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Explosive nucleosynthesis in aspherical supernovae of Pop III stars

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We have investigated explosive nucleosynthesis in core-collapse supernovae (SNe) of massive stars, based on two-dimensional 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 the solar metallicity (from 10.8 to 40$M_\odot$) and 15 Pop III stars (from 10 to 40$M_\odot$). We adopt a PNS core model, with which we evaluate evolution of neutrino luminosities and temperatures as in Ugliano et al. 2012 and tune two parameters of the PNS core model for solar metallicity stars, so that a star with $\sim 20M_\odot$ explodes as SN1987A-like, that means an explosion energy of $\sim 10^{51}$ergs and a Ni56 mass of $\sim 0.07M_\odot$.

For the Pop III stars, we find IMF-averaged abundances of SN ejecta of the stars well reproduce averaged abundances of observed in metal-poor stars (Cayrel et al. 2004).
In particular, K, which is underproduced in previous theoretical evaluation based on 1D models, is abundantly produced in our model and the IMF-averaged abundances of K is comparable to the observed abundance.

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Talk/Poster

Poster

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