

V and K-band Mass-Luminosity Relations for M Dwarf Stars

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Applying *Hubble Space Telescope* Fine Guidance Sensor astrometric techniques developed to establish relative orbits for binary stars (Franz et al. 1998, AJ, 116, 1432), determine masses of binary components (Benedict et al. 2001, AJ, 121, 1607), and measure companion masses of exoplanet host stars (McArthur et al. 2010, ApJ, 715, 1203), we derive masses with an average 2.1% error for 24 components of 12 M dwarf binary star systems. Masses range from 0.08 to 0.40 solar masses. With these, we update the lower Main Sequence V-band Mass-Luminosity Relation first shown in Henry et al. (1999, ApJ, 512, 864). We demonstrate that a Mass-Luminosity Relation in the K-band has far less scatter than in the V-band. For the eight binary components for which we have component magnitude differences in the K-band, the RMS residual drops from 0.5 magnitude in the V-band to 0.05 magnitude in the K-band. These relations can be used to estimate the masses of the ubiquitous red dwarfs that account for 75% of all stars, to an accuracy of 5%, which is much better than ever before.

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