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The Role of the Third Dredge-up and Mass Loss in Shaping the Initial–Final Mass Relation of White Dwarfs

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The initial-final mass relation (IFMR) plays a crucial role in understanding stellar structure and evolution by linking a star's initial mass to the mass of the resulting white dwarf. This study explores the IFMR using full PARSEC evolutionary calculations supplemented with COLIBRI computations to complete the ejection of the envelope and obtain the final core mass. Recent works have shown that the supposed monotonicity of the IFMR is interrupted by a kink in the initial mass range $M_{ini} \approx 1.65 - 2.10 M_{\odot}$, due to the interaction between recurrent dredge-up episodes and stellar winds in carbon stars evolving on the thermally-pulsing asymptotic giant branch phase. To reproduce the IFMR non-monotonic behavior we investigate the role of convective overshooting efficiency applied to the base of the convective envelope (f_{env}) and to the borders of the pulse-driven convective zone (f_{pdcz}), as well as its interplay with mass loss. We compare our models to observational data and find that f_{env} must vary with initial mass in order to accurately reproduce the IFMR's observed kink and slopes. We find some degeneracy between the overshooting parameters when only the IFMR information is used. Nonetheless, this analysis provides valuable insights into the internal mixing processes during the TP-AGB phase. Finally, we present chemical yields and ejecta calculated with our IFMR-calibrated models at solar metallicity.

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