TEXAS TECH UNIVERSITY™

# Jet eclipses in X-ray binaries

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# Overview

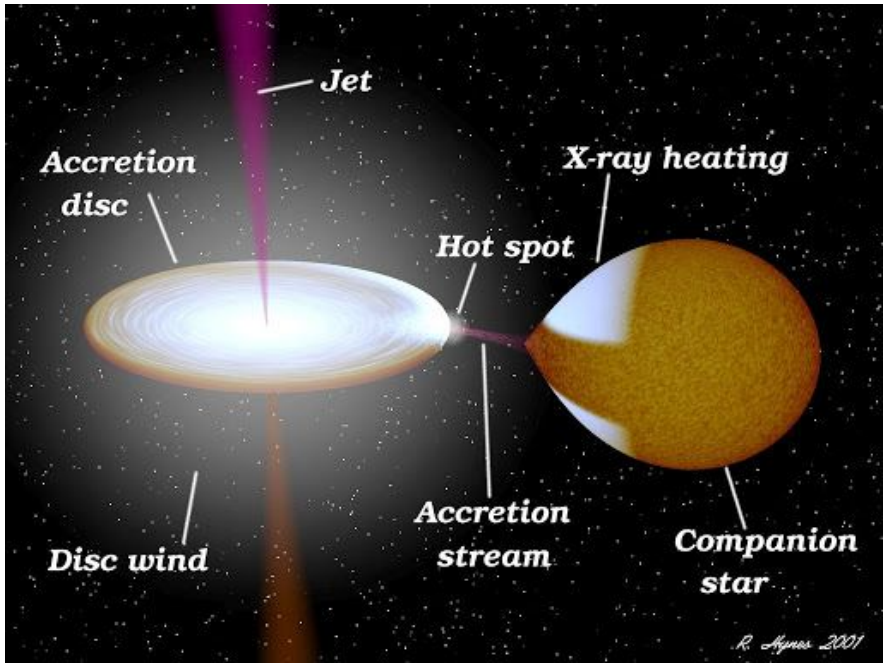
Jets from X-ray binaries, what we know and what we want to know

