Possible anti-correlations between pulsation and the circumstellar disk growth in Be X-ray binaries

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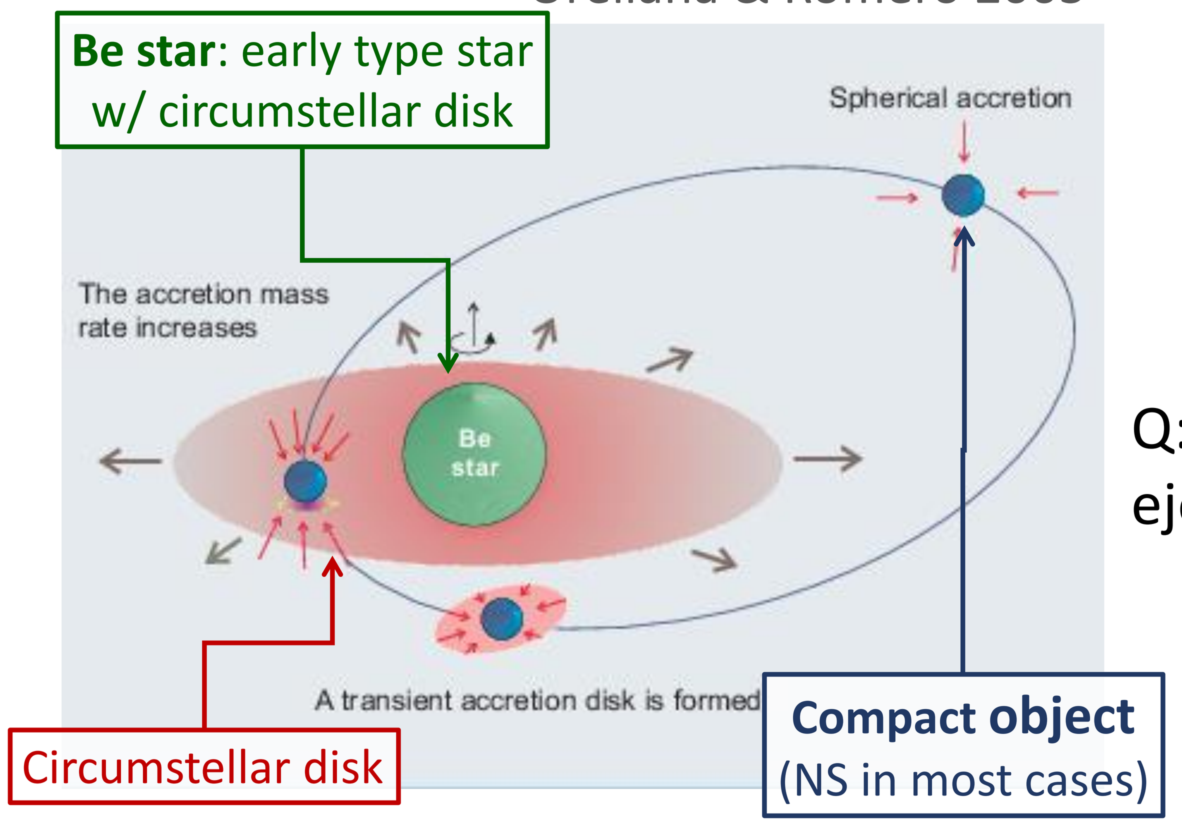
Conclusion

Our results may disprove pulsation-driven mass ejection scenario of Be stars

- We analyzed light curves of five Be X-ray binaries from TESS and time-domain survey projects
- We found anti-correlation between flux oscillation amplitude & IR excess

Be X-ray binary

Orellana & Romero 2005



Two important features

- **IR excess**
  - ➢Thermal free-free emission from the disk
- **Periodic flux oscillation**
  - ➢Rotation & Pulsation

