Relativistic X-ray jets in the black hole candidate MAXI J1820+070

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Jets and outflows are observed in a diverse range of accreting systems such as young stellar objects, galactic X-ray binaries and active galatic nuclei (AGN). The formation of jets, their propagation and their association with accretion processes are still largely unclear. However, their feedback on their immediate environment is now starting to be quantified, as their interaction with the interstellar medium can be observed using high spatial resolution images of X-ray binaries (e.g. Corbel et al. 2002, Migliori et al. 2017).

Here, we report on the black hole candidate MAXI J1820+070, discovered during its 2018-19 outburst and extensively monitored. Radio observations have revealed the formation of relativistic radio jets on both sides of the system (Bright et al. 2020). To constrain the high energy emission from these jets, we conducted four X-ray observations with the Chandra X-ray Observatory between 2018 November and 2019 May. Simultaneously, MAXI J1820+070 was monitored in radio with the VLA and MeerKAT.

The observations reveal the presence of X-ray moving sources associated to the radio counterparts of the jets. The jets are travelling at apparent relativistic velocities, with a possible deceleration at late time, which could be due to shocks with the surrounding environment. In addition, the broadband spectra of the jets are consistent with synchrotron radiation from particles accelerated up to very high energies (above 10 TeV) during shocks, probably between the jets and the interstellar medium. MAXI J1820+070 is the third black hole X-ray binary for which such an interaction is observed at high energy.

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