W43a Evolution of fast neutrino flavor conversions with scattering effects in core-collapse supernovae

Milad Delfan Azari, Hirokazu Sasaki, Tomoya Takiwaki, Hirotada Okawa

As a result of supernova explosions, neutrinos are produced in copious quantities. Based on one of the most promising supernova theories, the neutrino-heating mechanism, neutrinos carry the majority of the energy released during the gravitational collapse of massive stars. If neutrino flavors are converted fast in the cores, by depositing energy, they can rejuvenate stalled bounce shocks and provide the energy for supernova explosions.

In this presentation, I will report our latest results on the investigations of the dynamics of fast neutrino flavor conversions with collisions under energy-dependent treatment in detail based on the realistic initial condition, which is taken from the results of the self-consistent, realistic Boltzmann simulations in two spatial dimensions under axisymmetry. Our finding suggest that the energy-dependent collision term significantly enhances neutrino flavor conversion. This may have implications for core-collapse supernova explosion mechanisms, nucleosynthesis, and neutrino astronomy.