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Jets and winds from super-critical accreting black holes

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Determining the power output and efficiency of accreting black holes is a fundamental astrophysical problem: we want to know the relation between mass accretion rate, radiative output (photons) and mechanical output (kinetic energy of jets and winds). We focus in particular on off-nuclear black holes that are accreting from a donor star at a rate near or above the critical Eddington limit. Many of them appear as “ultraluminous X-ray sources”, evidence of their high radiative output. But how much additional power is carried by winds and jets?

To answer this question, we studied a sample of powerful black holes associated with large bubbles of shock-ionized and/or photo-ionized gas. We used the bubbles as calorimeters to measure the power injected by the black hole into its surroundings. We find that black holes at super-Eddington accretion rates can have a mechanical power comparable to their radiative luminosity. Our study provides empirical constraints for theoretical models of super-Eddington accretion, and for models of black hole feedback in the early universe.

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