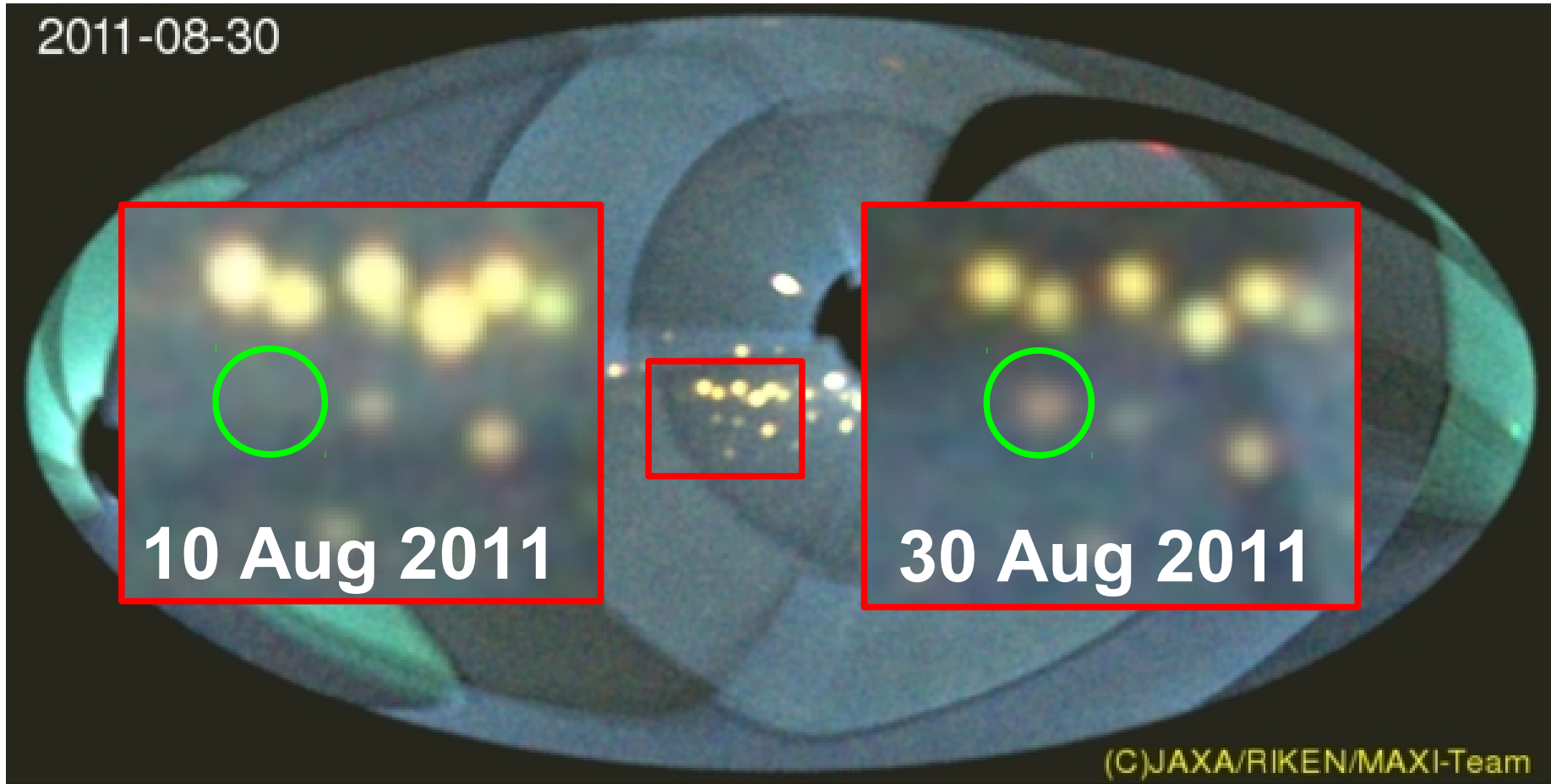
- Similar processes/different timescales
- Probe accretion and jet physics
- BH growth
- Ionising the early universe
- Galaxy/cluster evolution



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MAXI J1836-194

2011-08-30



Simultaneous multiwavelength observing



Image courtesy of NRAO/AUI



Image courtesy of Harvard - SMA

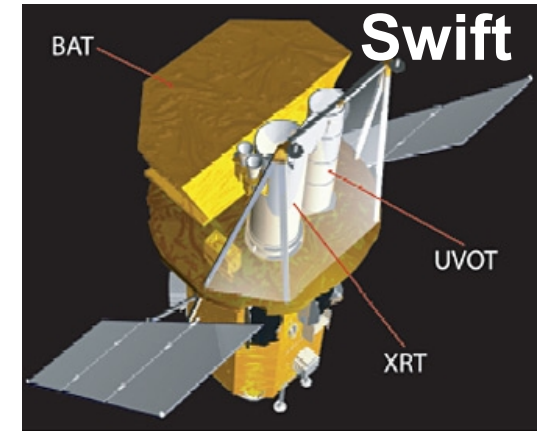


Image courtesy of NASA

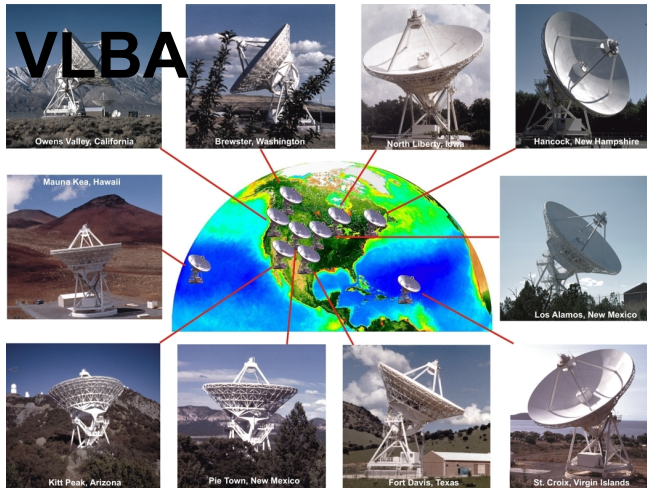
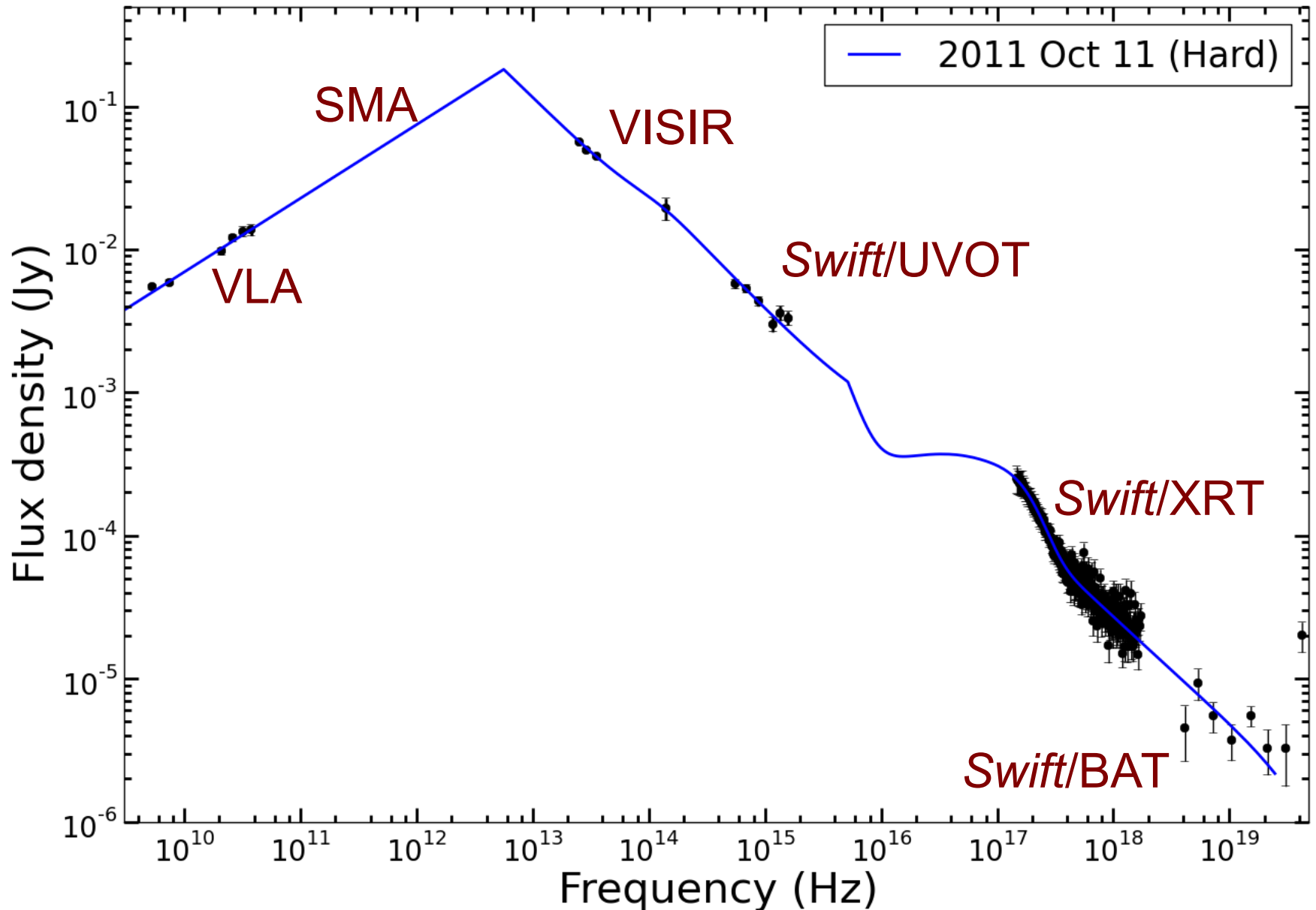


