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The Impact of Inspiral Timing and Model Assumptions on Convective Common Envelopes

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Common envelope (CE) evolution occurs when one, often more massive, star in a binary system completely engulfs a nearby companion. The companion continues its inspiral inside the shared envelope, leading to one of two outcomes: the companion merges with the primary star, or its liberated orbital energy unbinds and ejects the envelope. In the latter case, the ejection of the envelope leaves behind a tight binary; this process is thought to be the primary formation mechanism for both thermonuclear supernova and gravitational wave progenitor systems. However, population synthesis codes often fail at reproducing the observed population of these systems, highlighting gaps in our physical understanding of the CE phase. In this work, we study the physics of CE evolution by using a convective CE model, which accounts for the redistribution of energy by convection within the primary, where inspiral energy liberated in a convection-dominated zone is lost via convection and radiation. We extend previous research by investigating how the specific convection models assumptions adopted in the stellar evolution code MESA impact the predictions for the outcome of CE evolution along the asymptotic giant branch (AGB). We find that differences in stellar structure caused by variations in the adopted convective parameters can lead to drastic differences in the predicted CE efficiency (and therefore final binary separation), particularly for binaries with large initial separations which enter the CE towards the end of the primary's AGB phase.

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Yes

What is your career level?

Undergraduate

Which keyword describes the area of focus of this talk?

Transients

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