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Nucleosynthesis in core-collapse supernovae

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Core-collapse supernovae (CCSNe) are one of the most important sites of element synthesis in the universe and drive the chemical evolution of galaxies. A major goal of CCSN nucleosynthesis studies is to determine how nucleosynthesis outcomes depend on progenitor properties (e.g. mass and metallicity) and the explosion details. Traditional calculations do not account for neutrino-matter interactions, thus omitting key microphysics relevant for both the explosion and the explosive nucleosynthesis. In this talk, I will review our current understanding of nucleosynthesis in core-collapse supernovae. I will also present nucleosynthesis yields for progenitors of different masses and metallicities exploded using PUSH. The PUSH method is based on the neutrino-driven mechanism and follows the evolution of the proto-neutron star as well as the electron fraction of the ejecta. This allows a more accurate treatment of nucleosynthesis in the innermost stellar layers. I will focus especially on the synthesis of iron group elements, which are produced in these innermost layers and are therefore quite sensitive to the explosion details. I will contrast our results with more traditional calculations. Finally, I will compare our predicted yields to observationally derived values for supernovae and metal-poor stars. This complete set of isotopic yields provides an essential input for modeling galactic chemical evolution.

Keywords

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