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Pre-supernova models for massive stars produced with large nuclear reaction network by MESA

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Supernova (SN) is one of violent phenomena in the universe. SN generates heavy elements and leaves neutron star behind. It has been known that the physical properties of SN depend on those of pre-supernova such as mass, metallicities including distribution of elements, and the density and temperature profile which are obtained from the stellar evolution calculation. In particular, the production of heavy elements in SN is sensitive to the abundance profiles in the pre-supernova models. In this study, we evolved massive main sequence stars (Mstar>15Msun) by using large nuclear reaction networks that include heavy elements beyond iron. Our calculations were done by MESA (Modules for Experiments in Stellar Astrophysics) which allowed us to use networks containing a few hundred isotopes. We discuss how to select an effective network with the limited number of isotopes for the explosive nucleosynthesis of heavy elements in SN.

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