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Study of the EPIC 246257206 EA variable star system discovered with the Kepler Space Telescope(12+3)

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Variable stars are stars of variable brightness. This means that their brightness doesn't remain constant throughout time. Eclipsing variables are binary stars where two stars orbit periodically around their common center of mass. When one of them is situated in front of the other relative to the observer, the total brightness of the system decreases. These brightness variations depend only on geometric factors. There are three types of eclipsing variables: EA (well defined eclipses with constant brightness outside the eclipses), EB (well defined eclipses with brightness variations outside the eclipses) and EW (the eclipses are not noticeable). Throughout this investigation an unregistered variable star has been found through observations taken by the Kepler Space Telescope. With this data, and with data from other land and space observatories its period, amplitude and distance to the Earth was calculated in order to find out the cause of variability of the star and to register it in the Variable Star Index. Photometric observations were taken from the Kepler Space Telescope, from the Minor Planet Center (MPC) L94 observatory and from the MPC J38 observatory. Astrometric observations were taken from the Gaia space telescope. The PanSTARRS telescope was used to validate Kepler's K2 data. The star found is EPIC 246257206. Analyzing the photometric data using the Lomb-Scargle periodogram, the period 0.2198 ± 0.0004 days was obtained. Analyzing its phased light curve and the value of the period, it can be concluded that the star is an EA type eclipsing variable. Using the parallax method and the observations taken by GAIA, it has been calculated that the EA variable star EPIC 246257206 is 7.0832 ± 0.0002 light years away from Earth. The most peculiar aspect of the star is its amplitude, of only 0,5 magnitudes (astronomical unit referring to the brightness of the star). This is probably due to the fact that the eclipses produced are grazing eclipses: in the plane that both stars are observed, they are not overlapping totally but partially. This, therefore reduces the total brightness change of the system. To confirm this, spectroscopic observations of the system are suggested. With these type of observations, joint with the already conducted photometric observations, the system could be modeled and its orbit can be calculated. With this information, it is possible to figure out the nature of the eclipses. Its small amplitude also suggests the possibility of a third body in the system that also blocks part of the light. To confirm this an investigation searching for transit-timing variation is also recommended.

In summary, to characterize the EPIC 246257206 star, its distance to the Earth, its amplitude and its period had to be determined. These values allowed to conclude that the star EPIC 246257206, located at $(7,0832 \pm 0,0002) \cdot 10^2$ light years away from the Earth, presents a variability of 0,05 magnitudes periodically every $0,2198 \pm 0,0004$ days due to the eclipses formed by the two stars that constitute the binary system. This can be viewed at its webpage at the International Star Index site.

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