

Photometric investigation of KIC06118779: a totally eclipsing contact binary showing very active light curve variations and having extremely low mass ratio

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We report the first photometric properties of the contact binary star KIC 06118779 discovered by the Kepler mission. We compiled the 4-year Kepler photometric measurements into 738 sets of full light curve from which a total of 1455 times of minima were determined. The light curves with a flat bottom at secondary eclipse show quasi-cyclically variable O'Connell effects. Quite similar variation is also seen in the eclipsing time variation (ETV) diagram where the primary times of minima are strongly anti-correlated with the secondary ones. To obtain a unique photometric solution, the most symmetric light curve least influenced by both the O'Connell effect and the anti-correlation was chosen and solved with the 2015 version of the Wilson & Devinney (1971) binary model. The results show that KIC 06118779 is a very deeply contact binary star with fill-out factor of over 80%, extremely low mass-ratio of about 0.12, large inclination of 87 degrees. After fixing the unique solution, the spot parameters of a possible cool spot on the primary massive component were adjusted to individual light curves. One of the results show that the longitude of the spot drifts in a period of about 140 days in a good agreement with the quasi-cyclic periods of the variations of the O'Connell effect and the anti-correlation. After correcting the anti-correlation effect in the ETV diagram by using our spot model, we found that the system is undergoing the rapid period variation of 2.27×10^{-6} days yr⁻¹. In addition, we discuss the possible evolution state of KIC 06118779.