Image courtesy of NRAO



Image courtesy of ESO

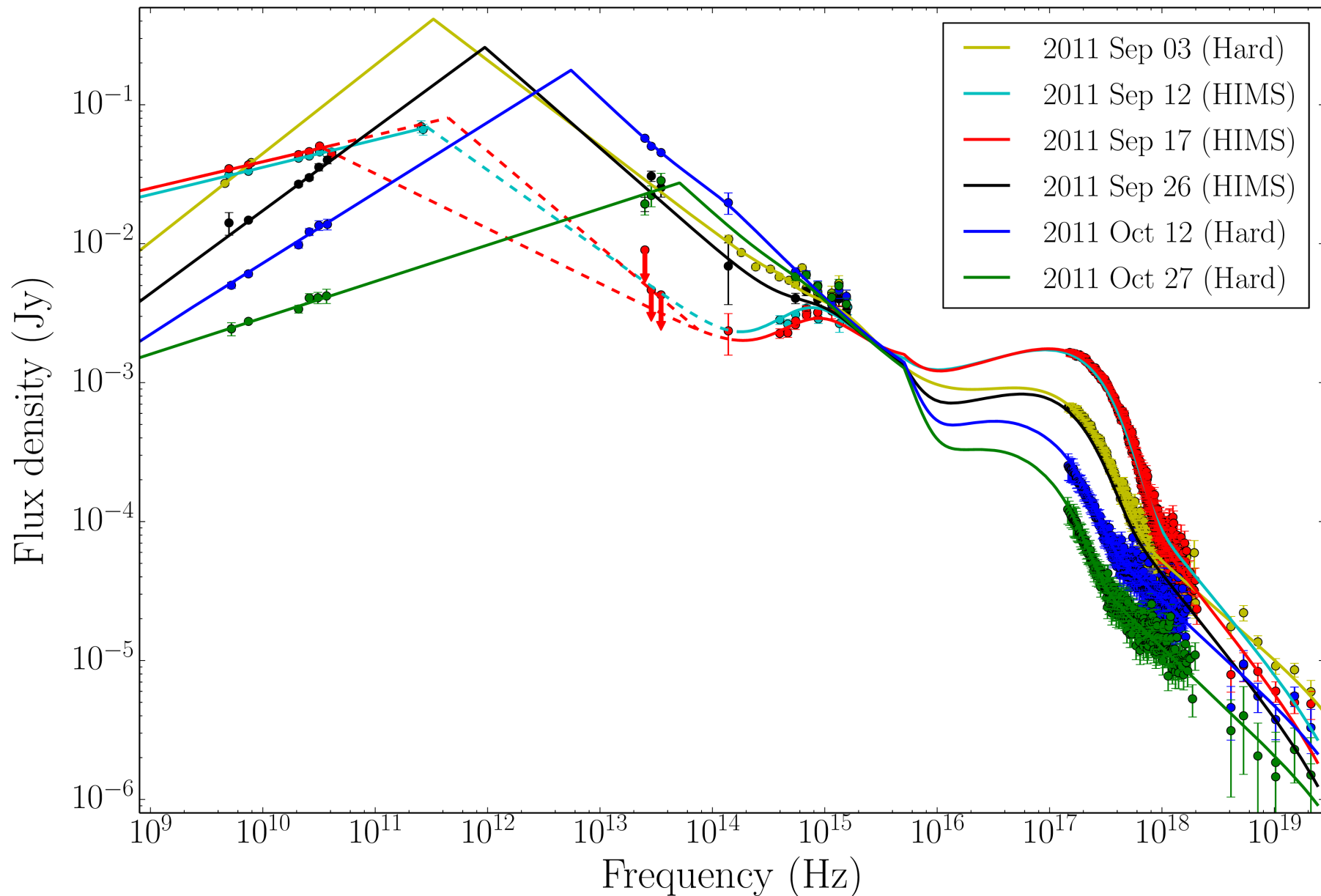
Model the broadband spectrum





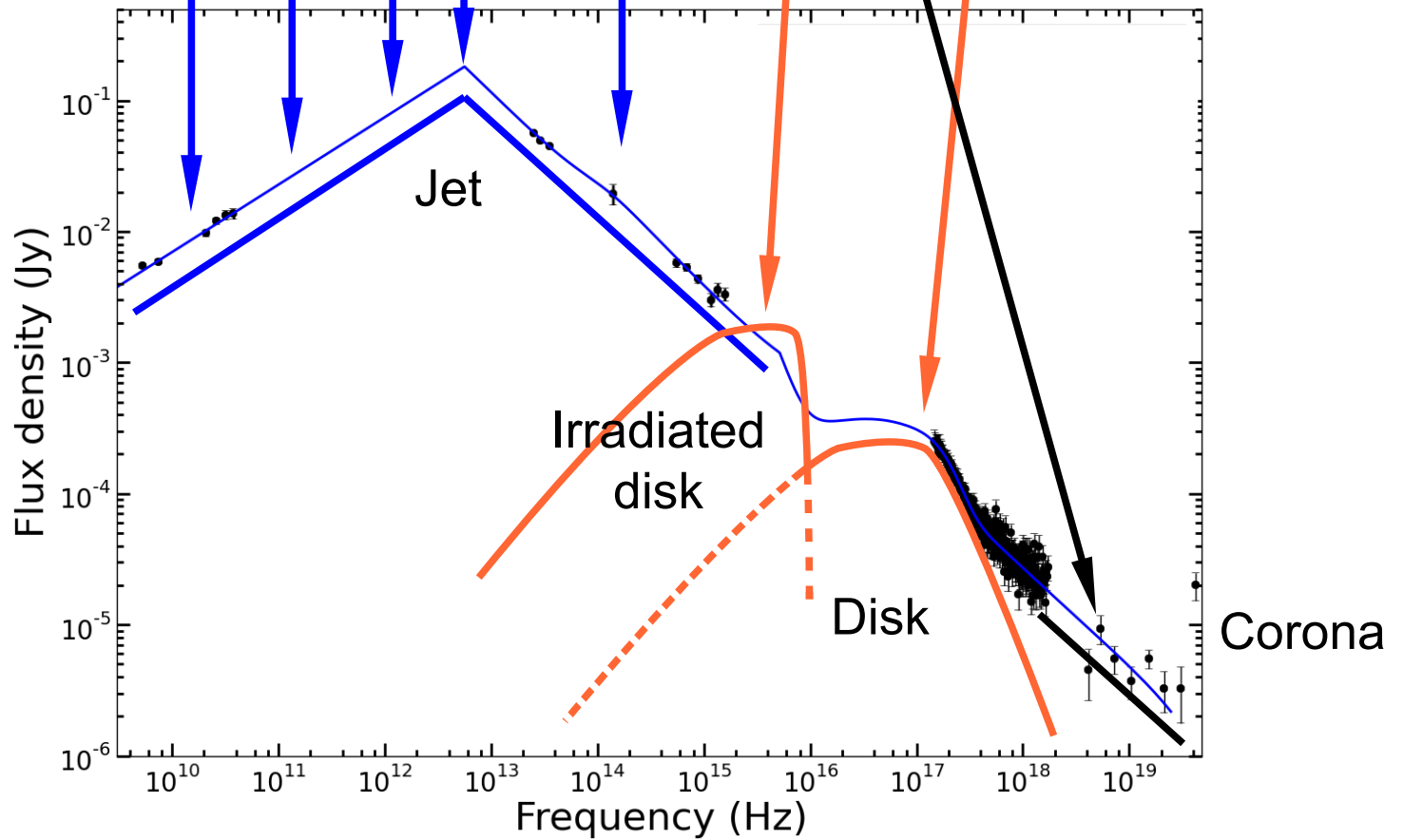
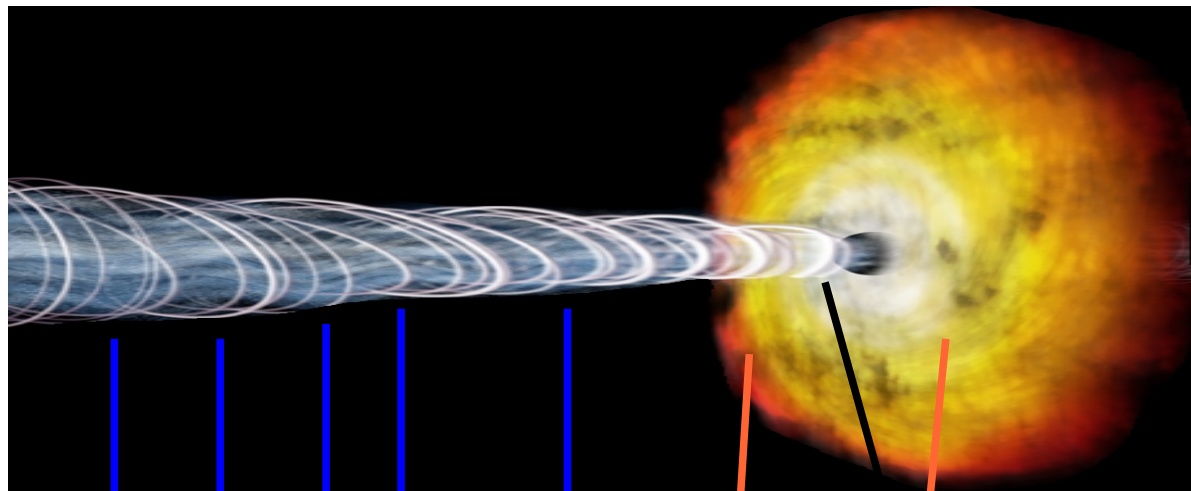
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The evolving spectrum



