Modeling Mass Transfer Evolution in Algol-Type Eclipsing Binaries

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Abstract

Algol-type eclipsing binaries provide a unique laboratory for investigating the complex interactions that occur during star evolution, including mass transfer between components of near binary systems. In this study, we create and apply evolutionary computational models to simulate mass transfer processes in such systems, with an emphasis on conservative and non-conservative scenarios. By combining time-dependent stellar structure equations with Roche lobe overflow dynamics, we study how starting mass ratios, orbital periods, and angular momentum loss processes affect the long-term evolution of binary parameters. Our models are calibrated with observational data from well-studied Algol-type binaries, allowing us to follow evolutionary paths and anticipate system behaviors at various stages of mass exchange. The results show key thresholds where rapid mass transfer changes the orbital configuration, potentially leading to contact or merger phases. The simulations also provide information about mass transfer efficiency and its significance in shaping the observed diversity among Algol systems. These findings add to a more thorough understanding of close binary evolution and lay the groundwork for future observational and theoretical studies on mass exchange in interacting binaries.