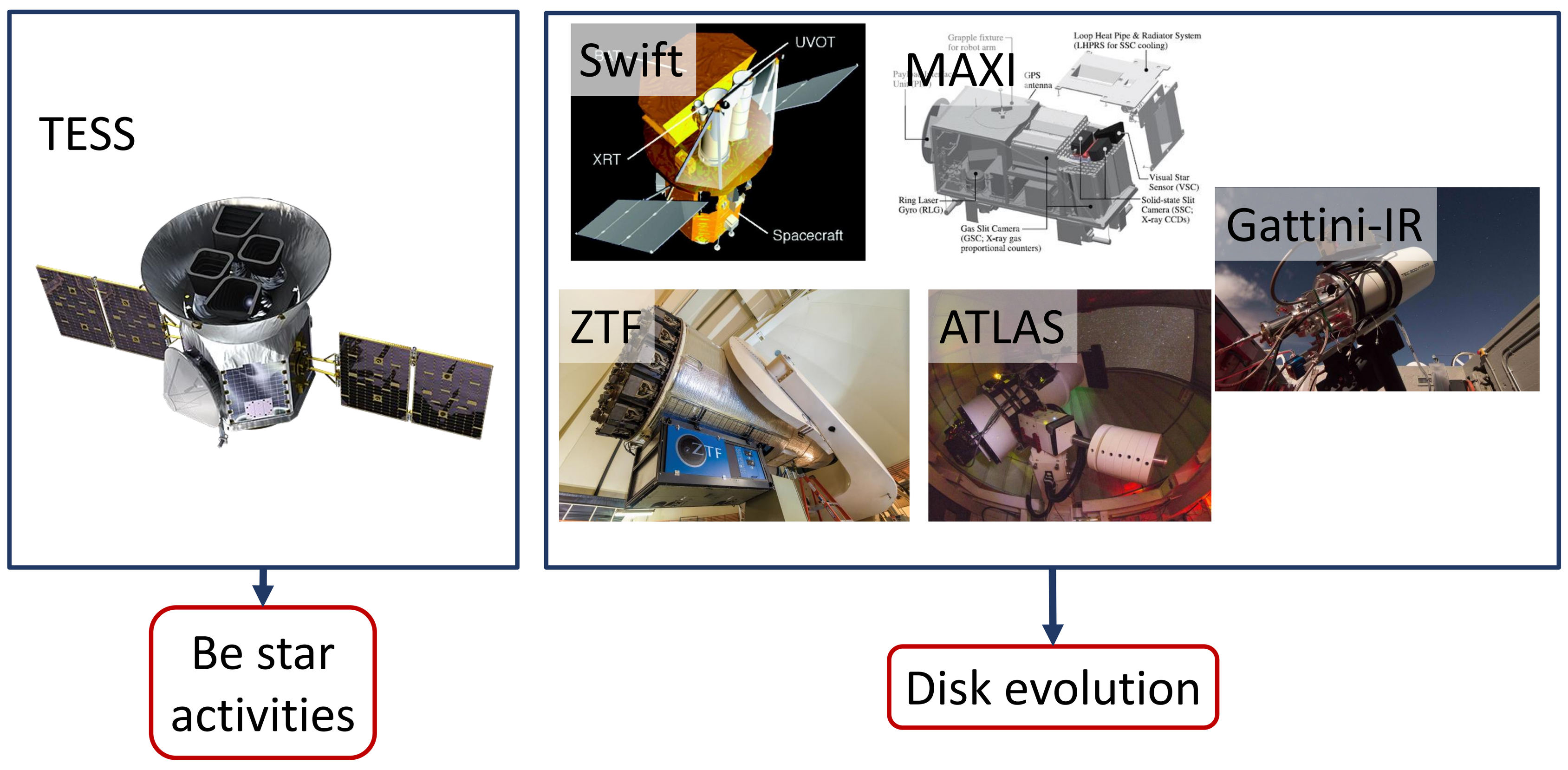
Q: What drives mass ejection?

- Rapid rotation
- **Non-radial pulsation**
- Magnetic field
- Other process?

