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A new connection between the accretion disk and corona revealed by simultaneous NICER and HXMT observations

The X-ray flux from black hole X-ray binaries in the hard state is highly variable on a broad range of timescales. On a timescale of seconds, such broadband noise is thought to arise in the turbulent accretion disk and propagated to the corona, which emits harder X-rays in the spectral shape of a powerlaw with a cut-off. The nature and geometry of the corona is subject to debate, but there is general consensus that its emission arises from Compton-upscattering of seed photons. In this picture, the cut-off represents the coronal temperature. If the accretion disk is the main source of seed photons, it may modulate the coronal temperature as the number of seed photons and heating of the corona varies.

To test this scenario, we analysed the variability properties of black hole X-ray binary MAXI J1820+070 with simultaneous NICER and Insight-HXMT observations to study disk-corona interactions across an unprecedented X-ray energy range of 0.3-250 keV. We also show simulations to help interpret the data and find that the disk modulates the coronal cut-off energy. We discuss possible explanations for our findings, concluding that the complex variability places novel constraints on the origin of the hard X-ray emission from the corona.

Contribution

Oral talk

Affiliation

University of Amsterdam

E-mail

n.a.bollemeijer@uva.nl

Author: BOLLEMEIJER, Niek (University of Amsterdam)

Co-author: Dr UTTLEY, Phil (University of Amsterdam)

Presenter: BOLLEMEIJER, Niek (University of Amsterdam)

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