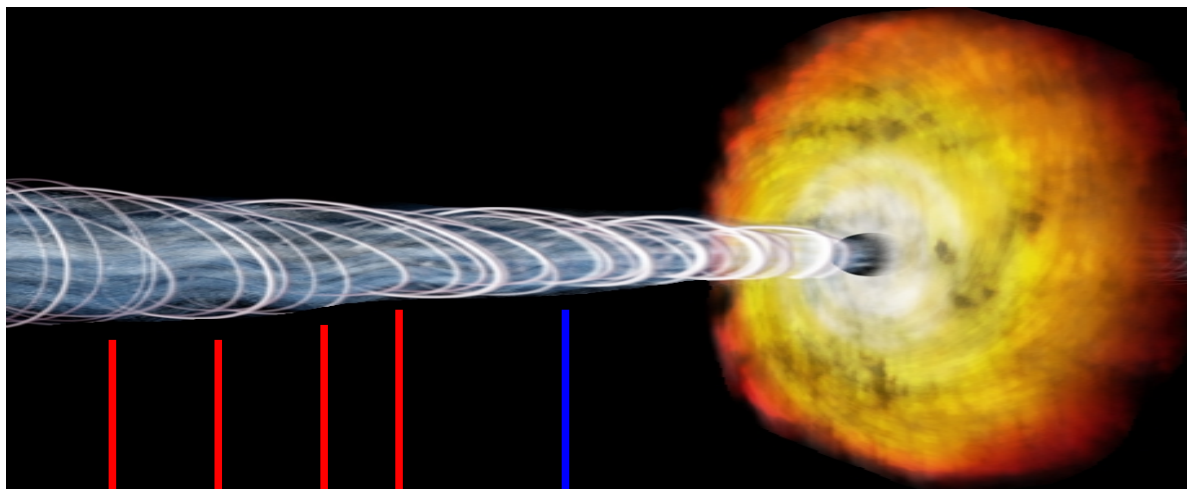


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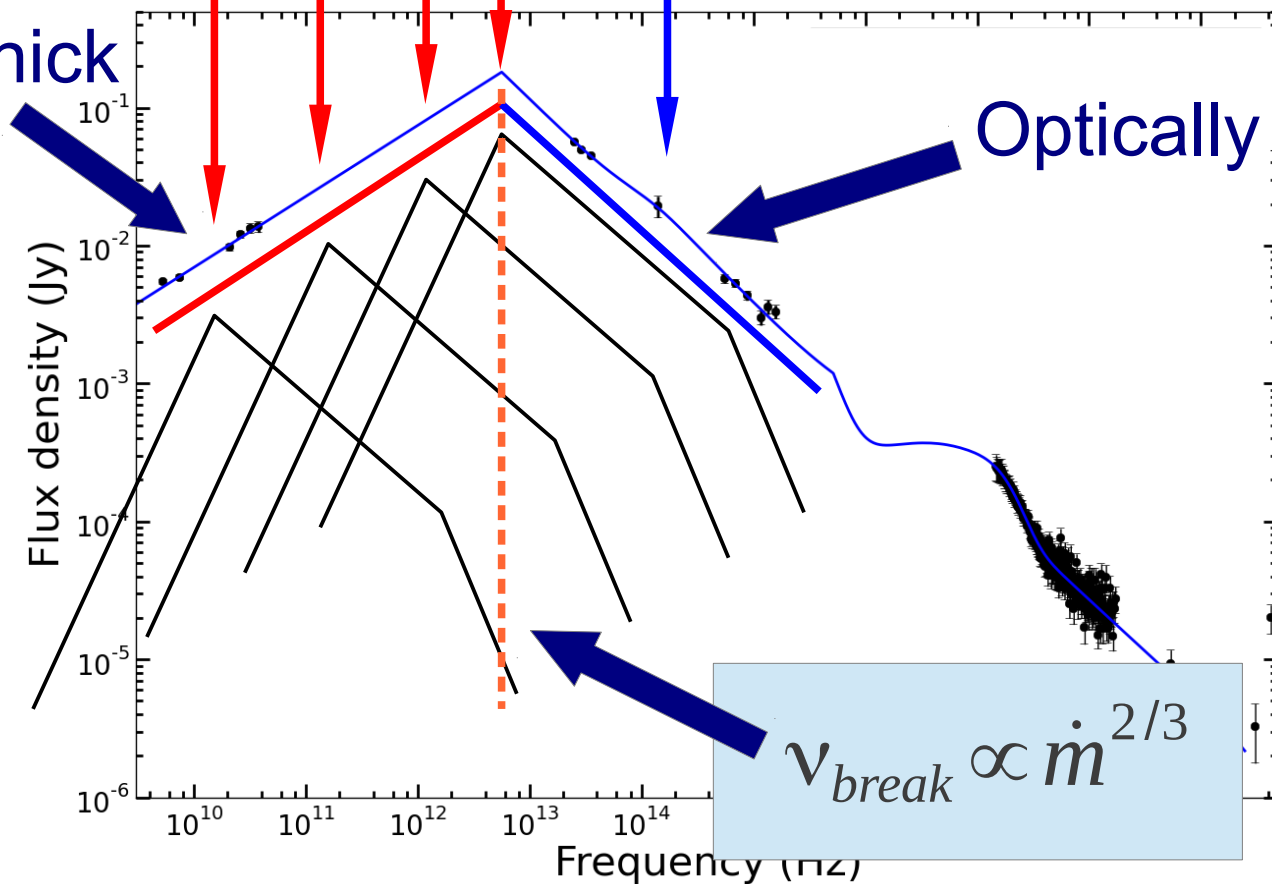




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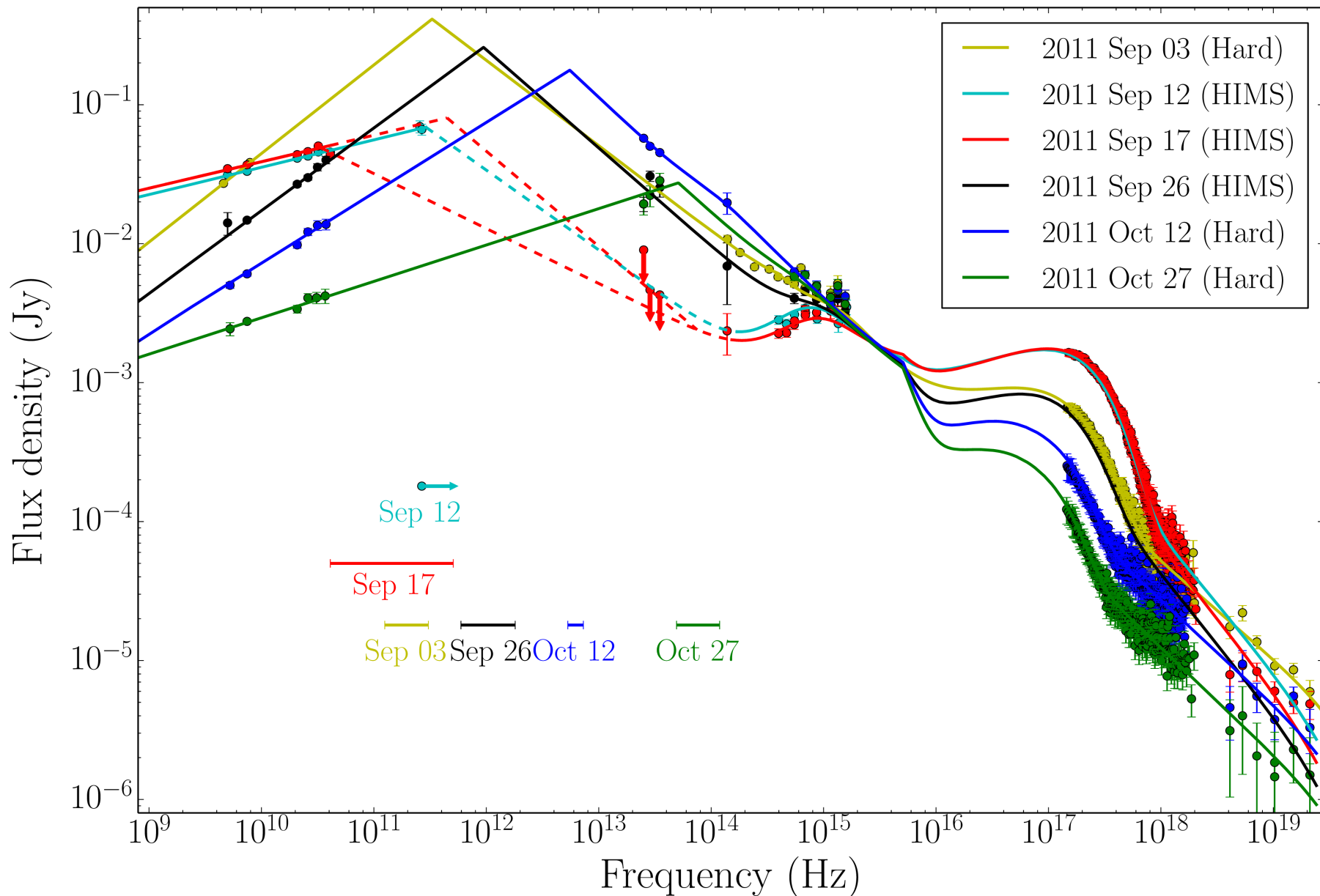
Optically thick



