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Toward solving the quantum kinetic transport of neutrinos in supernovae and neutron star mergers

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Neutrinos play pivotal roles in determining the dynamics and nucleosynthesis in core-collapse supernova explosions and in binary neutron star mergers. However, a crucial element that has not been modeled consistently in the hydrodynamical simulations of these events is the flavor oscillations of neutrinos. It is, however, very challenging to include this element because of the associated non-linearity as well as the related temporal and spatial scales very different from the classical processes. In this talk, I'll mainly discuss our recent effort on the development of an effective classical transport model that can accurately capture perhaps the most prominent feature of neutrino oscillations in dense environments. I'll also talk about other aspects of neutrino oscillations and the related physical implications.

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