

W18a Flares from stars crossing active galactic nuclei disks on low-inclination orbits

Hiromichi Tagawa (Shanghai Astronomical Observatory), Zoltan Haiman (Columbia University)

The origin of the recently discovered new class of transients, X-ray quasi-periodic eruptions (QPEs), remains a puzzle. Due to their periodicity and association with tidal disruption events and active galactic nuclei (AGN), it is natural to relate these eruptions to stars or compact objects in tight orbits around supermassive black holes. In our work, we predict the properties of emission from bow shocks produced by stars crossing AGN disks and compare them to the observed properties of QPEs. We find that when a star's orbit is retrograde and has a low inclination with respect to the AGN disk and the star is massive, the breakout emission from the bow shock can explain the observed duration and X-ray luminosity of QPEs. This model can further explain various features of QPEs, which are difficult to be explained by other models, such as their complex luminosity evolution, the modulation of the luminosity and the period, and the evolution of the temperature.