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Radio emission as a stellar activity indicator

Radio observations are excellent probes of the environmental conditions in the coronae/magnetospheres of stars and brown dwarfs. In particular, radio emission traces the impact of stellar plasma on exoplanet atmospheres, the processes of coronal heating, and key parameters for assessing exo-habitability. The strong magnetic field of these stellar systems leads to radio emission via different mechanisms such as gyrosynchrotron radiation, electron cyclotron maser instability, and plasma oscillation. As the ongoing LOFAR Two-metre Sky Survey (LoTSS) and VLA Sky Survey (VLASS) are some of the deepest and most sensitive radio sky surveys ever conducted, I shall present our latest efforts on identifying different radio emissions from stellar systems in these surveys. By using the radio-detected population's properties, I shall differentiate the two possible acceleration mechanisms (the so-called engines): (a) chromospheric/coronal acceleration similar to that observed on the Sun, and (b) magnetospheric acceleration occurring far from the stellar surface similar to that observed on Jupiter. Since one expects stars to have Sun-like engines, and brown dwarfs to have Jupiter-like engines, our aim is to search for a transition from one to another in the realm of M dwarfs: the tail of the main-sequence stars. Furthermore, to understand how stellar activity impacts radio detectability, I shall also investigate whether the radio detection rate in our samples correlate with canonical activity indicators in the optical and X-ray bands.

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