

Using SCUBA-2 to Probe Variability in X-ray Binary Jets

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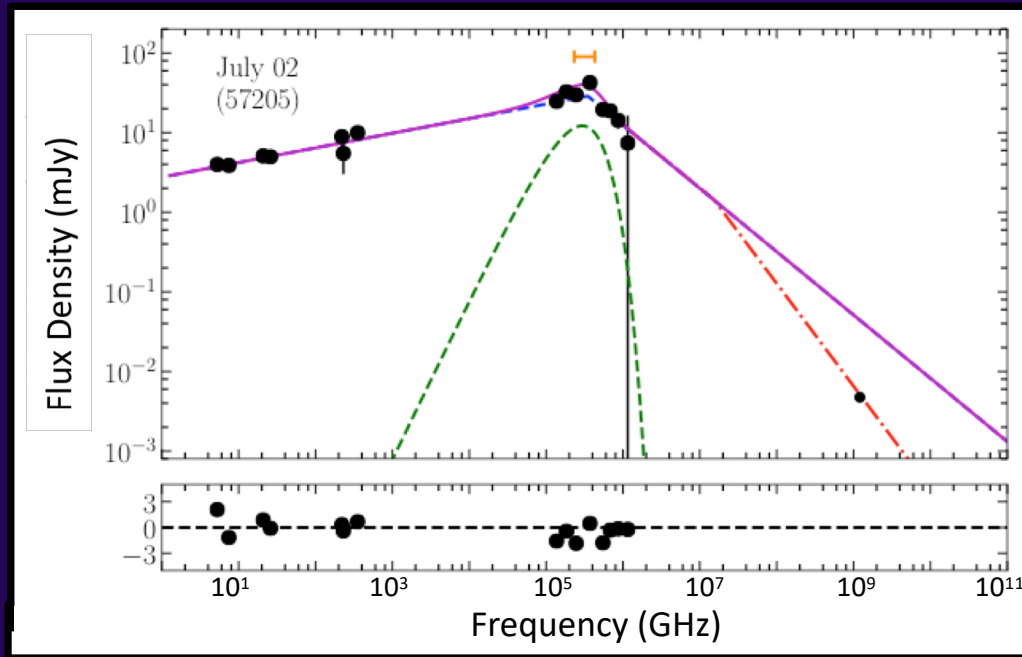


Studying Jets in X-ray Binaries

Modeling the
broad-band spectra

Time Domain

?



Tetarenko et al. 2019

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What can we learn from time domain studies of jet emission?

- Map out the jet size scale
- Probe jet geometry, beyond what we can accomplish with high resolution imaging
- Measure compact jet speed
- Probe the connection between the accretion flow and the jet



V404 Cygni - June 2015 Outburst

- On June 15, 2015 X-ray flaring activity detected by Swift BAT, MAXI and INTEGRAL
- Extraordinary multi-wavelength flaring activity followed
- Brightest BHXB outburst in the past decade

