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BROWN DWARFS AT THE EXOPLANET MASS BOUNDARY

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Young brown dwarfs and directly-imaged exoplanets have enticingly similar photometric and spectroscopic characteristics, indicating that their cool, low gravity atmospheres should be studied in concert. Similarities between the peculiar shaped *H* band, near and mid-IR photometry as well as location on color magnitude diagrams provide important clues about how to extract physical properties of planets from current brown dwarf observations. Our team has assigned > 30 brown dwarfs to 10-150 Myr nearby moving groups. In so doing, we have discovered important diversity among this extremely low-mass (10 - 30 M_{Jup}) age-calibrated sample indicating that cloud properties play a critical role in their observables.

We have identified 65 brown dwarfs with observable signatures of a low-surface gravity that are candidates for an age calibrated sample (see Cruz et al. 2009, Faherty et al. 2009, 2013, Rice et al. 2010). Many of our sources are coincident with members of the Argus (∼ 30 Myr), β Pictoris (∼10 Myr), TW Hydrae (∼10 Myr), Tucana Horologium (∼30 Myr), or AB Doradus (∼ 150 Myr) associations. To conclusively assign membership, we have measured proper motions, radial velocities and/or parallaxes and obtained precise kinematics (see Faherty et al. 2009, 2012, and Faherty et al. in prep). Using estimated UVW velocities and XYZ positions in combination with a convergent point and Bayesian analysis we assign membership to 35 low-surface gravity brown dwarfs and find that their resultant masses are close to (or below) the classic planetary mass boundary of 13 M_{Jup}.

When observed as a uniform age-sample, we find significant diversity among the inferred gravity related spectral and photometric features. Faherty et al. (2013) discuss the γ (or < ∼100 Myr) L dwarfs and find that these proposed lowest surface gravity isolated brown dwarfs can be anywhere from 0–1 magnitude redder in the near-infared and 0–0.2 magnitude redder in the mid infrared than equivalent subtype sources. For those objects with parallax measurements, Faherty et al. (2012) find that the M dwarfs are "overbright" in the NIR whereas the L dwarfs are normal to "under bright" in the NIR regardless of the age calibration. We postulate that this diversity among the age calibrated sample is due to complex atmospheric chemistry which can differ from source to source.

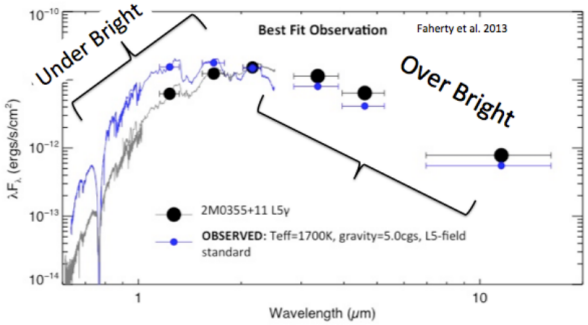

Fig. 1. The distance calibrated spectral energy distribution for the exoplanet analog 2M0355 (Faherty et al. 2013). While the source is "under bright" in the optical and near-infrared compared to an equivalent field age source, we find that the flux has simply been shifted to longer wavelengths by an extremely dusty photosphere making it "over bright" in mid infrared wavelengths.

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