
HD183648: a Kepler eclipsing binary with anomalous ellipsoidal variations and a pulsating component

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Abstract

HD183648 (KIC8560861) is a slightly eccentric ($e = 0.05$) eclipsing binary system with an orbital period of 31.973 days, exhibiting mmag amplitude pulsations on time scales of a few days. We present the results of the complex analysis of high and medium-resolution spectroscopic data and Kepler Q0 – Q16 long cadence photometry. The iterative combination of spectral disentangling, atmospheric analysis of the highest signal-to-noise ratio averaged spectra, radial velocity and eclipse timing variation studies, separation of pulsational features of the light curve, and binary light curve analysis led to the accurate determination of the fundamental stellar parameters. We found that the binary is composed of two main sequence stars with masses of 1.93 and 1.06 solar masses. After subtracting the binary model from the observed light curve, we found three independent frequencies, two of which are separated by twice the orbital frequency. We also found an enigmatic half orbital period sinusoidal variation that we attribute to an anomalous ellipsoidal effect with an opposite phase than usually observed. Both of these observations indicate that tidal effects are strongly influencing the luminosity variations of HD183648. The analysis of the eclipse timing variations revealed both a parabolic trend suggesting constant period variation, and apsidal motion. The parabolic eclipse timing variations and the apsidal motion discrepancy might be indicators of the presence of a distant, unseen third companion in the system.

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