Observation & Analysis

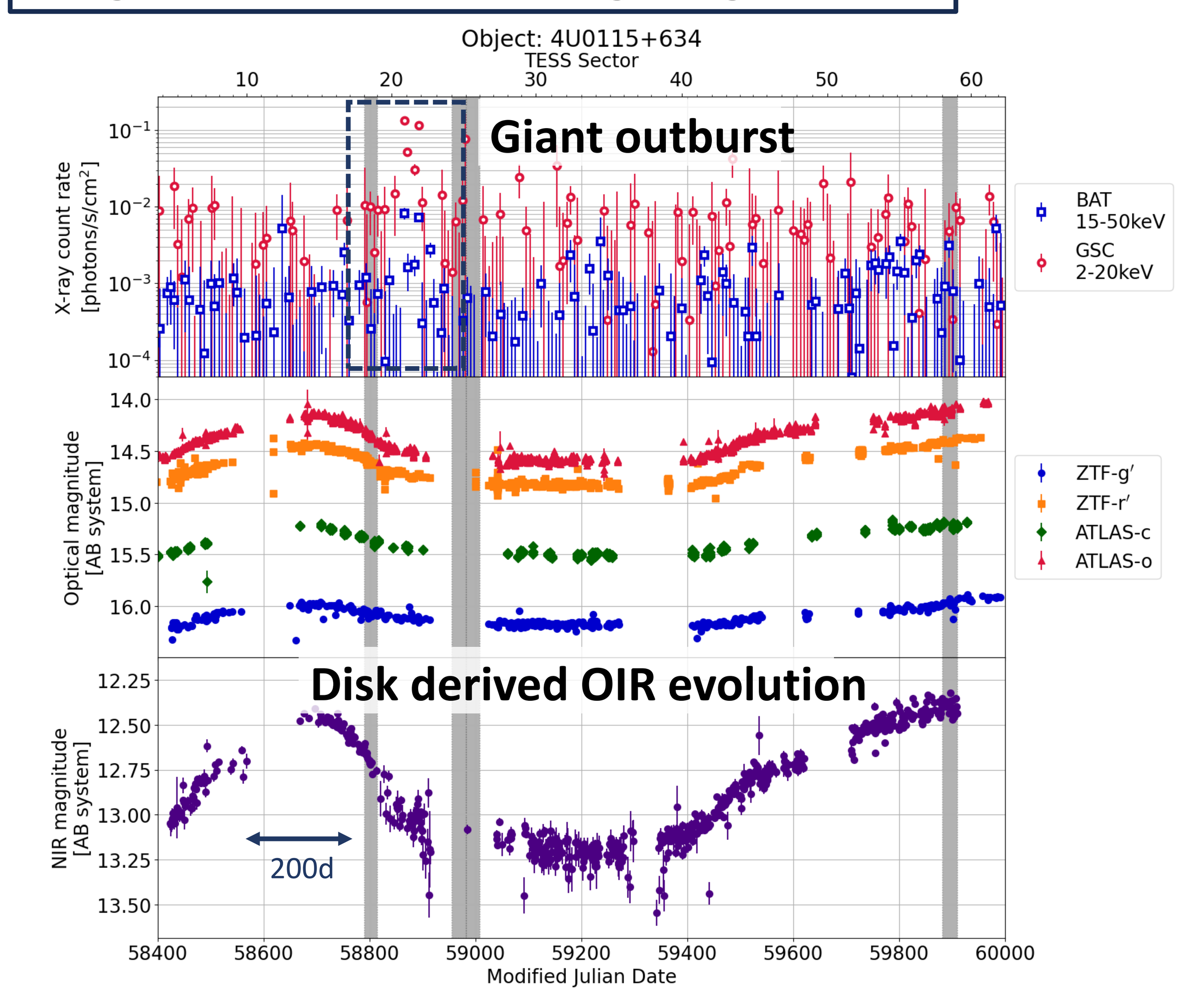
Targets: 5 galactic Be X-ray binaries

(4U0115+634, GRO J2058+42, RX J0440.9+4431, SAX J2103.5+4545, V0332+53)

