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A black hole jet bent by stellar wind

Jets provide an important channel of kinetic feedback from accreting black holes into their environments. In the absence of instantaneous jet power measurements the extent of this feedback has proven difficult to quantify. Here we report the detection of stellar wind-induced bending of the jets in black hole X-ray binary Cygnus X-1, using 18 years of high-resolution radio imaging. By undertaking detailed physical modeling of the jet-wind interaction, we determine the current kinetic power of the jet at launch to be $\log_{10}(L_{\rm jet}/{\rm erg\,s^{-1}}) = 37.3^{+0.1}_{-0.2}$, consistent with the long-term time-averaged power required to inflate the nebula around the system. We also measure the hard state jet speed of Cygnus X-1 to be 0.5c, and also rule out misalignment between the black hole spin and binary orbit thought to exist in the system. Our measurement of the instantaneous jet power robustly anchors the theoretically-derived scaling relation between radio luminosity and jet power across the black hole mass scale.

Contribution

Oral talk

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