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The intermediate neutron capture process in AGB stars

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Despite considerable progresses over the past few decades, the origin of trans-iron elements is not yet fully understood. In addition to the slow (s) and rapid (r) neutron capture processes, an intermediate neutron capture process (i-process) is thought to exist at neutron densities intermediate between the s- and r-processes. The existence of this process is supported by the observation of metal-poor stars whose chemical compositions are intermediate between the s- and r-processes (the so called r/s-stars). The i-process is triggered when protons are mixed in a convective helium-burning zone (proton ingestion event or PIE). The astrophysical site(s) hosting PIEs and thus the i-process is (are) actively debated. Among the various possible sites, the early Asymptotic Giant Branch (AGB) phase of low-mass stars is a promising one. In this presentation, I will focus on the development of the i-process in state-of-the-art AGB stellar models of various masses and metallicities computed with the STAREVOL code. I will first show how the AGB evolution of models suffering a PIE can be dramatically altered. Then, I will discuss the i-process nucleosynthesis accompanying a PIE, identify key reaction rates, highlight the chemical fingerprint of these stars, present i-process yields as a function of mass and metallicity and eventually discuss the implication on galactic chemical evolution.

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