Contributed Talk

Splinter Activity

Strong surface magnetic field on a brown dwarf

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Radio surveys by Berger (2002, 2006) and McLean et al. (2012) revealed a large number of brown dwarfs with radio emission. The origin of the radio emission is most likely the electron acceleration in the global magnetosphere of the dwarf. Depending on the acceleration mechanism, gyrosynchrotron or electron-cyclotron maser instability, the strength of the global magnetic field can be as large as $\sim$ 10 G or $\sim$ 1 kG (Berger et al. 2008 or Hallinan et al. 2008, respectively). Although this is a rather rough and assumption-dependent estimate, until recently there were no other means for studying the substellar magnetism.

We present the first detection of a strong magnetic field of a brown dwarf, which is independent of the radio estimates (Kuzmychov et al. 2017; Berdyugina et al. 2017). We introduce our spectropolarimetric technique, which makes use of the Zeeman and the Paschen-Back effects in atomic and molecular lines (Berdyugina et al. 2003; Kuzmychov & Berdyugina 2013; Berdyugina et al. 2017). We discuss a possible magnetic field topology for the M8.5 dwarf LSR J1835, which we can reconstruct with the help of our technique and the radio observations found in the literature.

This study demonstrates that the magnetism of brown dwarfs can be successfully studied with the help of spectropolarimetry. It also paves the path for probing the magnetospheres of hot Jupiters with the effective temperatures of L- and T-type dwarfs.

This work is based on the full-Stokes data obtained with the Low-Resolution Imaging Spectropolarimeter (LRISp) at the Keck observatory on August 22nd and 23rd, 2012.