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Precision NIR RM effect observations with the Habitable-zone Planet Finder

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Significant progress has been made in recent years in measuring the sky-projected obliquity distribution of early-type planet hosting systems via precise Rossiter-McLaughlin (RM) effect observations. However, currently only two M-dwarf systems, GJ 436 and Kepler-45, have published obliquities—and interestingly GJ 436 is observed to be misaligned. With such a sparse sample, key questions remain about the dynamical histories of M-dwarfs at the fully convective boundary. The advent of stabilized extremely precise RV spectrographs in the near-infrared (NIR) are opening the doors to answering these questions, capitalizing on the large RM-effect amplitudes produced by transiting exoplanets orbiting around rapidly-rotating M-dwarfs. In this talk, we will discuss recent precision RM effect observations of fully-convective M-dwarfs with the Habitable-zone Planet Finder (HPF), a stabilized NIR spectrograph recently commissioned on the 10m Hobby-Eberly Telescope (HET) at McDonald Observatory. We will discuss recent RM effect observations of the transit of TRAPPIST-1b, early results of which are consistent with a well-aligned orbit. We will discuss the merits and limitations of the HET/HPF queue to observe RM effects of M-dwarfs, utilizing the excellent stability of HPF, large collecting area of HET, and the short transit durations of M-dwarf planets. Finally, we will discuss future planned observations in the TESS era, with TESS being expected to discover a multitude of M-dwarf planet systems favorable for precise RM effect measurements in the NIR.

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