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Explosive nucleosynthesis in aspherical supernovae of massive stars with the solar and zero metallicity

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We have investigated explosive nucleosynthesis in core-collapse supernovae (SNe) of massive stars, based on two-dimensional (2D) hydrodynamic simulations of the SN explosion.
Employing a simplified light-bulb scheme for neutrino transport and excising a central part of a proto-neutron star (PNS), we follow long-term evolution of the SN explosion over 1.0 second after the core bounce for 22 massive stars with masses from 10.8 to 40M and with the solar metallicity and 15 stars with masses from 10 to 40M and with zero metallicity, adopting a PNS core model, with which we evaluate evolution of neutrino luminosities and temperatures as in Ugliano et al. 2012. We adopt two parameter sets of the PNS core model; one results in faster explosion of 0.2-0.4s after the bounce and the other later explosion of 0.4-0.6.
Then, we calculate abundance evolution of the SN ejecta through post-processing calculation using a large nuclear reaction network including 463 nuclei from neutron, proton to Kr and evaluate abundances and masses of the SN ejecta.
We find two explosion models of 19.4 and 25.0 M_ stars Z=Z_ whose E and MnucNi56 and MnuNi57 are comparable to those observed in SN1987A, only for the PNS core model with the faster explosion.
For the progenitors with Z=Z_ and using the PNS core model with the faster explosion, we well reproduces a correlation between MnucNi56 and E_rm observed in Type II-Plateau SNe (Pejcha and Prieto, 2015). Moreover, we have calculated IMF-averaged abundances of the SN ejecta of the Z=Z progenitors and added appropriate amounts of ejecta from Type Ia SN (W7 model of Iwamoto et al. 1999 and 20% of all SNe) to the IMF-averaged abundances.
The resultant abundances are found to be well agree with those in the solar system.
Finally, we have calculated IMF-averaged abundances of the SN ejecta of progenitors with Z=0 and find that the IMF-averaged abundances well reproduce averaged abundances of observed in metal-poor stars (Cayrel et al. 2004).

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