Fundamental Parameters of Nearby Red Dwarfs: Stellar Radius as an Indicator of Age

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Red dwarfs dominate the Galactic population, yet determining one of their most fundamental characteristics — age — has proven difficult. The characterization of red dwarfs in terms of their age is fundamental to mapping the history of star and, ultimately, planet formation in the Milky Way. Here we report on a compelling technique to evaluate the radii of red dwarfs, which can be used to provide leverage in estimating their ages. These radii are also particularly valuable in the cases of transiting exoplanet hosts because accurate stellar radii are required to determine accurate planetary radii.

In this work, we use the BT-Settl models in combination with Johnson-Kron-Cousins VRI, 2MASS JHK, and WISE All-Sky Release photometry to produce spectral energy distributions (SEDs) to determine the temperatures and bolometric fluxes for 500 red dwarfs, most of which are in the southern sky. The full suites of our photometric and astrometric data (including hundreds of accurate new parallaxes from the RECONS team at the CTIO/SMARTS 0.9m) allow us to also determine the bolometric luminosities and radii. This method of radius determination is validated by a comparison of our measurements to those found using the CHARA Array (Boyajian et al. 2012), which match within a few percent.

In addition to a compilation of red dwarf fundamental parameters, our findings provide a snapshot of relative stellar ages in the solar neighborhood. Of particular interest are the cohorts of very young and very old stars identified within 50 pc. These outliers exemplify the demographic extremes of the nearest stars.

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