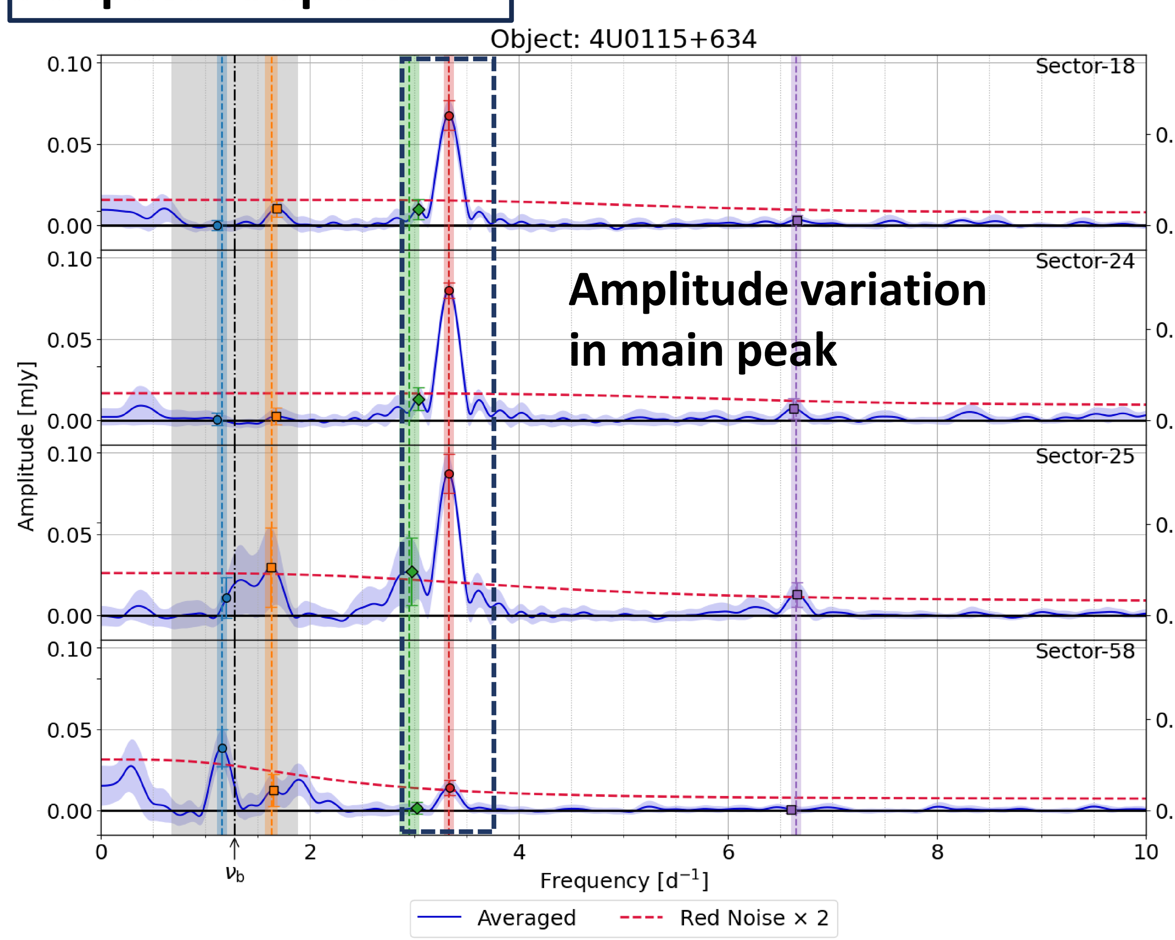


Results

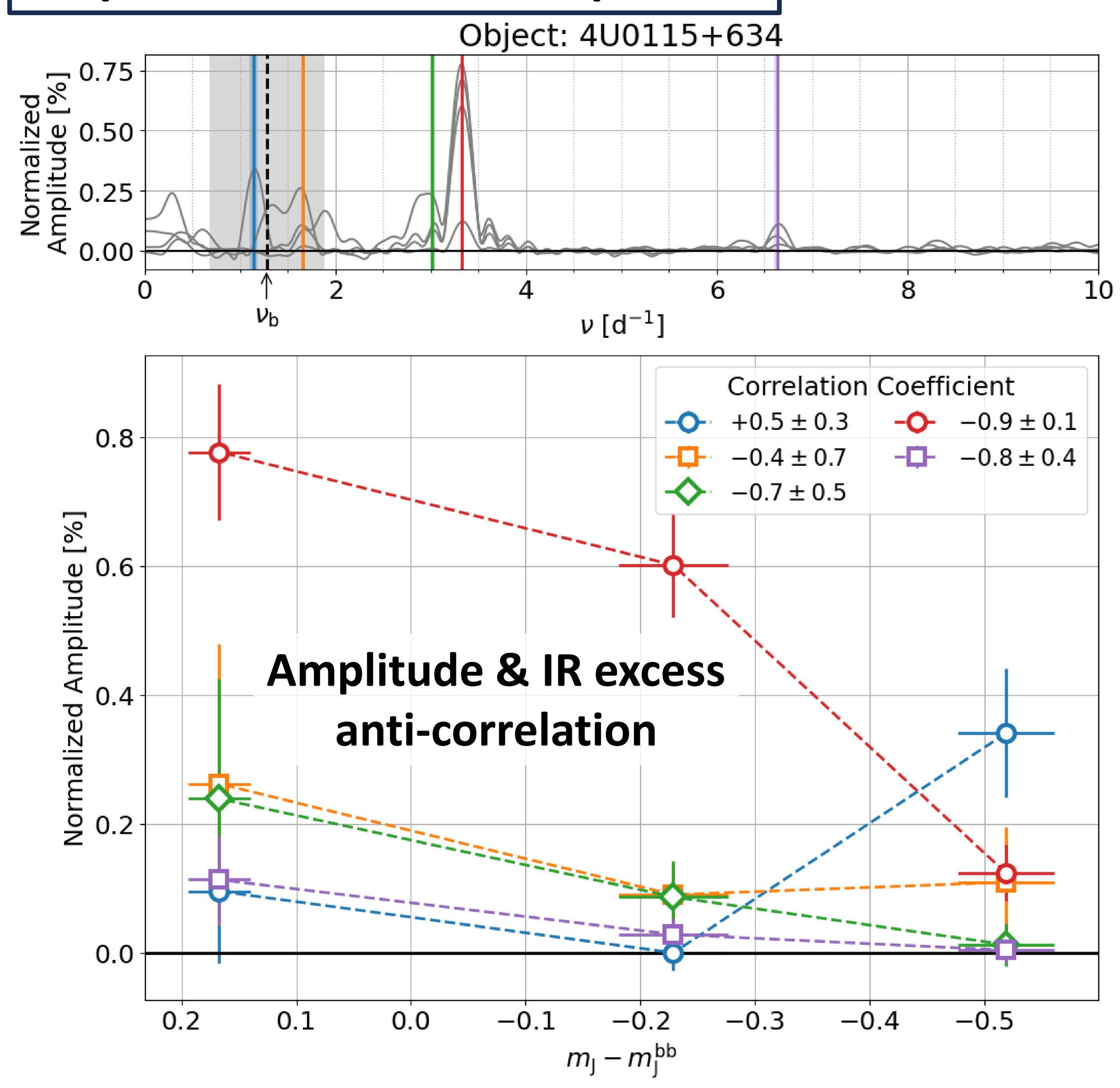
Long-term multi-wavelength light curve



Amplitude spectrum



Amplitude-IR excess comparison



Discussion

Observation

Peak amplitude & IR excess anti-correlation

Hypothesizes

Anti-correlated peaks = rotation-derived peaks

- ➢Few anti-correlated peaks showed rotation-derived features ⇒ **Unfavored**

Flux reduction by reprocessing of circumstellar materials

- ➢Difficulty in coexistence of anti-correlated and non-correlated peaks ⇒ **Unfavored**

True anti-correlation b/w pulsation & disk growth

