

Talk at Splinter Meeting

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EJECTA FROM BINARY NEUTRON STAR MERGERS AND THE ROLE OF
NEUTRINOS

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The merger of a binary system of neutron stars is among the most extreme events happening in the Universe. In addition to be intense gravitational wave emitters and presumably the progenitor of a subclass of Gamma-Ray Bursts (GRBs), the so-called “short GRBs”, these events are expected to eject matter in the interstellar medium and to play an important role in the chemical evolution of their host galaxy.

Due to the potential neutron-richness of the ejecta, it has been long suspected that r-process nucleosynthesis can occur in these mergers, producing heavy elements well above the iron-group nuclei. Different ejection channels can appear during and after the actual coalescence: tidal torques and strong shocks are expected to expel matter during the merger, while neutrinos, magnetic fields and viscosity can trigger the ejection of matter from the central remnant and its surrounding disk on longer time scales (from tens of milliseconds up to a seconds after the merger).

Neutrino-matter interactions in the hot and dense matter can significantly affect the dynamical and thermodynamical properties of the ejecta. In particular, the competition between the expansion and the weak reaction time scales, as well as the effects of neutrino irradiation, can change the neutron richness, ultimately affecting the nucleosynthesis abundances. In this talk, I will present recent results on the role of neutrinos in this scenario, with a special emphasis on the formation of a neutrino-driven wind from a merger remnant, and its consequences in terms of nucleosynthesis and electromagnetic counterparts. The implication of the r-process nucleosynthesis on the galactical chemical evolution, as well as a comparison with the elemental abundances observed in metal-poor stars, will also be discussed.