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Nucleosynthetic signatures of astrophysical r-process sites

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The first observation of a kilonova (or macronova) in the aftermath of a gravitational wave signal has confirmed neutron star mergers (NSMs) as a major source of heavy r-process nuclei in the universe. However, some observational data of r-process elements in the galaxy seemingly cannot be explained if NSMs are assumed to be the only r-process site. Theoretical models show that the heaviest r-process nuclei can possibly be produced also in other astrophysical scenarios, such as magneto-rotationally driven supernovae (MRSNe) or disks forming around collapsars. Distinguishing these scenarios by means of their nucleosynthetic signatures proves extremely challenging, since the properties of the neutron-rich nuclei involved are unknown, in addition to the uncertainties in hydrodynamical conditions of the ejecta. Most models, however, agree that the ejecta from NSMs include components that are neutron-rich enough for fission cycling, while simulated outflows from MRSNe are generally less neutron-rich. This talk aims to outline possible differences in abundance patterns originating from this difference and to discuss uncertainties in nucleosynthesis calculations.

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