Optically thin

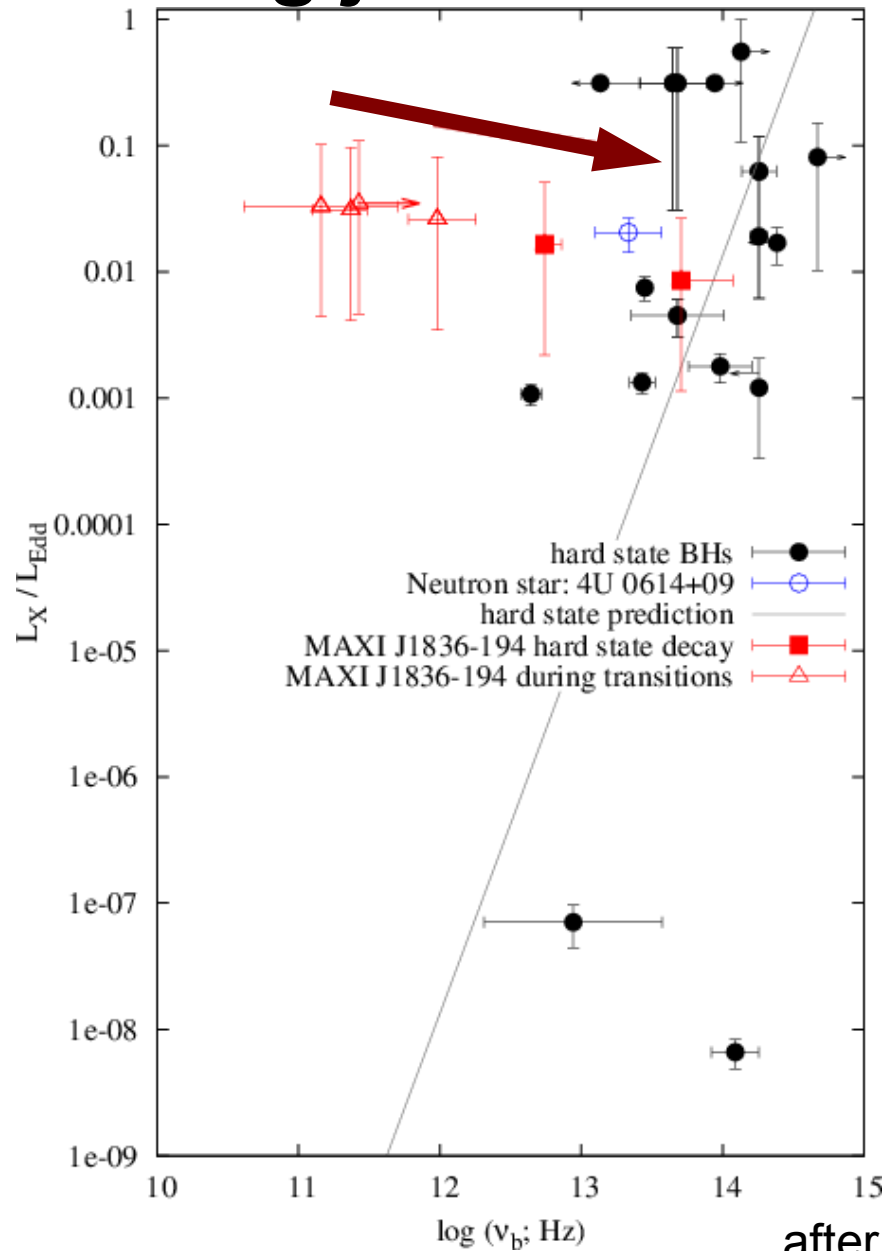


Evolving jet break



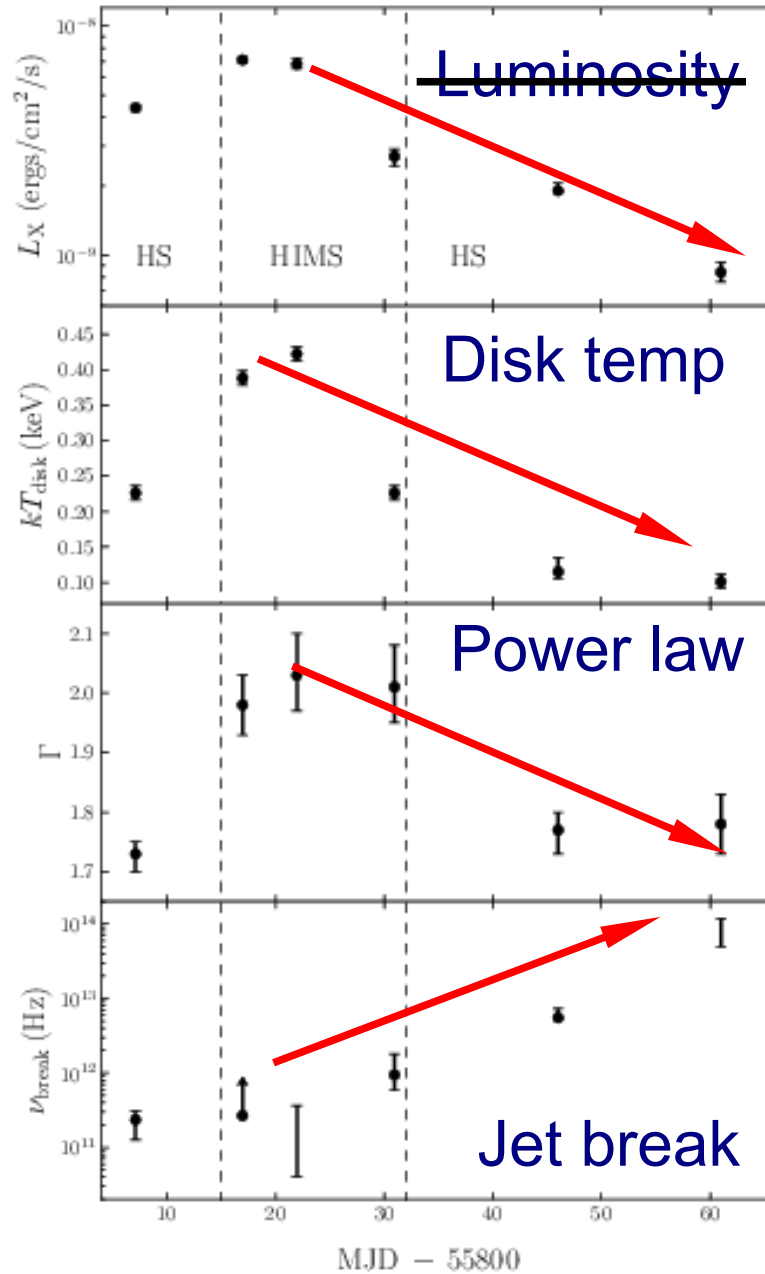


Evolving jet break

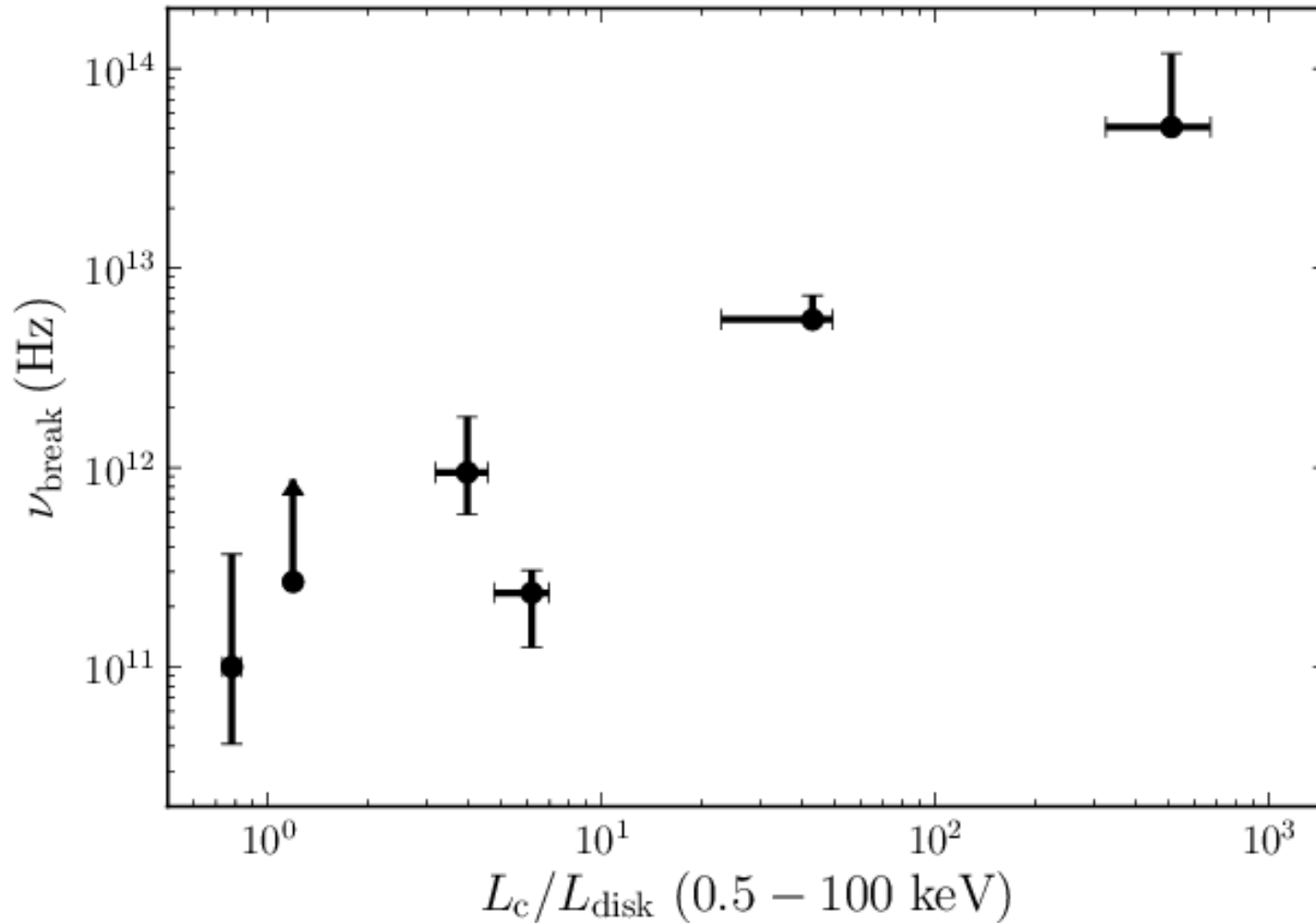




$$v_{break} \propto ?$$

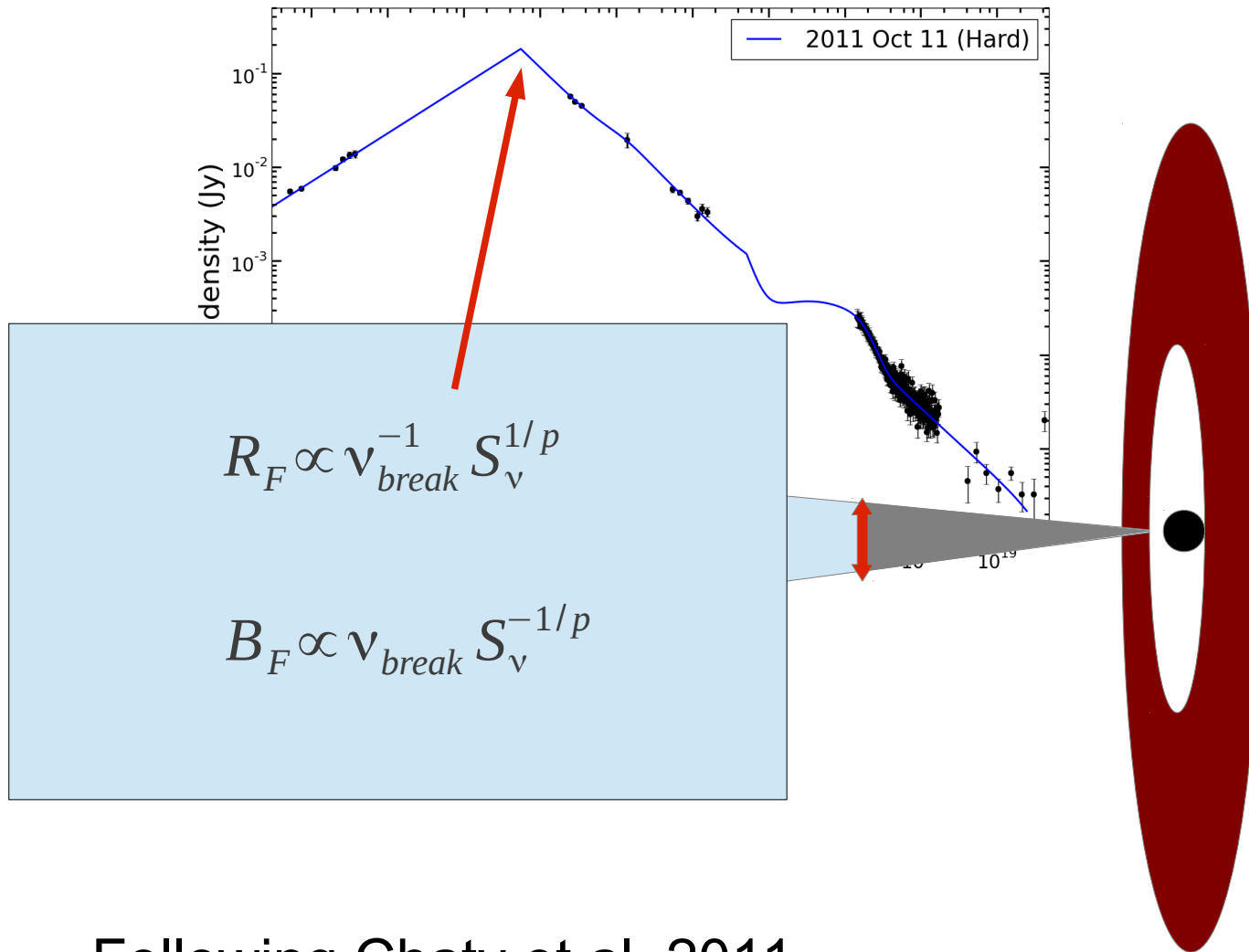


Correlation with hardness



- Spearman's rank coefficient = 0.71 ± 0.14
(significance = 0.86 ± 0.12)

