Investigations of Fast-Pairwise Collective Neutrino Oscillations in Core-Collapse Supernovae based on the results of the Boltzmann simulations in 3D

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Neutrinos are belived to play a crucial role in the explosion mechanism of core-collapse supernovae. They may change their flavor identities through so-called fast-pairwise conversions induced by mutual forward scatterings. If the fast-pairwise neutrino collective oscillation happens, the dynamics of supernova explosion will be ifluenced, since the conversion may occur near the neutrino sphere, from which the neutrinos are effectively emmitted.

In my presentation, I will speak about such possibilities based on the results of fully self-consistent, realistic simulations of a core-collapse supernova explosion in two and three [1] spatial dimensions under axisymmetry. As we solved the Boltzmann equations for neutrino transfer in the simulation not as a post-process but in real time, the angular distributions of neutrinos in momentum space for all points in the core at all times are available, a distinct feature of our simulations. We employ some of these distributions extracted from the numerical data and investigate the possibility of the conversion. This is a first ever such attempt and the detailed results will be presented.

[1] Milad Delfan Azari et al., (in preparation)