Rare, bright
accretion state



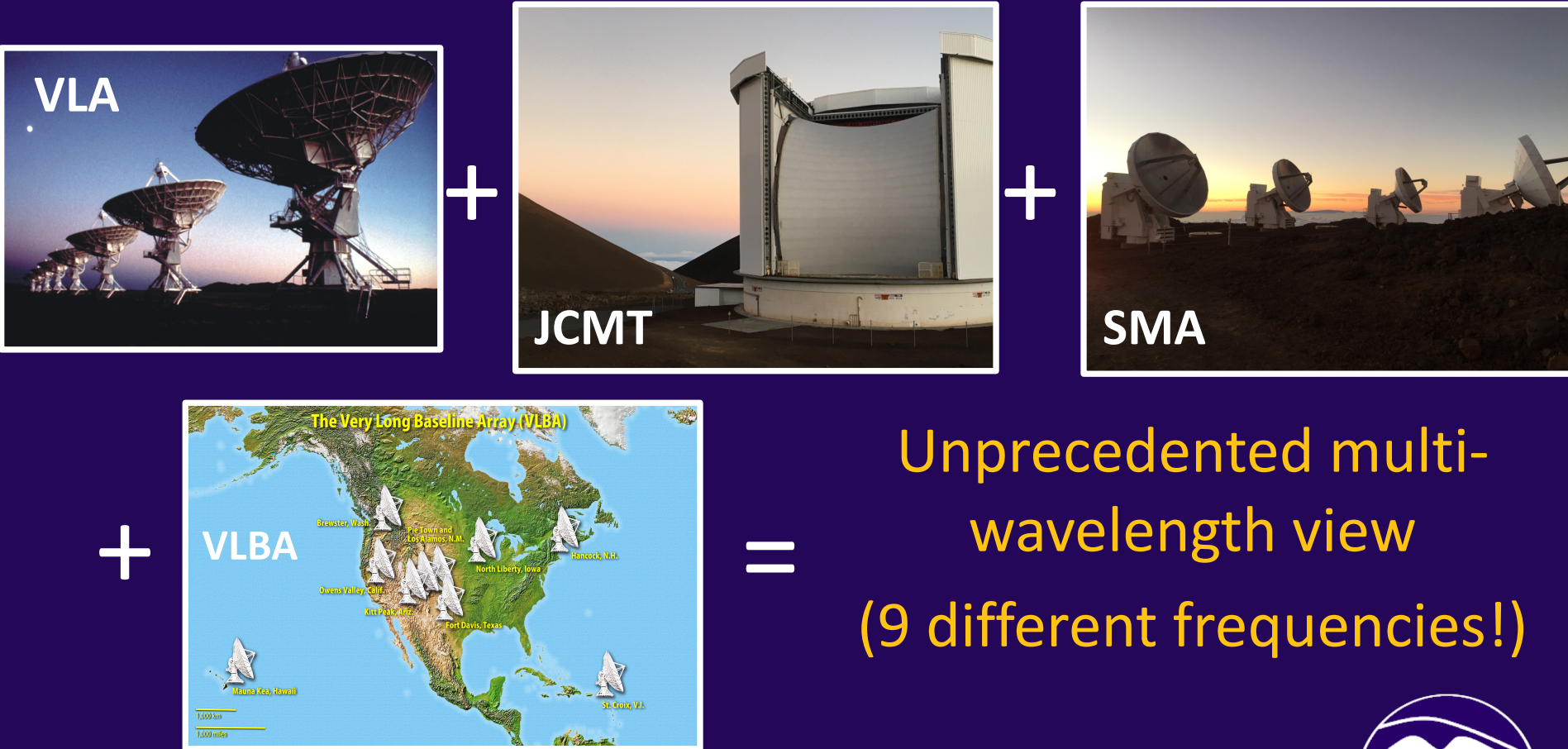
Well-known system
parameters



Close Proximity

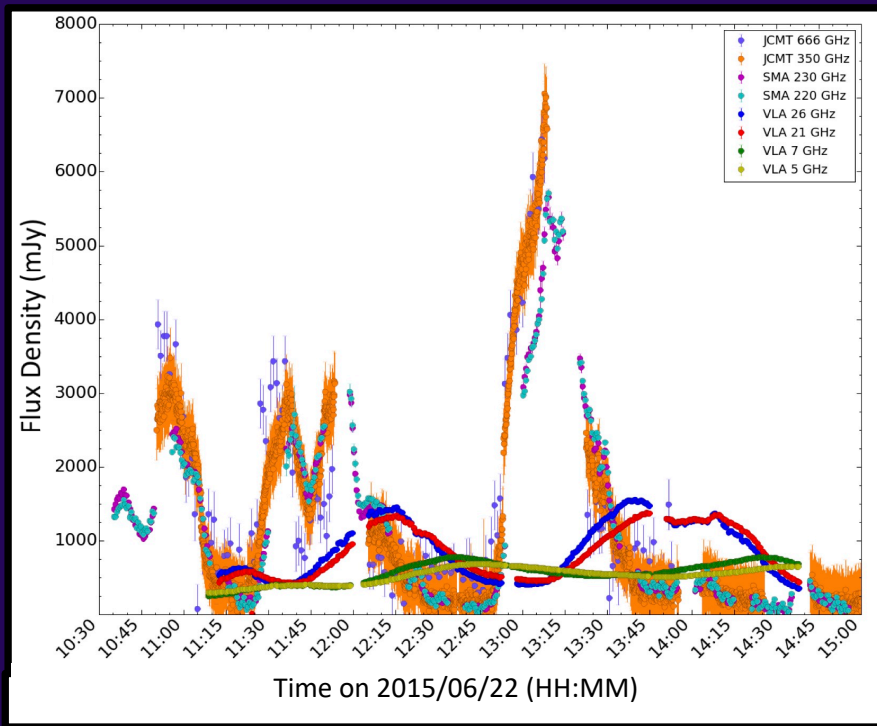


The Golden Data Set



The Golden Data Set: PART 1

