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Early Radio Emission from Tidal Disruption Events

Abstract

Tidal disruption events (TDEs) occur when a star that gets too close to the supermassive black hole (SMBH) in the centre of a galaxy is torn apart by the strong tidal forces. TDEs can produce bright radio emission that lasts from months to years. There are many open questions about TDEs for which radio observations can provide crucial input: which TDEs produce powerful jets? Is there a dichotomy of radio-loud and thermal, radio-quiet TDEs or is there a continuum in radio power? Does the radio emission in thermal TDEs arise from jets, from a wind or wide-angle outflow, or from shocks in tidal streams? How much energy do TDE jets deposit into their surroundings? What is the profile of the gas density near SMBHs? Does that density differ between the low-mass or quiescent SMBHs which TDEs preferentially select and the more typical mass, more active SMBHs? Only ~9 TDEs have been detected in radio at present, which is insufficient to address these questions. We propose MeerKAT target of opportunity observations of new TDEs discovered during the upcoming observing cycle, as well as of two recent TDEs which are still radio bright, AT2018azh and AT2019dsg. For new triggers, we will target either nearby TDEs (D < 300 Mpc), allowing us to probe potential faint radio emitters, or more distant TDEs whose already-detected radio or gamma-ray emission indicate the likely presence of a radio-bright relativistic jet.