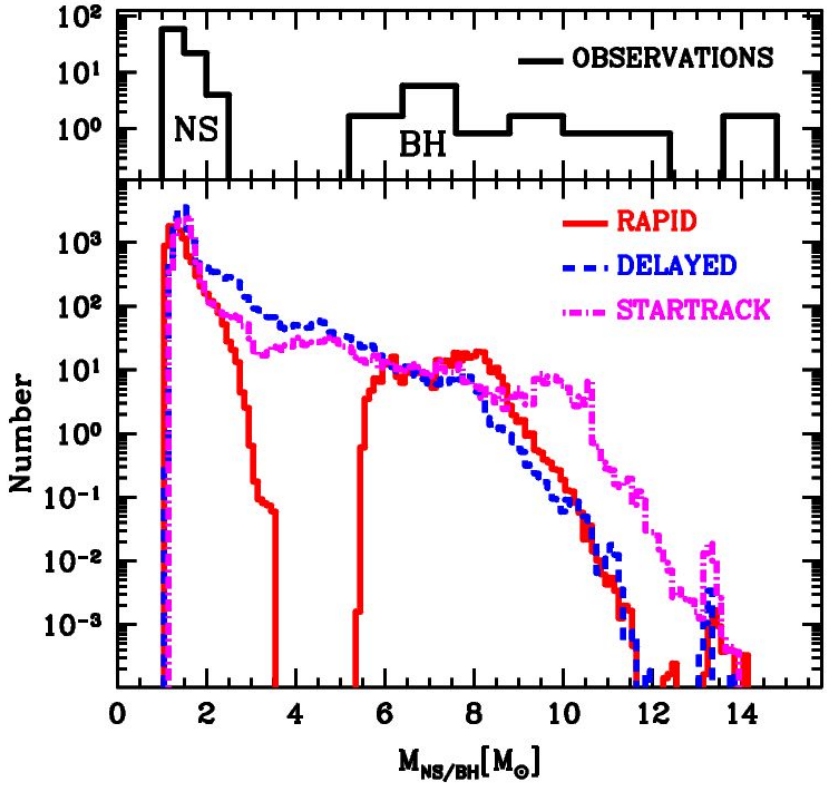
How eclipses help

Which sources will be the best targets

# Why understand jets?

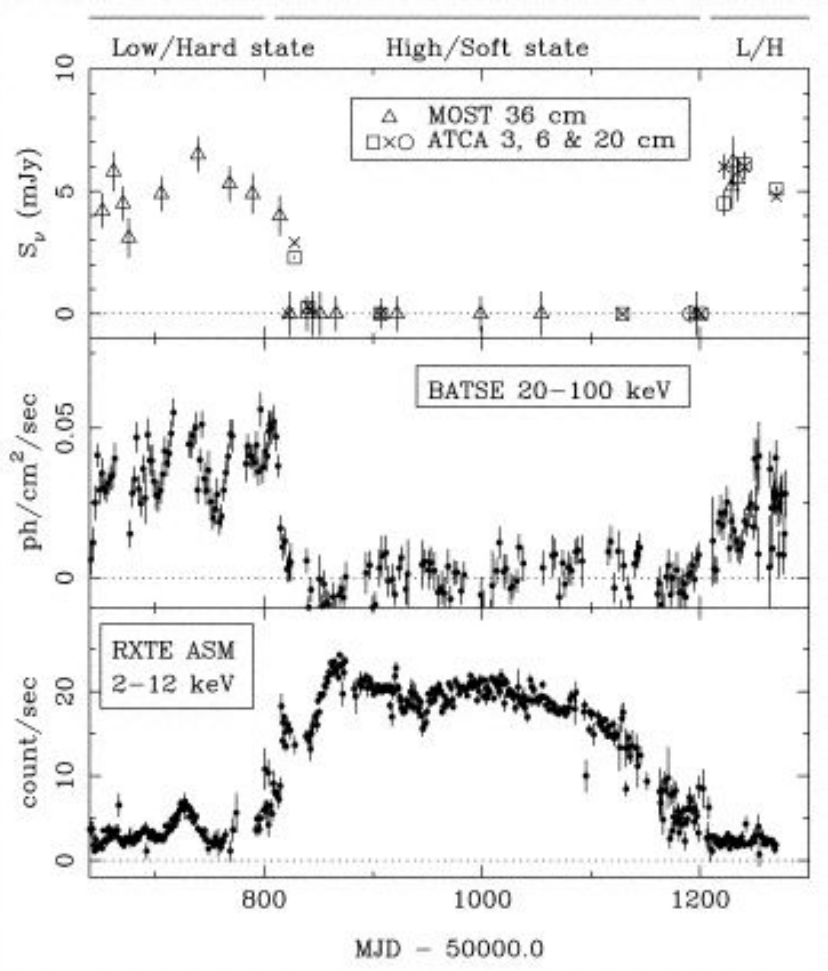
# Why study X-ray binaries?



