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The weak s-process production in massive stars: theory, uncertainties and comparison with observations

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The abundances in the Solar System are the result of the contributions from many generations of stars. Beyond the Fe-group elements, about half of the abundances were made by the slow neutron-capture process, or s-process. Stars with initial mass of the order of 9 solar masses or larger contributed a relevant fraction of the s-process elements between Fe (Z=26) and Zr (Z=40), with free neutrons mostly provided by the alpha-capture reaction on Ne22. The predictions from computational simulation of the s-process in these stars are strongly affected by nuclear and stellar uncertainties. Therefore, after decades of research, the solar s-process abundance pattern of these elements remains uncertain. In this presentation I will discuss current challenges for s-process nucleosynthesis simulations in massive stars, the main uncertainties and available observations to benchmark stellar models.

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