Contribution ID: **99** Type: **Talk**

Disc–Corona Geometry Modelling and Lense–Thirring Precession in QPOs

Based on the AGNSED model (Kubota & Done 2018), we developed a spectral model, SSsed, which describes the disc–corona geometry in stellar-mass black hole binaries. We applied this model to RXTE spectral datasets of XTE J1550–564 and compared the estimated coronal radii
$R_{\rm cor}$ with independently determined centroid frequencies of low-frequency QPOs in their power density spectra. In the intermediate states (HIMS and SIMS), the relation between $R_{\rm cor}$ and the QPO frequencies is in good agreement with predictions from the Lense–Thirring precession scenario for the QPO origin (Kubota et al. 2024). In that work, we could not explain the QPOs in the hard state using the LT scenario, as the assumed sandwich-type disc–corona structure was unsuitable for reproducing the hard spectra ($\Gamma < 1.9$). We have now modified the SSsed model to better represent the hard state, incorporating an inner hot corona region (as in the original AGNSED model), with allowance for two-temperature Comptonisation, in addition to the sandwich-type disc–corona region. The updated model appears capable of explaining the QPOs observed in the bright hard state as well.

Contribution

Oral talk

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Session Classification: Timing properties (Observations, modelling)

Track Classification: Talk