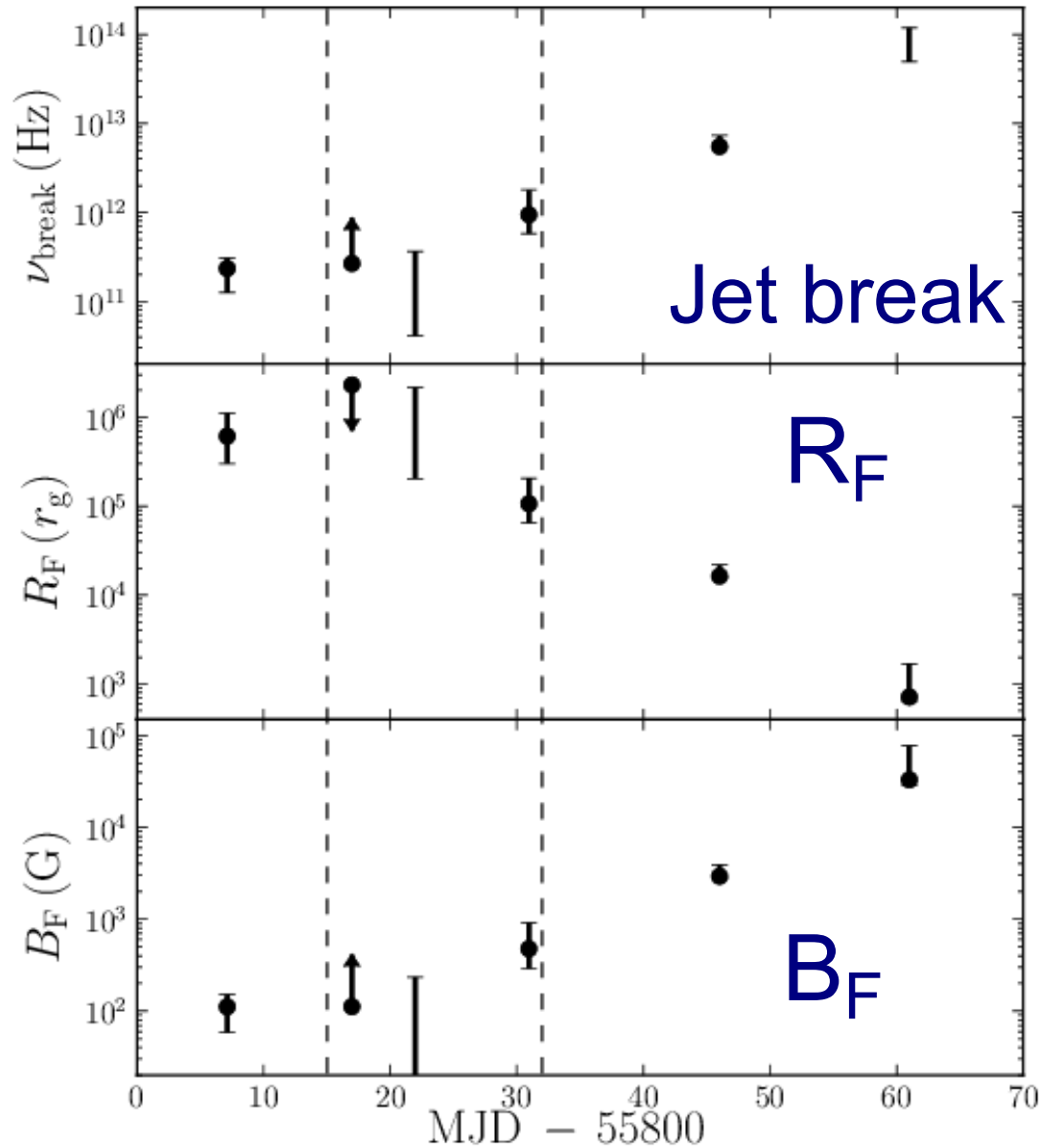
Radius of first acceleration zone



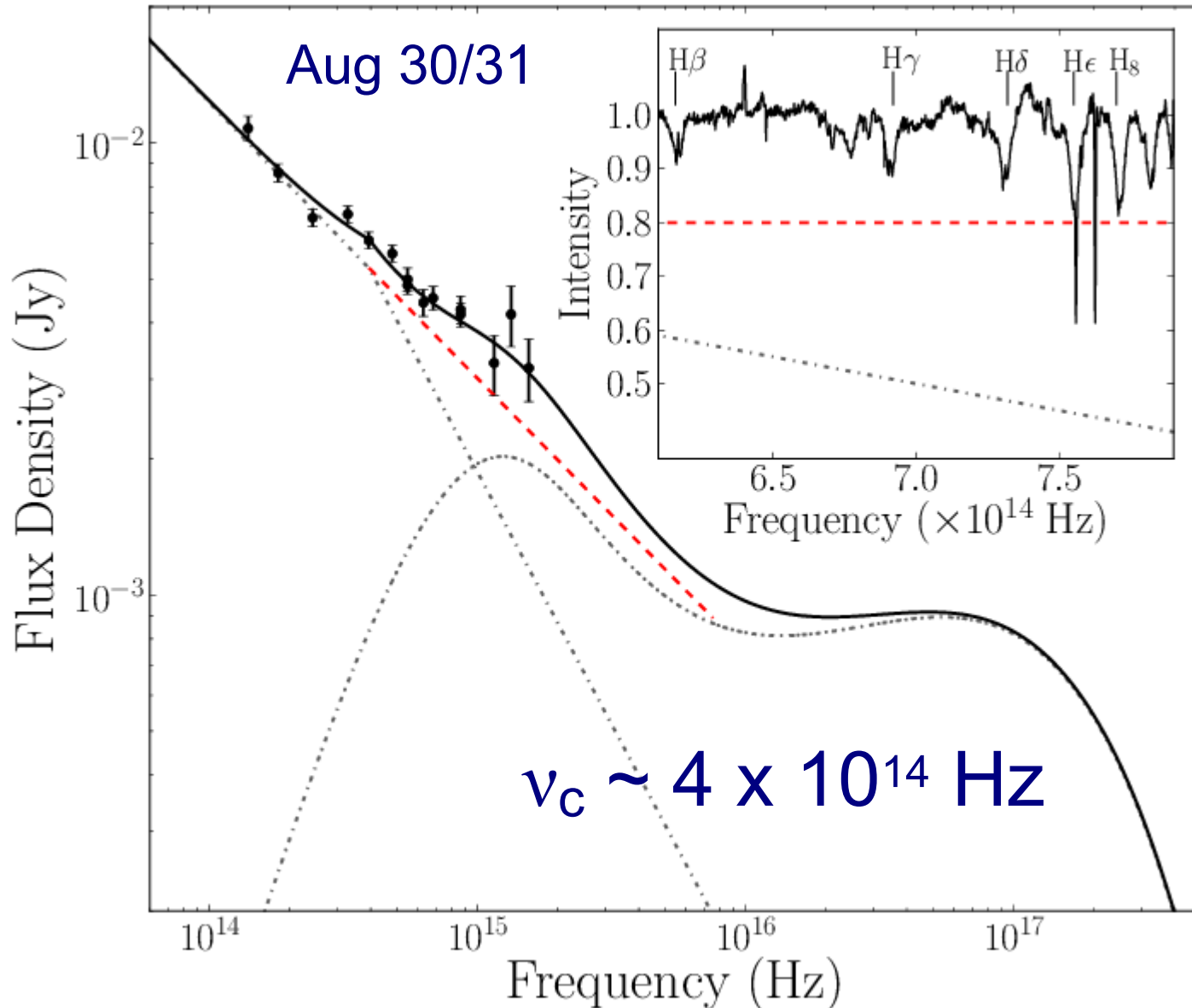
Following Chaty et al. 2011



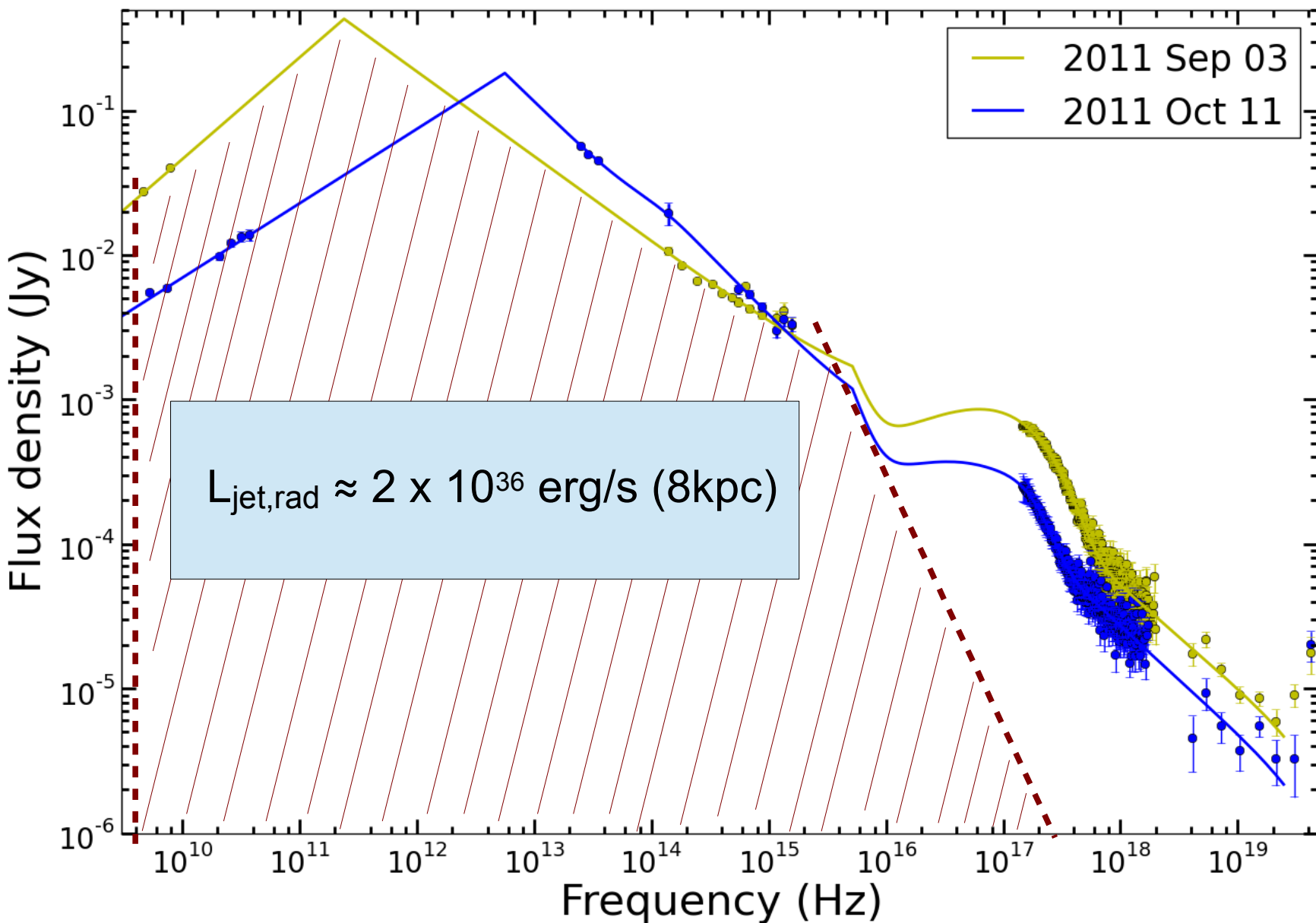
The evolving compact jet



Synchrotron cooling break



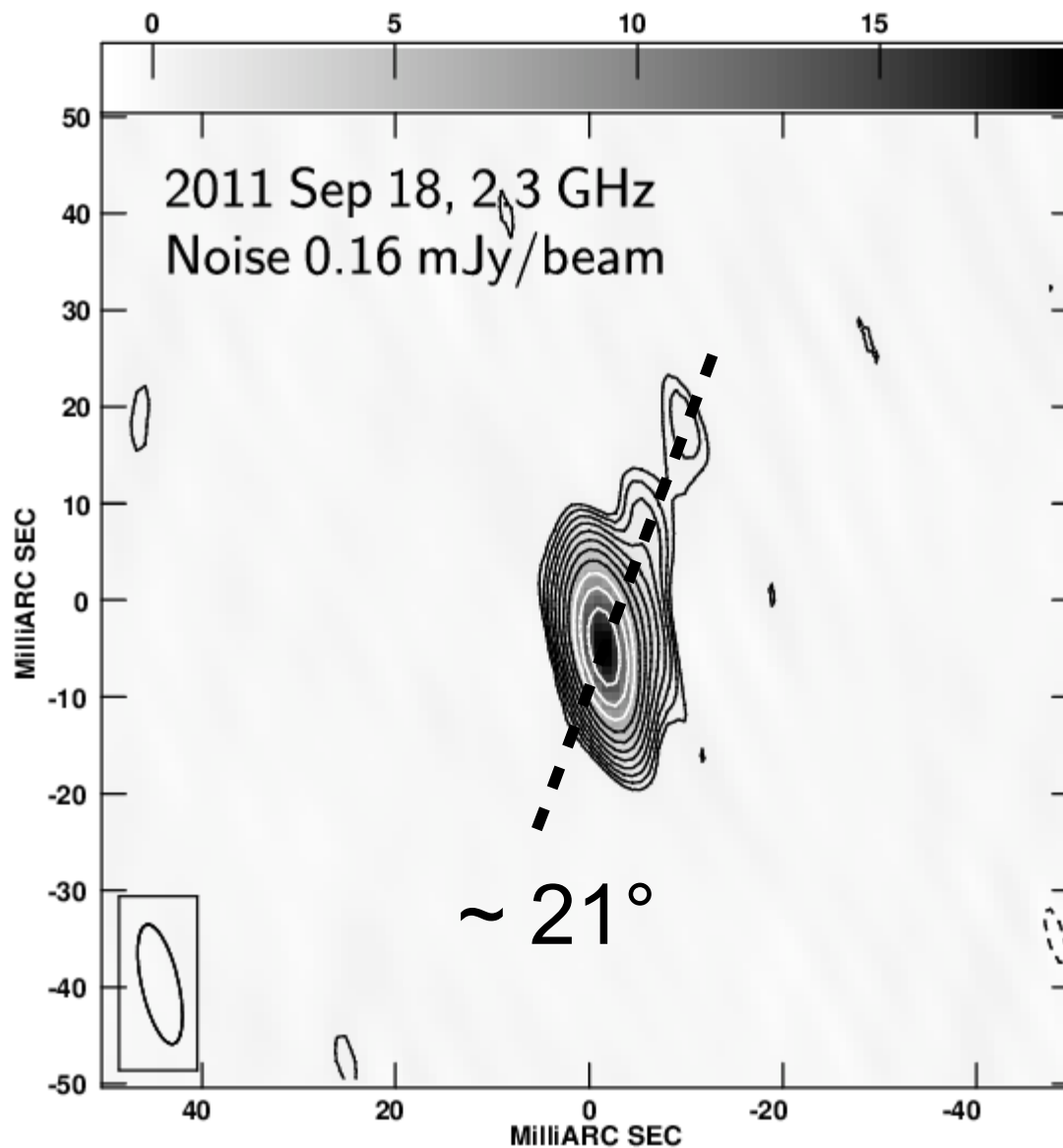
Evolving jet luminosity





