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Observing the detailed connection between accretion and outflows in X-ray binaries using multiwavelength coordination with ASTRO-H

○ Gandhi, Poshak (ISAS/JAXA)

I discuss the possibility of observing the connection between accretion and outflows in X-ray binaries in near 'real-time', using ASTRO-H observations coordinated with other wavelengths. The base of X-ray binary jets can be directly probed using infrared/optical (OIR) spectral and timing observations. The signature of the base is the optically-thin to self-absorbed emission break which lies in the OIR for binaries in the hard state. This break frequency is directly related to the magnetic field strength at the jet base. Recently, I have found strong and fast variability in the position of the break frequency for the black hole X-ray binary GX 339–4, implying that the magnetic field is being modulated by factors of $\sim$10 on short timescales. The origin of this modulation is currently unclear, though it ought to be related to instabilities within the accretion flow.

Monitoring of X-ray binaries at multiple energies may be used to map out the detailed connection between accreting matter (via ASTRO-H) and outflows (via coordinated OIR observations), by searching for correlated flares and/or OIR color changes on times of $\sim$0.1–100 s. The OIR will be monitored with current ground-based telescopes (e.g. VLT, SALT), and in the future with space-based IR missions such as Spica and JWST. If also coordinated with sub-mm monitoring (using ALMA), one can measure evolution in the jet size over 3 orders of magnitude out from the base and constrain the nature and velocity of perturbations travelling along its length. I will discuss the requirements for ASTRO-H for multiwavelength coordination of timing observations.