

Nuclear and astrophysics aspects for the rapid neutron capture process in the era of multimessenger observations



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Neutron capture elements in the Early Universe

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In the last years, the search for the oldest stars has started to investigate the central region of our Galaxy and its outskirts with ultra-faint galaxies.

Both Galactic bulge and ultra-faint galaxies host extremely old stars, with ages compatible with the ages of the oldest halo stars. The data coming from these recent observations present new signatures in neutron capture elements. Our study, based on stochastic chemical evolution models, shows how this new fundamental information can improve the constraints on the nature of the first sources of neutron capture elements: the r-process events and the first massive stars.

Our findings support a scenario where at least a fraction of r-process events has exploded in a very short timescale and where the first stellar generations have been fast rotators. We also predict the existence of Eu-free stars due to the rarity of the r-process events.

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