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The Z-shape parsec-scale jets of the microquasar GRS1758-258 as seen by MeerKAT

Jets from black-hole X-ray binary systems (BH-XRBs) are powerful outflows that release a large fraction of the accretion energy to the surrounding environment, providing a feedback mechanism that alters the properties of the interstellar medium (ISM). Studying accretion processes alongside their feedback on the environment is crucial, as it enables to estimate the energy input/output around accreting BHs.

Signatures of jet feedback from BH-XRBs have been confirmed in few sources, such as GRS1758-258. At radio frequencies extended structures around the binary position were first observed in archival VLA data. These features are believed to originate from the jet-ISM interaction, leading to the formation of parsec-scale jets that create a Z-shape structure.

We present the recent results obtained from ~9hr of observations taken in 2024 at 1.28GHz using the MeerKAT interferometer. We identified several regions forming the extended structures seen in the radio image, characterized by synchrotron or bremsstrahlung emission. Comparing these data with those from VLA we observed the jet's motion and measured a velocity of ~6000 km/s. Following a calorimetry-based method originally proposed for AGN, later applied to XRBs, we estimated the time-averaged jet power transferred to the ISM to be on the order of ~10e36 erg/s, comparable to the accretion energy released by XRBs in outburst. The morphological resemblance to the jet-ISM interaction structures seen in other cases, GRS1915+105 and Cygnus X-1, combined with the lower energy transfer observed in GRS1758-258, suggests that the latter may represent an earlier evolutionary stage of large-scale jets interacting with the environment.

Contribution

Oral talk

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