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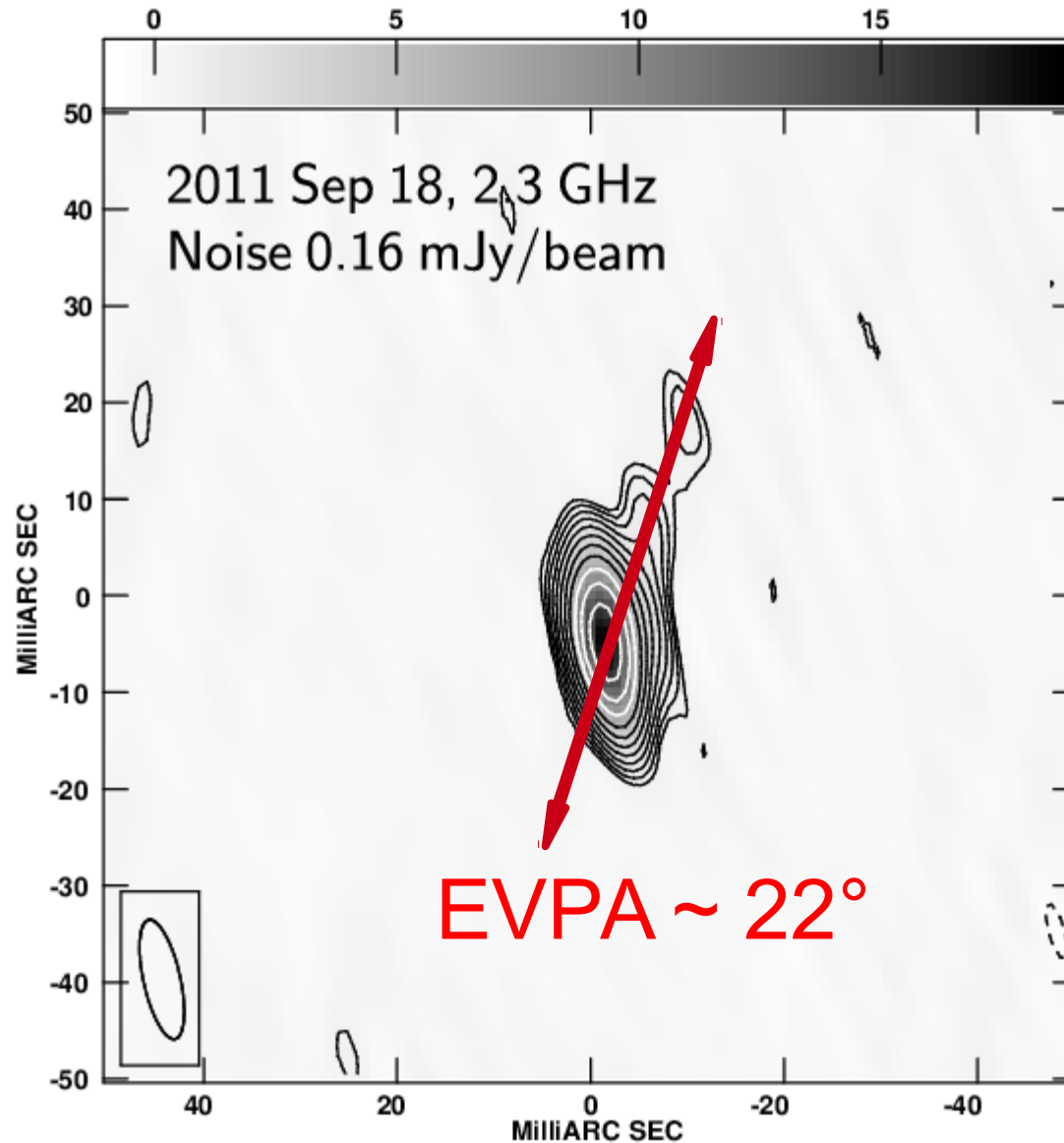
Resolved jet axis





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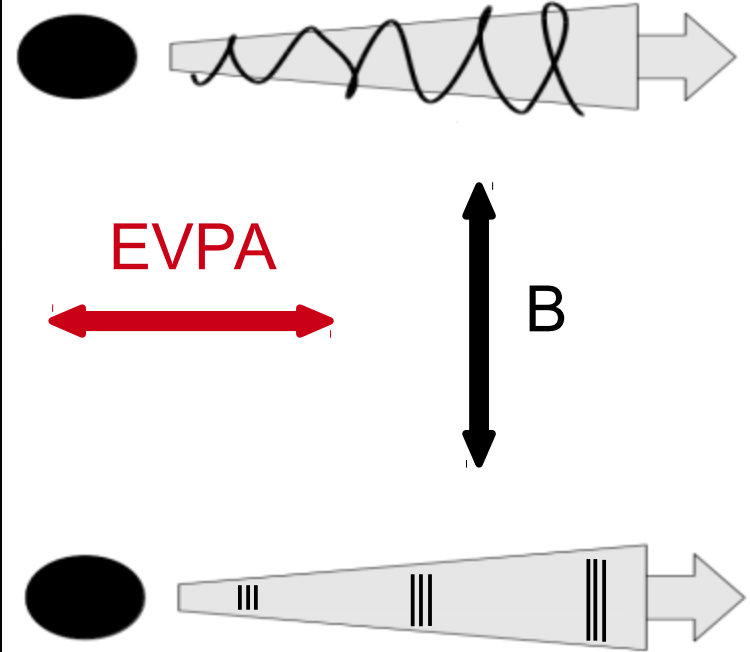
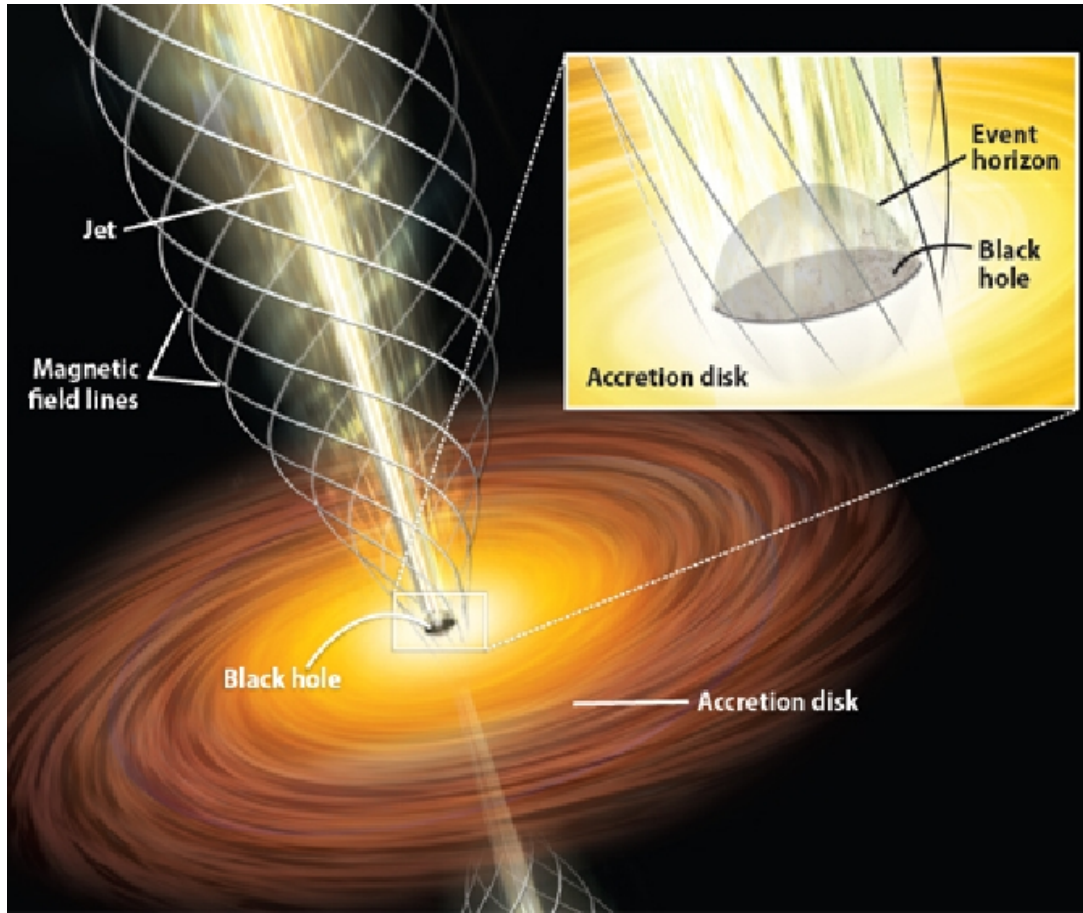
Aligned jet axis





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Helical magnetic fields or internal shocks



Source: Astronomy/R. Kelly

Summary

- Evolution of compact jet and disk
- Jet spectral break does not scale with X-ray luminosity – possibly with X-ray hardness
- Jet cooling break – dominates jet power
- Determine parameters of jet acceleration region
- Parameters of the jet

Conclusions

- Only possible with multiwavelength monitoring
- mm and IR – probe inner regions of the jet



