

Correlation between nuclear capture rates and abundances in r-process nucleosynthesis

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Neutron star mergers eject dense neutron rich material which are understood to be the primary sites for the production of many of the heavy elements in the universe via rapid neutron capture process, the r-process. There are several competing processes and reactions that determine the amount of heavy nuclei produced during this process, including the cooling of the material, neutron captures, compound nucleus formation followed by gamma emission, beta decays when free neutrons become scarce, fission, and the complexities associated with forming nuclei away from stability in the form of favorable shell closures for nucleons. In this talk we will discuss our work on exploring the impact of correlation in nuclear reactions on astrophysical observations such as the abundance patterns and the heating rates. We investigate the impact of correlations in neutron capture rates which have not been studied in the past and conduct a reaction theory-consistent Monte Carlo study to assess the full impact of rate uncertainties.

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