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Fast spectral evolution in a new tidal disruption event

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When a star is disrupted by a super-massive black hole (SMBH), the stellar debris returns to the black hole at a rate which exceeds the Eddington accretion rate in the majority of cases and can cause a large X-ray flare. The X-ray emission from the resultant thick disk, shares characteristics with that seen from highly-accreting, low black hole mass (10^5 to 10^7 solar masses), AGN; namely soft, or steep, emission and ionised outflows. The spectrum generally evolves slowly in these events, with thermal emission softening further as the accretion rate drops, while a hard tail forms due to the creation of a low-temperature electron, compton-upscattering, region. In most events it is hard to separate these components due to the quickly diminishing flux and ambiguity caused by wind-driven absorption features.
We report here on a recently discovered event whose evolution has been unusually rapid and has allowed us to observe for the first time the creation of a comptonising region, on a timescale of one week, and to disentangle the more gradual cooling of the disk. The decay of the X-ray flux by a factor 1000 over one year can be shown to be intrinsic to the source, rather than due to absorption, thanks to the combined power of XMM-Newton and NuSTAR. Implications for the creation and destruction of comptonising regions above disks in all SMBH systems are explored.

Topic

Multi-messenger and transient astronomy

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