Characterizing Planetary Systems Orbiting TESS Cool Dwarfs

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Project Overview

Most stars in the Milky Way Galaxy are cool dwarfs,1,2 which means that planetary systems orbiting cool dwarfs are a crucial component of the galactic census of planets. Cool dwarfs frequently host planetary systems,3,4,5,6,7, but the nuances of cool dwarf planet occurrence are not yet fully understood. For our Cycle 1 TESS GI program, we are exploring how the properties and prevalence of planetary systems orbiting cool dwarfs depend on stellar properties. The first step is to establish which cool dwarfs host planets and determine the properties of those systems. In this poster, we present initial results from our campaign to characterize TESS cool dwarfs and the planetary systems they harbor. We focus here on adaptive optics imaging, but we are also acquiring spectra to determine stellar metallicities, identify eclipsing binaries, and measure planet masses.

The Need for Adaptive Optics Imaging

Regardless of whether nearby stars are physically associated or merely chance alignments, light from additional stars within a TESS aperture contributes to the observed flux and must be considered to correctly interpret transit-like signals. Ignoring the effects of nearby stars can lead to misclassified eclipsing binaries, underestimated planet radii, and inaccurate planet occurrence rates.8,9,10

Results: Adaptive Optics Images of 30 TOIs

Using NIRCam on the 10-m Keck II Telescope and ShARCS on the 3-m Shane Telescope at Lick Observatory, we have imaged 30 TOIs with 7 cool dwarfs and 23 hotter stars. We will concentrate more heavily on cool dwarfs once a larger fraction of TESS targets are visible from Mt. Hamilton and Maunakea.

References

[10] Rouma et al., 2018, AJ, 155, 244

Acknowledgements

Our study of differential planet occurrence rates for cool dwarfs is supported by the NASA TESS Guest Investigator Program through grant BNNSC18K1583. Some of the data presented herein were obtained at the W. M. Keck Observatory, which is operated as a scientific partnership among the California Institute of Technology, the University of California and the National Aeronautics and Space Administration. The Observatory was made possible by the generous financial support of the W. M. Keck Foundation. The team wishes to recognize and acknowledge the very significant cultural role and reverence that the summit of Maunakea has always had within the indigenous Hawaiian community. We are most fortunate to have the opportunity to conduct observations from this mountain.