Why this is Important:
- The future evolution of a star will be dramatic, spanning a binary system or a hypernova in a black hole.
- The evolution is highly contingent on mass and angular momentum exchange, subject to instability.
- The presence of companion stars can trigger instabilities and pose implications for mass and angular momentum exchange.

X-rays as a Key Diagnostic
- X-ray temperatures trace pre-shock wind velocities.
- periodic X-ray variability traces the orbit.
- X-ray line variations trace slow perturbations of the shock wave.

Line Profile Variations from the HETG:

Helium-like lines
Left: the variation of the Si XII triplet from phase=0.528 (near apastron) to phase=0.392 (just before X-ray minimum, near periastron). The R ratios are consistent with the low density/low photoionization limit, although the lines broaden and become more blue-shifted near periastron.
Above: the Fe XVII triplet blend shows increasingly strong "red wing" near phase=0.392.

Hydrogen-like lines
Left: the variation of the Si XIV vs. phase. The lines broaden and shift in continuum velocity. The lines show the profiles from the model described below.
Above: Comparison of the Si XIV and S XII lines at phase=0.392, near X-ray maximum.

A Model of the Colliding Wind Flow
We modeled the colliding wind flow as a series of cylindrically symmetric rings using:
- the Canto, Raga and Wilkin (1996) wind-wind interaction geometry, with a scale factor to describe the Canto et al. flow velocity in each ring.
- emissivity given by:

\[
\rho = \frac{\pi}{8} \frac{a^2}{(1 + x)} \left( \frac{1}{1 - \frac{1}{2}} \right)
\]

where \( x_{\text{peak}} \) is the peak of the emission, and \( L_T \) the total line luminosity. The line profiles for 3 longitudes of periastron are...