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Effective Reaction Rates (ERR) for the Helium Burning Reactions[1] SAM M. AUSTIN, MSU/NSCL, CHRISTOPHER WEST, University of Minnesota, ALEXANDER HEGER, University of Minnesota, Monash University, JINA COLLABORATION — Simulations of helium burning in presupernova stars are subject to uncertainties in the rates of both the triple alpha and $^{12}C(\alpha,\gamma)$ reactions and to approximations in the simulation itself, particularly in the treatment of convection. We have attempted to treat this problem in a consistent manner by introducing "Effective Reaction Rates" (ERR) for the two reactions, their parameters fixed by requiring that they reproduce the production of the intermediate mass and s-only isotopes. The process is based upon a data base of 2112 simulations (West et al., ApJ **769**, 2 (2013)) in which the two rates are varied by $\pm 2\sigma$ for a set of 12 stars with masses from $12 - 30 M_{\odot}$. We find that the abundances are well reproduced for ERR lying along a line $r_{\alpha,\gamma} = r_{3\alpha} + 0.35$. It is a test of the ERR procedure that the ERRs reproduce a variety of observables. For points along the ERR line, the central C fraction at the end of helium burning, the remnant mass after the SN explosion, and the yields of the neutrino isotopes have constant values.

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