- ➢**Most plausible?**
- ➢Contrary to the conventional idea
- ➢**Then, what drives mass-ejection?**

Pulsations are driven by κ −mechanism

➢ Stellar internal temperature variation may cause pulsation amplitudes

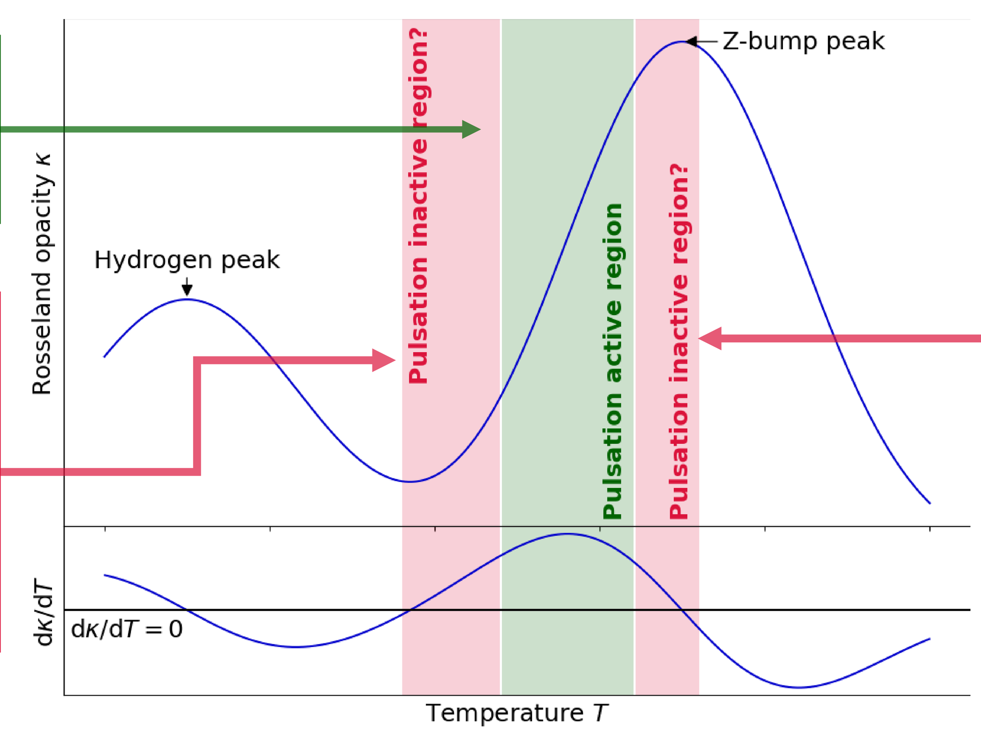
Pulsation active state

- Steeper T - κ curve → Active pulsation

Possible Pulsation inactive state (Low-T)

- Low-T caused by star expansion?

⇒ **Favorable for mass ejection?**



Possible Pulsation inactive state (High-T)

- High-T → stronger radiation pressure

⇒ **Favorable for mass ejection?**