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Simulations of binary neutron star mergers

KENTA KIUCHI, Yukawa Institute for Theoretical Physics, Kyoto University

The merger of a binary composed of a neutron star and/or a black hole is one of the most promising sources of gravitational waves. If we detected gravitational waves from them, it could tell us a validity of the general relativity in a strong gravitational field and the equation of state of neutron star matter. Furthermore, if gravitational waves from a compact binary merger and a short-hard gamma-ray burst are observed simultaneously, a long-standing puzzle on the central engine of short gamma-ray bursts could be resolved. In addition, compact binary mergers are a theoretical candidate of the rapid process nucleosynthesis site. Motivated by these facts, it is mandatory to build a physically reliable model of compact binary mergers and numerical relativity is a unique approach for this purpose. We are tackling this problem from several directions; the magneto-hydrodynamics, the neutrino radiation transfer, and a comprehensive study with simplified models. I will talk a current status of Kyoto Numerical Relativity group and future prospect on the compact binary mergers.