X-ray emission from candidate stellar merger remnant TYC 2597-735-1 and its Blue Ring Nebula

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About me

- Research scientist in the Chandra/HETG group
- Stellar activity and star formation
- Chandra grating support
- New missions: ray-tracing
- Astropy
- Roman warships
TYC 2597-735-1: A stellar merger remnant with a blue ring nebula (Hoadley et al, 2020)
IR and UV excess (Hoadley et al. 2020)
Merger scenario (Hoadley et al. 2020)
Should we write a Chandra proposal? No, it’s already in the archive serendipitously!

- 8.7 ks observation
- On one of the outer chips
- Can only be found using narrow energy filter
Should we write a Chandra proposal? No, it’s already in the archive serendipitously!
TESS lightcurve: Consistent with 14 day period
X-ray spectroscopy: Not the best spectra you’ve seen...

- TYC itself: 0.1-1.5 keV, a few times $10^{-14}$ erg/s/cm$^2$
- Knots in outflow: Temp $\ ?$, a few times $10^{-13}$ erg/s/cm$^2$
How does it compare?
X-ray emission from TYC 2597-735-1

- X-ray emission is present, parameters uncertain
- RV and TESS indicate period → rotational variability
- X-rays from
  - Corona ($L_X/ L_{bol}$ fits the usual relation)
  - Collimation shock in outflows
  - Accretion
- Both scenarios require magnetic field.
- MESA models indicate outer convective layer.
X-ray emission from the outflow

- Inhomogeneous outflow?
- Assuming v, can use X-ray flux to put limit on n > $10^3 \text{ cm}^{-3}$
- Mass flux responsible for X-ray 0.1% of total mass flux
- Non-detection of other parts of outflow: $M < 0.1 \text{ M}_\text{sun}$

- Total outflow mass $0.008 \text{ M}_\text{sun} < M < 0.1 \text{ M}_\text{sun}$
Summary

- X-rays from stellar merger remnant and (likely) the outflow
- Coronal activity is best explanation, but magnetic field in any case
- FK Com progenitor?
- Can learn more with more data. TESS looking again, XMM proposal accepted.