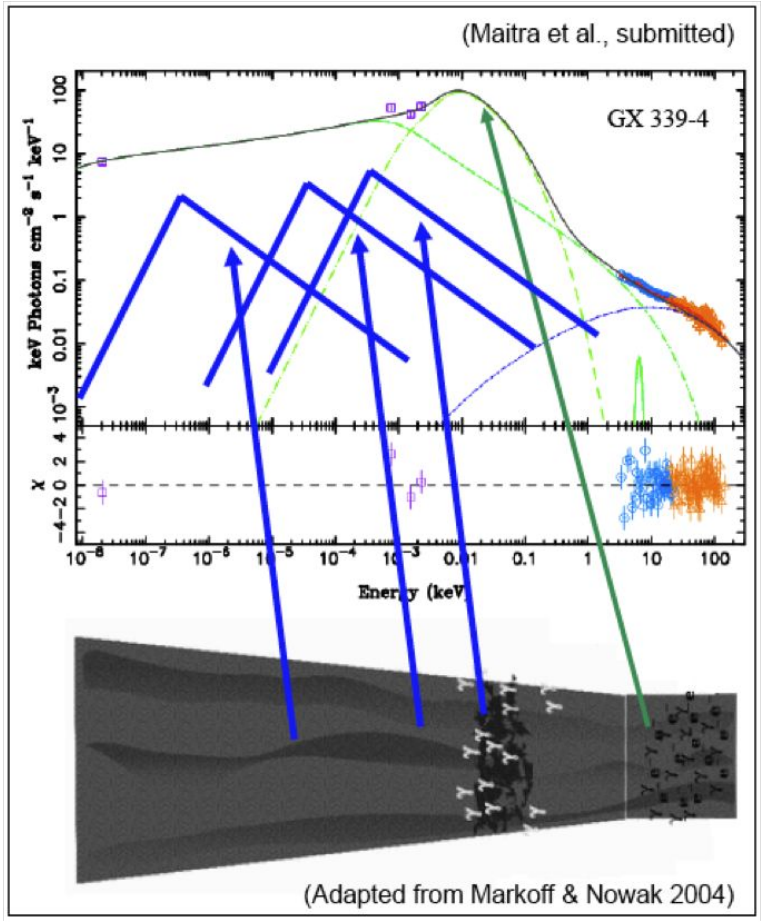




Belczynski et al. 2012

# Jets from X-ray binaries

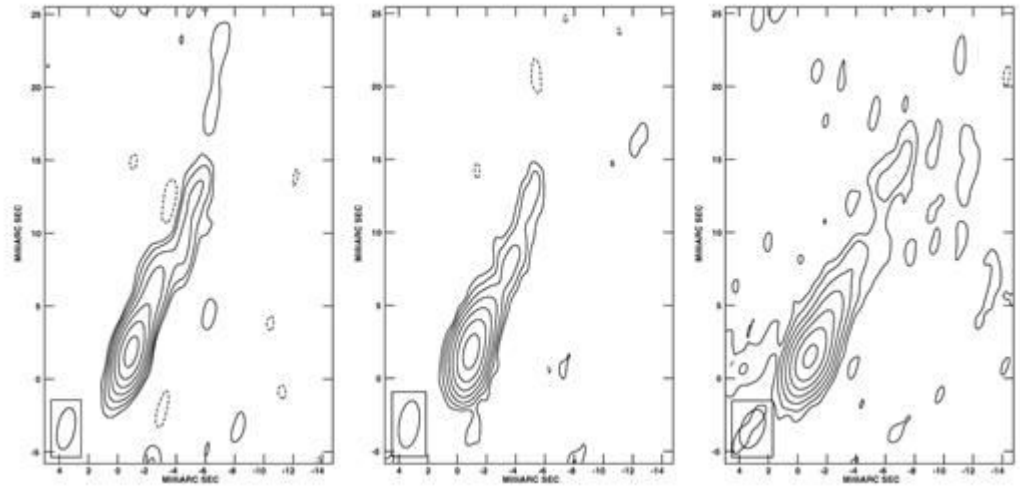



From Fender et al. 1999; see also Tananbaum et al. 1972, Hannikainen et al. 1997




Flat spectrum can be explained by synchrotron self-absorption in conical jet (Blandford & Konigl 1979)

# Testing the model given the featureless spectra



Stirling et al. 2001

Cyg X-1 (at 2 kpc) is barely resolved, other objects are generally unresolvable

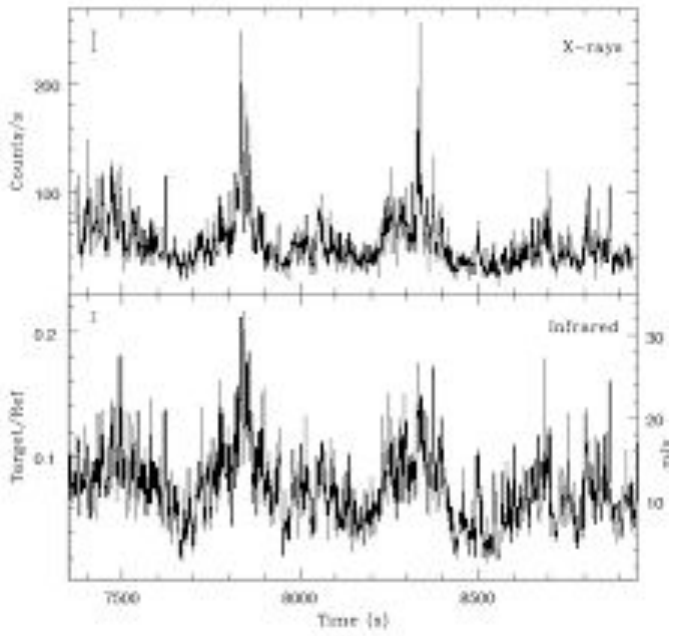
BK model predicts same size in resolution elements at all wavelengths, because both resolution and jet size are proportional to wavelength

Misaligned jets:

Clearest for GRO J1665-40 - jet inclination from two sided proper motion with small precession is 85+-1 degrees

