Observational signatures of magneto-rotational supernovae associated with r-process jets

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Magnetically-driven supernovae of massive stars have been expected as a viable astrophysical site of heavy-elements, including r-process nuclei, as well as the central engine of gamma-ray bursts, magnetar formation, and other peculiar supernovae (e.g., superluminous supernovae). However, there has not been direct observation and detailed nucleosynthetic properties of this type of supernovae are still unclear.

In this talk, I show recent results of nucleosynthesis for magneto-rotational supernovae associated with jet-like explosions producing r-process nuclei. Using the simplified models for the r-process-rich inner ejecta based on our previous studies [1, 2], we extended propagation of the shock wave to the stellar surface and calculated complete sets of nucleosynthesis yields from lighter elements to r-process nuclei. We discuss the possibilities of observational constraints on the nucleosynthesis properties of magnetically-driven supernovae, e.g., chemical evolution of galaxies and the ejection process of radioactive nuclei.

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[2] N. Nishimura, H. Sawai, T. Takiwaki et al., The Astrophysical Journal Letters **836**, L21 (2017).