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Neutrino flavor evolution in turbulent supernova matter

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The flavor evolution of neutrinos propagating through a turbulent medium is a highly interesting and complicated problem. Depending upon the hierarchy and the properties of the turbulence, the neutrino spectral signatures of collective effects and/or shock waves in the supernova may be smothered to the point where they are unobservable in the "golden"channels (ν_e ⟶ ν_μ transitions) of the next Galactic Supernova Neutrino Burst. However, at the same time, turbulence can also generate effects in mixing channels where none previously existed. We investigate the effects of neutrino self-interactions, MSW conversions as well as the impact of turbulence on the neutrino flavor evolution along single radial directions in turbulent dense matter, paying special attention to the combined impact of these three effects. We find that adding up to 10% turbulence leads to only minor differences in the emerging neutrino spectra, while overall features of the collective and MSW interactions remain. Increasing the amount of turbulence to 50% though will cause several of the spectral features to be obscured. Fortunately it also leads to new mixing patterns. We briefly investigate the observability of the predicted spectral features in a future neutrino detection at Earth.

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