Contribution ID: **128** Type: **Talk**

Whispering in the dark: X-ray faint black holes around OB stars

Thursday, 22 August 2024 12:25 (20 minutes)

Despite the potential of GAIA DR3 to reveal a large population of black holes (BHs), only a few BHs have been discovered to date in orbit with luminous stars without an X-ray counterpart. It has recently been shown that black holes in orbit with main sequence companions seldom form accretion disks, from where observable X-ray flux is conventionally thought to be produced. Yet, even without accretion disks, dissipative processes in the hot, dilute and magnetized plasma around the BH can lead to radiation. For instance, particles accelerated through magnetic reconnection can produce non-thermal emission through synchrotron. We study the X-ray luminosity from this large unidentified population of black holes using detailed binary evolution models computed with MESA, having initial donor masses from 10-90 Msun and orbital periods from 1-3162 d. A significant fraction (0.1% to 50%) of the gravitational potential energy can be converted into non-thermal radiation for realistic particle acceleration efficiency. A population synthesis analysis predicts at least 28 BH+OB star binaries in the Large Magellanic Cloud (LMC) to produce X-ray luminosity above 10**31 erg/s, observable through focused Chandra observations. We identify a population of observed SB1 systems in the LMC comprising O stars with unseen companions above 1.8 Msun that aligns well with our predictions of the orbital period and luminosity distribution of faint X-ray emitting BH+OB star binaries. The peak in the luminosity distribution of OB companions to these faint X-ray-emitting BHs lies around log(L/LSun) ~ 4.5-5. Finally, the X-ray luminosity from hot accretion flows around the faint BH can be ~one order of magnitude above the typical X-ray luminosity expected from embedded shocks in the stellar wind of the OB star companion.

Affliation

Nicolaus Copernicus University in Torun

Current Position

Postdoc

Primary author: SEN, Koushik (Nicolaus Copernicus University Torun)

Presenter: SEN, Koushik (Nicolaus Copernicus University Torun)

Session Classification: Stellar multiplicity, exotica, and transients in star clusters

Track Classification: Stellar multiplicity, exotica, and transients in star clusters