

Three-flavor collective oscillations of supernova neutrinos

Coherent forward scattering of neutrinos off each other leads to complex collective neutrino oscillations inside a supernova. We explore this phenomenon during the cooling stage of the explosion. Two- and three-flavor calculations of the oscillations are shown to give strikingly different results, especially for the inverted mass hierarchy. Analysis shows that the 2-flavor evolution trajectory is unstable in the 3-flavor space. Additionally, the 3-flavor evolution is shown to be partially non-adiabatic, resulting in a “mixed” spectrum. Our results could impact the interpretation of the future galactic supernova signal, the analysis of the r-process nucleosynthesis, and the predictions of the diffuse supernova neutrino background.

Summary

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