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Supernovae neutrino pasta interaction ZIDU LIN, CHARLES HOROWITZ, MATTHEW CAPLAN, DONALD BERRY, Indiana Univ - Bloomington, LUKE ROBERTS, Michigan State University — In core-collapse supernovae, the neutron rich matter is believed to have complex structures, such as spherical, slablike, and rodlike shapes. They are collectively called "nuclear pasta". Supernovae neutrinos may scatter coherently on the "nuclear pasta" since the wavelength of the supernovae neutrinos are comparable to the nuclear pasta scale. Consequently, the neutrino pasta scattering is important to understand the neutrino opacity in the supernovae. In this work we simulated the "nuclear pasta" at different temperatures and densities using our semi-classical molecular dynamics and calculated the corresponding static structure factor that describes ν -pasta scattering. We found the neutrino opacities are greatly modified when the "pasta" exist and may have influence on the supernovae neutrino flux and average energy. Our neutrino-pasta scattering effect can finally be involved in the current supernovae simulations and we present preliminary proto neutron star cooling simulations including our pasta opacities.

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