Dynamic Photometric Variability in Three Young Brown Dwarfs in Taurus: Detection of Optical Flares with TESS Data

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I will present our I-band time-series photometric variability studies of three known nearby (∼140 pc) and young (∼1 Myr) brown dwarfs (BD) in the Taurus star-forming region in the Perseus molecular cloud. From 10 nights of observations over a time span of 10 yr, with a typical run of 3–6 hr each night, it is estimated that the BDs show unstable short-scale periodicity from 1.5 to 4.8 hr. Using the long-term photometry from the Transiting Exoplanet Survey Satellite (TESS), I have conducted a time-resolved variability analysis of CFHT-BD-Tau 3 and CFHT-BD-Tau 4, revealing orbital periods of ∼0.96 days and ∼3 days respectively, consistent with earlier studies. Two superflares were found in TESS sector 43 data for CFHT-BD-Tau 4 and estimated the flare energies as 7.09 × 10^35 erg and 3.75 × 10^36 erg. A magnetic field of ∼3.39 kG is required to generate such flare energies on this BD. I performed spot modeling analysis on CFHT-BD-Tau 3 and CFHT-BD-Tau 4 to address the variability detected in the data using the package BASSMAN. Spectral energy distribution and infrared colors of the sources suggest that they have a sufficient amount of circumstellar material around them