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When ULXs Blink: A Detailed Look at Short-Lived Super-Eddington Accretion in M51

Ultraluminous X-ray sources (ULXs) are thought to be powered by super-Eddington accretion onto stellar-mass compact objects and represent the high-luminosity end of accreting binary systems. Here, we report the discovery of a new transient ULX candidate (M51 ULX*) in the face-on spiral galaxy M51, identified using archival Swift, XMM-Newton, and Chandra data. The source underwent a short-lived outburst in 2018, reaching a peak X-ray luminosity of ~7.8 $\times$ 10^{38} erg s^{-1} and showing flux variability by a factor of ~200. The X-ray spectrum remained consistently soft, with no significant spectral evolution across the outburst. No pulsations were detected, with pulsed fraction upper limits of ~30\%. Optical and UV data from Swift and XMM-Newton revealed no counterparts, arguing against a background AGN or foreground object. We performed spectral modeling using both phenomenological and physical disk models, and applied Bayesian parameter estimation with BXA to characterize the emission properties and test for a multi-component structure. The results are consistent with a stellar-mass black hole or neutron star accreting at or above the Eddington limit. M51 ULX* adds to a growing class of transient ULXs in which short outbursts challenge standard models of disk stability and accretion state transitions. In this talk, I will present our analysis of M51 ULX* and explore how short-lived ULX transients are key to understanding the behavior and accretion processes of microquasars, linking accretion physics across a wide luminosity range and helping to unify our understanding of how co›mpact objects accrete under extreme conditions.

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