Investigating the radio emission from magnetic cataclysmic variables

Abstract

Accretion in magnetised plasmas is not well understood. Magnetic cataclysmic variables (mCVs), because of their solar proximity and strong magnetic fields (>1 MG), provide a valuable laboratory for understanding the conditions of such plasmas and their radiative mechanisms. A recent Karl G. Jansky Very Large Array (VLA) survey finds that about three quarters of radio detected mCVs show highly circularly polarised radio emission (~100%) that is attributed to electron cyclotron maser emission from a low-density plasma (<10^12 cm^-3) with a magnetic field of ~few kG. A possible location of this emission is the lower corona of the red dwarf donor star. This result has implications for CV evolution because of possible enhanced magnetic braking at orbital periods of <3 hours. This proposal requests a total of 65 hours of observing time (including overhead) to observe 42 mCVs in the L band. Complementary optical and X-ray observations will also be requested. This survey will provide a nearly complete all-sky survey of mCVs by observing those south of declination -30 degrees and help to identify radio bright mCVs (>1 mJy) for extended follow-up observations. Of the 42 proposed targets, at least one quarter are well known mCVs that are often studied at optical and X-ray wavelengths, particularly those south of declination -40 degrees that are difficult to observe using the VLA. Assuming a detection rate of 33%, we expect to detect approximately 14 new mCVs at radio frequencies.