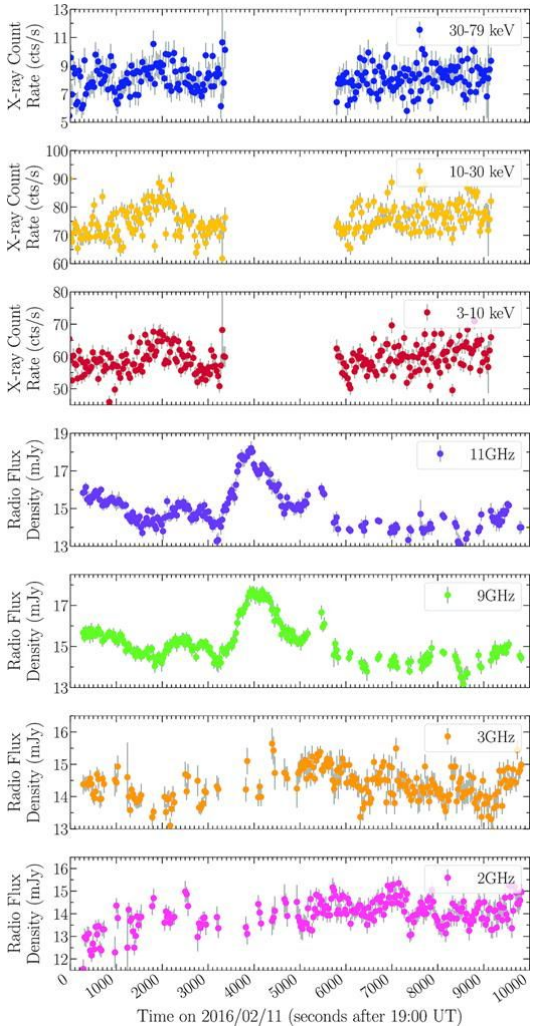
Binary inclination angle about 70 degrees - strong ellipsoidal modulations, not elipsing