Image courtesy of Harvard - SMA



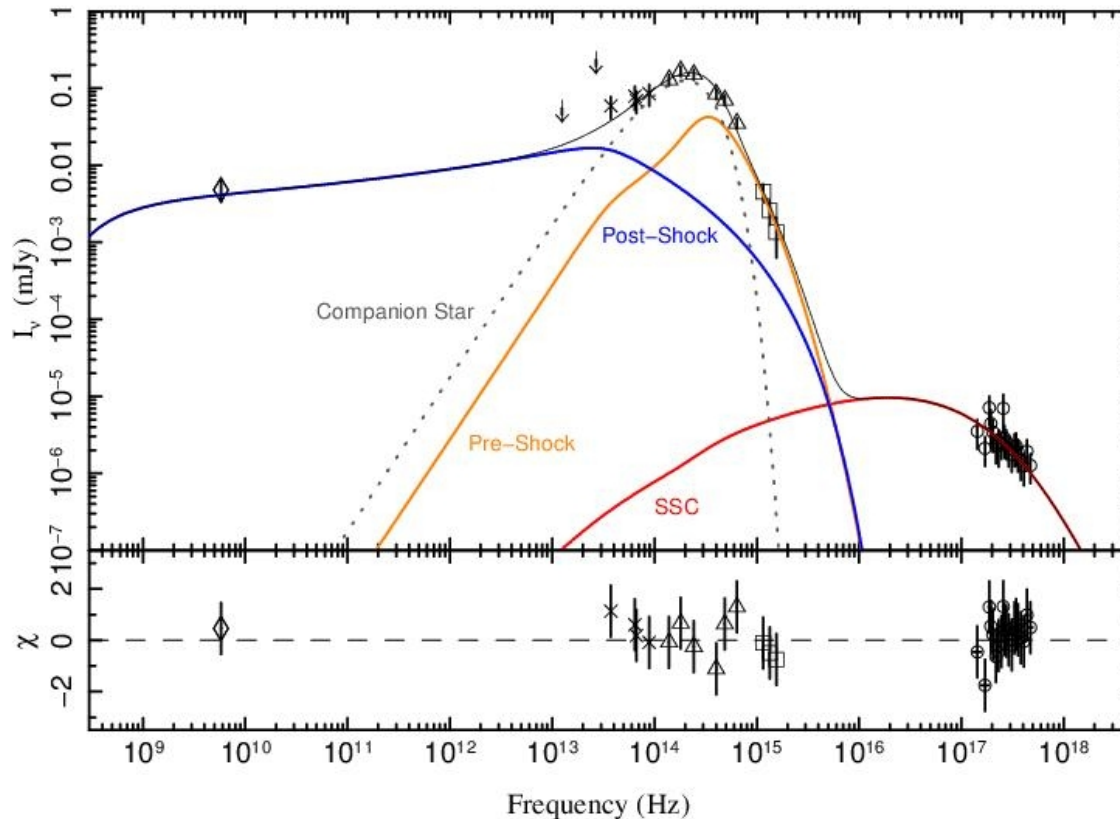
Image courtesy of
ALMA, O. Dessibourg



Image courtesy of ESO

Modelling the jet

Plotkin et al. 2015

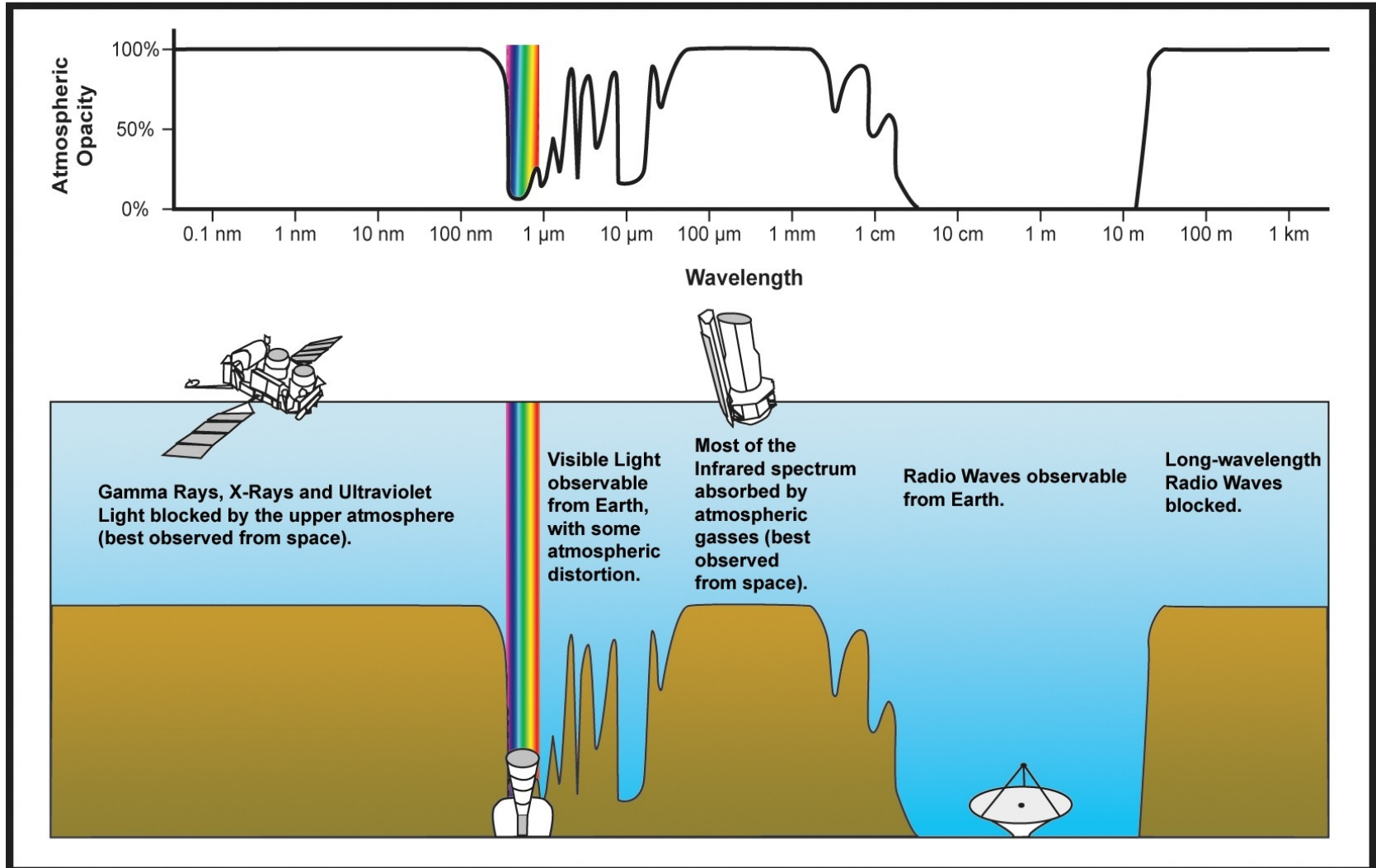


- Multiple accelerating regions, relativistic effects and internal shocks
- Track physical jet parameters



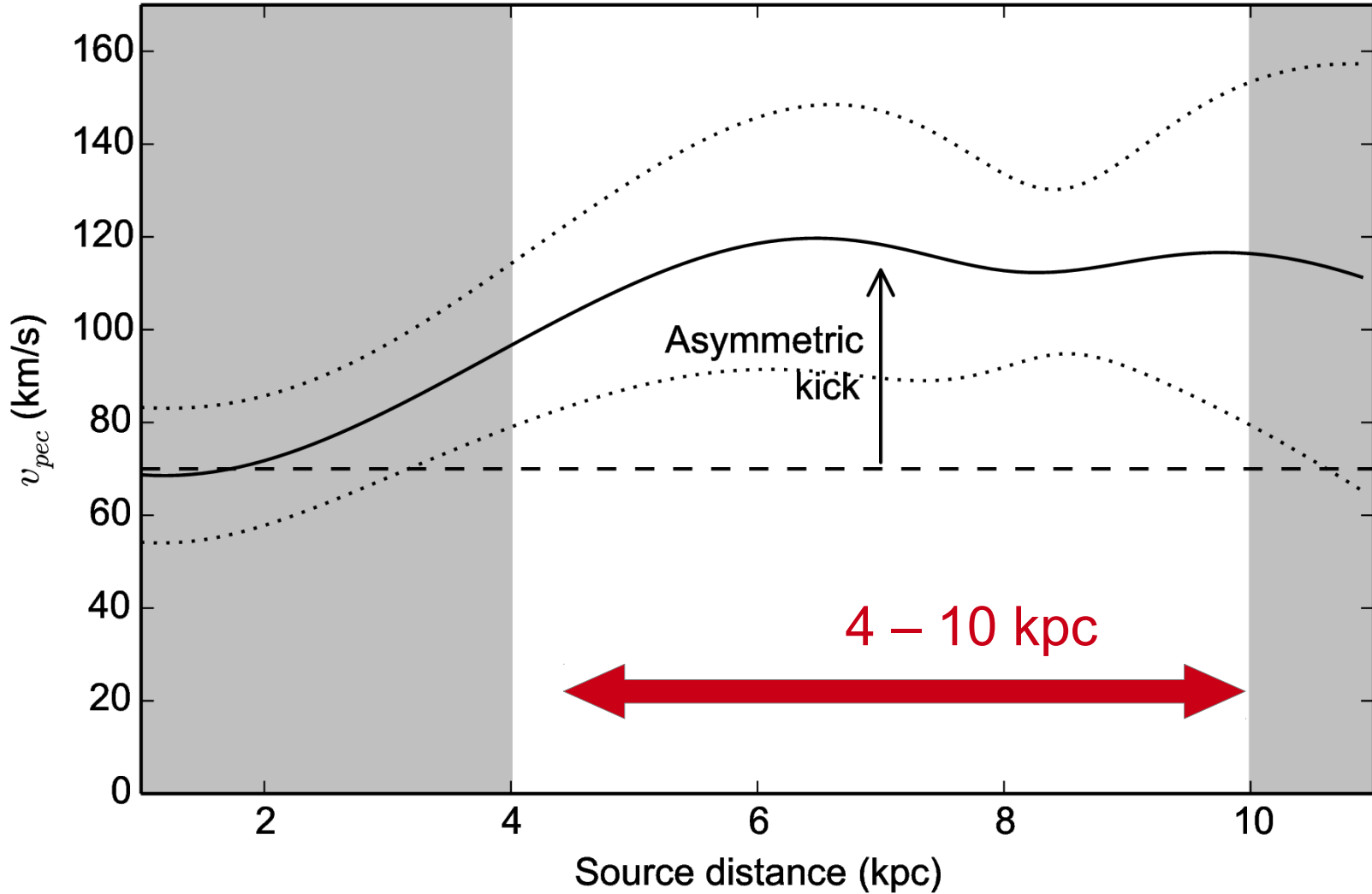
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Atmospheric opacity



ESA/Hubble (F. Granato)

Peculiar velocity



Radio X-ray correlation

