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ABSTRACT

The impacts of nuclear reaction uncertainty on heavy-element nucleosynthesis

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Astrophysical nucleosynthesis beyond iron involves numerous nuclear reactions and decay processes, even for unstable nuclei. Explosive nucleosynthesis, in particular, includes significant physical uncertainties on reaction cross-sections and has complex dependencies in the network. A comprehensive approach based on Monte Carlo is essential for understanding such complicated phenomena. We have developed a nuclear reaction network with a Monte-Carlo framework considering stellar reaction-rate uncertainties. We investigated the s-process and several nucleosyntheses relevant to p-nuclei production using this tool. In this presentation, I will present the recent results on the vp-process, which is expected to happen in core-collapse supernovae and may be the origin of lighter p-nuclei. I show important unknown reaction rates, which may impact the final abundances. In particular, I will discuss important reaction rates for reproducing the solar isotopic ratios of lighter p-nuclei.