Contribution ID: **1** Type: **Oral presentation**

# Effect of the explosion properties on $\gamma$-process nucleosynthesis in core-collapse supernovae

*Wednesday 16 October 2024 16:00 (20 minutes)*

The $\gamma$-process in core-collapse supernovae (CCSNe) can produce a number of neutron-deficient stable isotopes heavier than iron (p-nuclei). However, current model predictions do to not fully reproduce the solar abundances. We investigate the impact of different explosion energies and parameters on the nucleosynthesis of p-nuclei, by studying stellar models with different initial masses and CCSN explosions. We find that the total p-nuclei yields are only marginally affected by the CCSN explosion prescriptions if the $\gamma$-process production is already efficient in the stellar progenitors due to a C-O shell merger. In most of CCSN explosions from progenitors without C-O shell merger, the $\gamma$-process yields increase with the explosion energy up to an order of magnitude, depending on the progenitor structure and the CCSN prescriptions. The trend of the p-nuclei production with the explosion energy is more complicated if we look at the production of single p-nuclei. The light p-nuclei tend to be the most enhanced with increasing the explosion energy. In particular, for the CCSN models where the $\alpha$-rich freeze-out component is ejected, the yields of the lightest p-nuclei increase by up to three orders of magnitude. We provide the first extensive study using different sets of massive stars of the impact of varying CCSN explosion prescriptions on the production of the p-nuclei. Unlike previous expectations and recent results in the literature, we find that the average production of p-nuclei tends to increase with the explosion energy. We also confirm that the pre-explosive production of p-nuclei in C-O shell mergers is a robust result, independently from the subsequent explosive nucleosynthesis. A realistic range of variations in the evolution of stellar progenitors and in the CCSN explosions might boost the CCSN contribution to the galactic chemical evolution of p-nuclei.

## Length of presentation requested

Oral presentation: 17 min + 3 min questions

## Please select a keyword related to your abstract

Stellar Models and Galactic Chemical Evolution

**Author:** ROBERTI, Lorenzo (Konkoly Observatory, CSFK)

**Presenter:** ROBERTI, Lorenzo (Konkoly Observatory, CSFK)

**Session Classification:** Afternoon session