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Title: Combined analysis of the pulsating, eccentric, long period eclipsing binary KIC 008560861
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Abstract: Aliz Derekas^1; Tamas Borkovits^2,3; Balazs Csak^3; Gyula Szabo^3; Karen Kinemuchi^4; Jozsef Kovacs^3; John Southworth^5

KIC 008560861 (= HD 183648) is a relatively long-period (P_orb ~ 31.97days) moderately eccentric (e~0.1) eclipsing binary system which exhibits low amplitude (~mmag) pulsations on few days time-scales. We present the results of combined analysis of high-resolution spectroscopic data obtained by the Echelle spectrographh of Apache Point Observatory; densely phased radial velocity data observed by the Shelyak Echelle spectrograph of Gothard Astrophysical Observatory, Szombathely, Hungary, and Kepler Q0-Q16 long cadence photometry. After disentangling pulsational features, we give the first binary model solution. We studied also the pulsational light curve, and some enigmatic features were found. First, the two significant pulsational frequencies separated from each other accurately with the twice of the orbital frequency, which strongly suggests that the ~ 1.75 day-long pulsation should have tidal origin. However, the binary light curve solution resulted in stellar fractional radii less than 0.05 for both stars which means negligible tidal forces. Another extraordinay feature is an exactly half orbital period regular, sinusoidal light variation which produce maximal brightness of the binary about 0 and 0.5 orbital phases, i.e. around the primary minima, and close to the slightly displaced secondary minima, which phenomena looks like as it were an "inverse ellipsoidal effect".
We also carried out an extensive eclipse timing variation (ETV) study by the use of Kepler long cadence times of minima. We found a P~291 days period cyclic ETV, however, this was a simple beating due to the stellar pulsation, and not a real effect. A parabolic trend was also detected, which seems to be real, and its origin might be either light-time effect of a distant tertiary, or any other longer time-scale phenomena which produce constant period variation on a few years interval. The O-C curve of the difference of the primary and secondary minima also has a very slight no-zero slope, which might indicate apsidal motion.

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