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Broadband radio monitoring of tidal disruption events

Abstract

When a star passes too close to a supermassive black hole (SMBH) it can be destroyed, temporarily increasing the accretion rate onto the SMBH. Such tidal disruption events (TDEs) produce bright flares across the electromagnetic spectrum that provide a unique window into the central region of a galaxy, including the previously dormant black hole. Radio detections of TDEs are uncommon (with less than 20 TDEs with published radio detections), and probe the outflows and jets that may be produced in these energetic events. The origin of the differences in radio properties of TDEs is not well-known, and nor is the nature of the mechanism powering the observed outflows. Some outflows appear as highly collimated relativistic jets, whilst others present slower-moving, dispersed outflows that could be explained by a sub-relativistic jet, non-relativistic wind, or unbound tidal debris streams. We propose to obtain low-frequency radio observations of the decay-phase of up to seven TDEs, to combine with our VLA and ATCA 1-22 GHz observations. MeerKAT is uniquely suited to provide the sensitivity and critical frequency coverage required to resolve the synchrotron emission peak of the late-time radio emission of these events. These observations will provide a significant addition to the state of radio observations of TDEs, providing the first broadband coverage of a population of TDEs peaking below 1 GHz, in the MeerKAT UHF band, and enabling us to constrain the physical outflow properties and circumnuclear density stratification of the host galaxy out to larger distances than ever before.