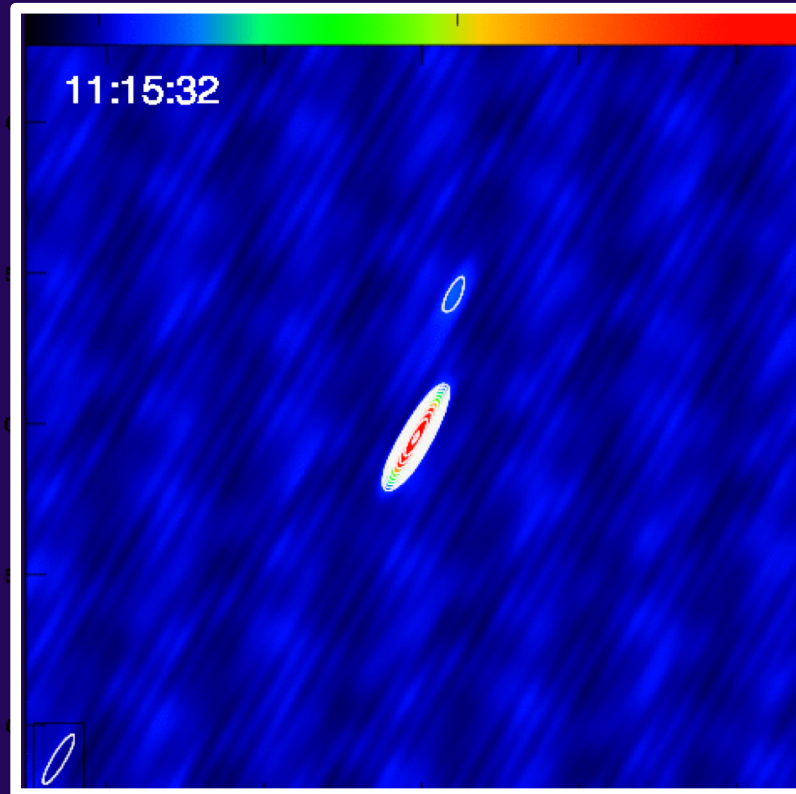
Extreme Flaring!



Tetarenko et al., 2017

- Flares reach extremely bright flux levels
- Lower ν are delayed, smoothed version of higher ν
- (Sub-)mm substructure not visible in cm emission

