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Photometric and Period Variation study of Two contact binaries

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Abstract

This study presents the first detailed photometric analysis of the short-period eclipsing contact binaries V1 and V2. We utilized data from TESS, Kepler 2, and Gaia DR3, applying the Wilson-Devinney method to analyze their light curves. Our comprehensive period variation studies, based on collected times of minima, indicate a secular decrease in the orbital periods of both binaries, suggesting the influence of mass transfer or angular momentum loss. V1 is classified as an A-type marginal contact binary with a low mass ratio of $q \approx 0.178$, while V2 is identified as a W-type marginal contact binary with a higher mass ratio of $q \approx 1.182$. We discuss the evolutionary status of these systems using the Mass-Radius diagram and examine the implications of their marginal-contact configurations and observed period decline. This analysis contributes to a deeper understanding of contact binaries and their evolutionary processes, highlighting the role of mass transfer mechanisms in shaping their properties. Further studies are recommended to investigate the complex astrophysical dynamics at play within these systems.