Contribution ID: **94** Type: **Parallel Flash talk**

Neutrino flavor conversions in binary neutron star merger remnants

Monday, 22 February 2021 11:45 (5 minutes)

Neutrinos are puzzling particles that could answer many of the open questions about our Universe. Unlike any other observed particle, the flavor of neutrinos can feedback into itself in a neutrino-dense astrophysical environment. Such neutrino self-interaction leads to intriguing "fast"flavor conversions that can develop within a few nanoseconds in the core of core-collapse supernovae and compact binary mergers. Inevitably, since neutrinos are copiously produced in the merger of two neutron stars, fast neutrino conversions are predicted to be ubiquitous in neutron star merger remnants with potentially major implications on the nucleosynthesis of the elements heavier than iron, and therefore on the related kilonova electromagnetic emission. We present the first multi-dimensional numerical modeling of the neutrino flavor evolution above the merger remnant disk and discuss the possible implications that neutrino flavor conversions could have on the associated kilonova observed at Earth.

In the work presented here, I have developed a new numerical framework to include neutrino conversions in a simplified model that resembles a binary neutron star merger remnant. Although an approximation, this model is the first multi-dimensional solution of such an astrophysical system that takes into account the detailed neutrino advection and neutrino flavor conversion physics that has not been explored in past studies. This work constitutes a major step forward in the exploration of the role of neutrinos in compact merger remnants. Our findings suggest that complete modeling of the neutrino flavor conversion physics should be taken into account in order to make robust predictions for the electromagnetic emission expected by the merger remnant and its aftermath.

Collaboration name

Co-authors: Prof. TAMBORRA, Irene (Niels Bohr Institute); Dr SHALGAR, Shashank (Niels Bohr Institute)

Presenter: PADILLA GAY, Ian (University of Copenhagen - Niels Bohr Institute)

Session Classification: Astrophysical Models

Track Classification: Neutrino Telescopes and Multimessenger