# Variability studies



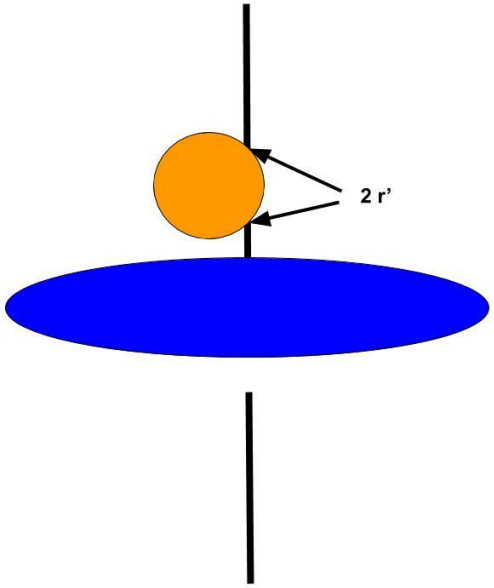

Casella et al. 2010

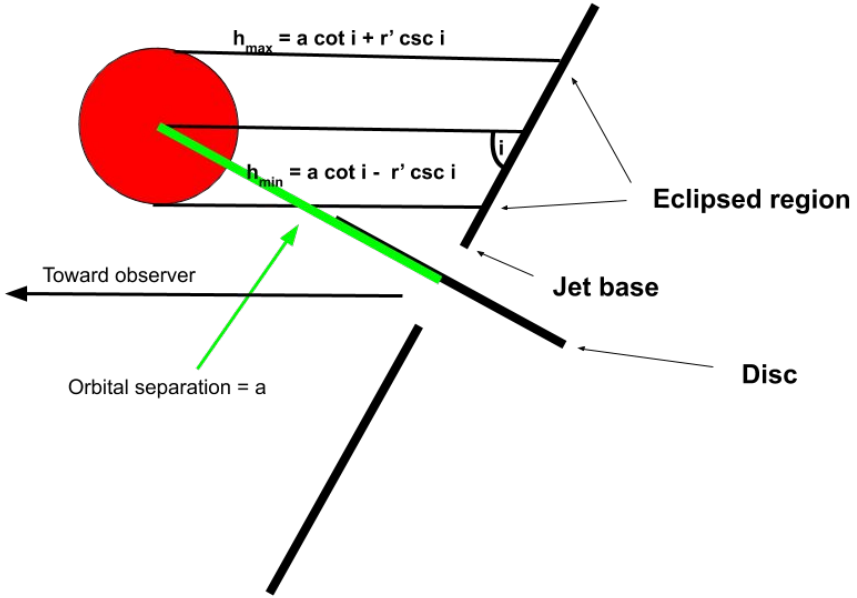
IR lags X-rays




Tetarenko et al. 2019

# Jet eclipses

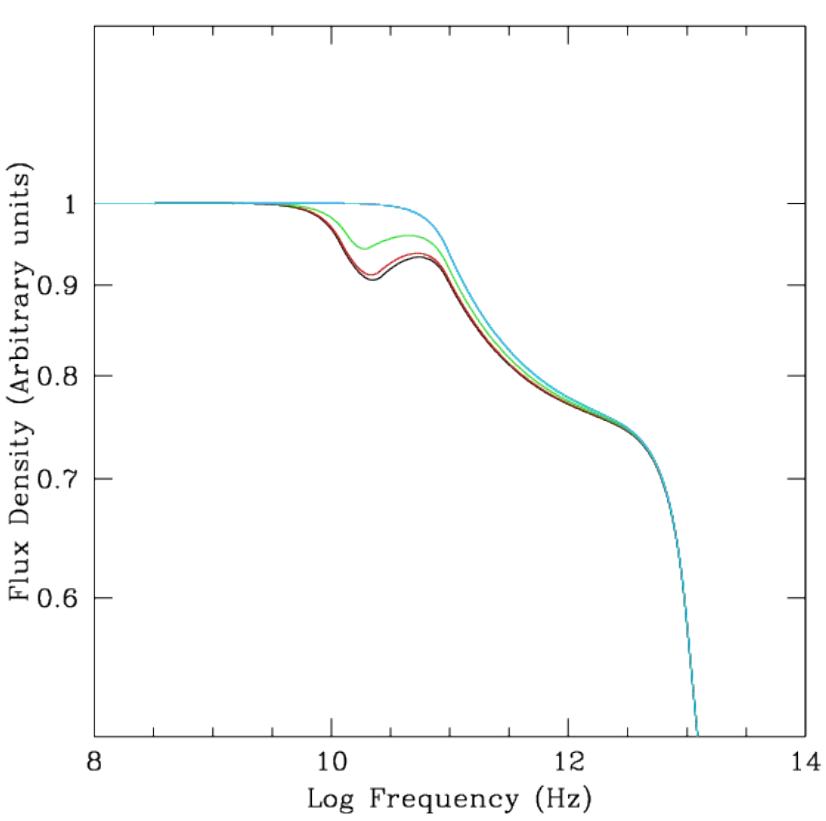


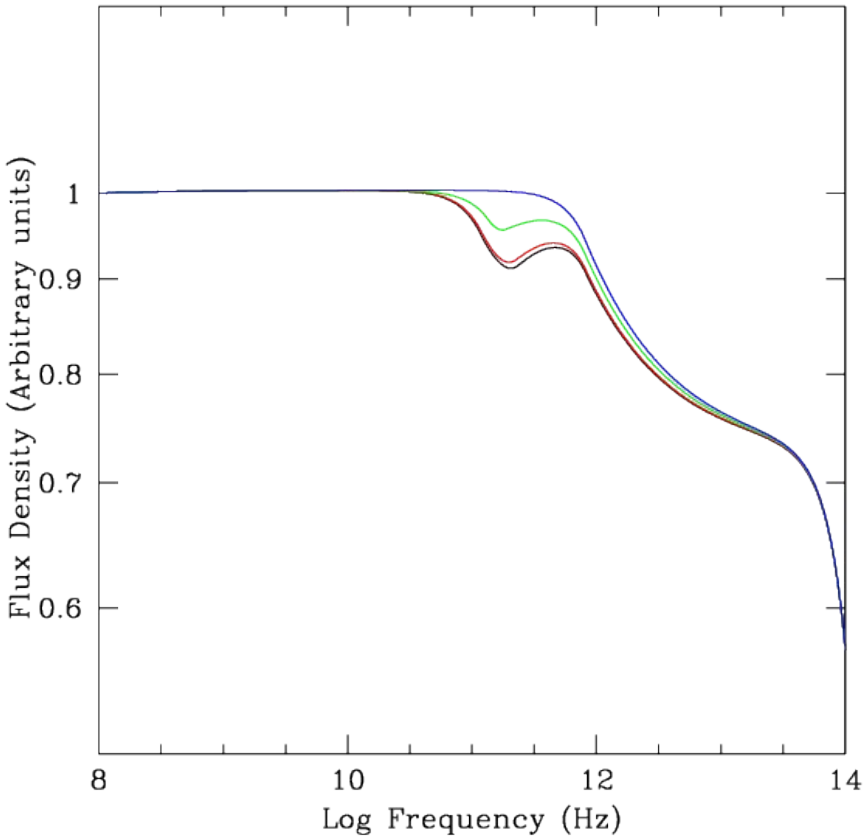



# What can we hope to get out?

- Test of Blandford & Konigl model
- Mass ratio between donor and accretor
- Inclination angle of binary
- Jet opening angle
- Speed of material in jet

# Some sample predictions




Left: Aql X-1, Right: Sco X-1. Color coding gives orbital phases 0.01, 0.02, 0.04, 0.07

# Summary

Jet eclipses should happen

Probably requires ngVLA to exploit full potential, but VLA can do proof of concept work

Opens up new possibilities to understanding both jet structure and binary parameters