The Golden Data Set: PART 2



Credit: J. Miller-Jones

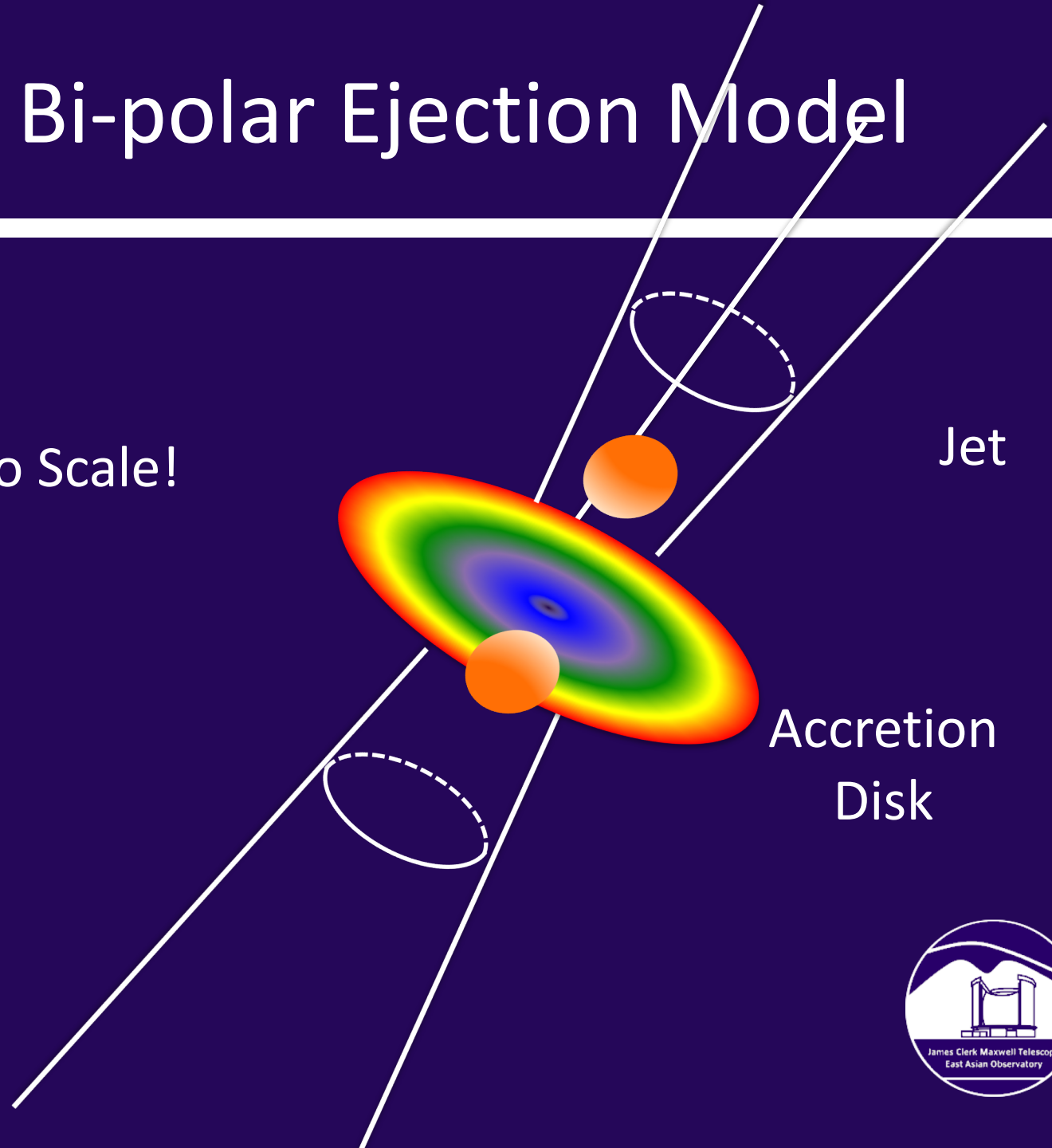
Miller-Jones et al. 2019, Nature in press

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Twin Bi-polar Ejection Model

Not To Scale!



Lab Procedure

- Reduce a time-resolved JCMT SCUBA-2 observation of V404 Cygni during the extreme flaring activity of its 2015 outburst.
- Make a movie of the extreme flux changes in V404 Cygni.
- Work to connect jet variability properties with internal jet physics; e.g., energy, power, and magnetic field strength.



Additional Notes

- Follow the detailed procedure in the lab writeup for creating a time domain data cube.
- You will NEED to FIRST download the data!
- You will NEED to have the Starlink software installed on your machine.
- All coding and analysis should be done in the jupyter notebook provided.



What do you need to hand in?

- Please email me your lab writeup, gif movie, and jupyter notebook
- Please use the subject line: UH Labs XRB Variability – [NAME]
- My email is: a.tetarenko@eaobservatory.org
- Questions? – Email me!

Thanks!

