Contribution ID: **19** Type: **Oral presentation**

Convective-Reactive Nucleosynthesis in O-C Shell Mergers

Wednesday 16 October 2024 14:50 (10 minutes)

O-C shell mergers in massive stars have been proposed as a potential site for the production of p-process isotopes. These mergers provide a convective-reactive environment where the timescales for the nucleosynthesis of C-shell ashes such as $^{20}\mathrm{Ne}$ and convective mixing of species are of the same order. However, the nucleosynthetic pathways of these convective-reactive processes remain largely unexplored. In this study, we use the $15M_{\odot}$, $Z = 0.02$ model from the NuGrid stellar data set II (Ritter et al., 2018) to create a detailed post-processed model of an O-C shell merger event. Three preliminary experiments were conducted by varying the reaction rates of $^{20}\mathrm{Ne}(\gamma,\mathrm{p})^{16}\mathrm{O}$, the (γ,p) rates for the odd-Z isotopes $^{31}\mathrm{P}$, $^{35}\mathrm{Cl}$, $^{39}\mathrm{K}$, $^{45}\mathrm{Sc}$, and all (p,γ) rates by a factor of 10 up and down from their default values. The results show that altering the $^{20}\mathrm{Ne}(\gamma,\mathrm{p})^{16}\mathrm{O}$ rate has the strongest effect on the production of p-nuclei, notably $^{115}\mathrm{Sn}$, $^{138}\mathrm{La}$, $^{162}\mathrm{Er}$, $^{168}\mathrm{Yb}$, and $^{180}\mathrm{Ta}$. The other two experiments show a smaller impact on all isotopes. We will present the results of a full multizone Monte Carlo analysis of the impact from varying all reaction rates.

Length of presentation requested

Oral presentation: 8 min + 2 min questions (Poster-type talk)

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Stellar Models and Galactic Chemical Evolution

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