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Probing Earth's Interior with Supernova Neutrinos under Invisible Neutrino Decay Scenarios

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Neutrinos produced in core-collapse supernovae (CCSNe) offer a valuable probe for investigating the Earth's density profile by studying how Earth's matter influences their oscillations. Nonetheless, recent studies suggest that the Earth matter effects on CCSN neutrinos are expected to be small and difficult to observe with existing or forthcoming neutrino detectors, primarily due to the similar fluxes of (\nu_e) and (\nu_x). In this work, we explore, within the linear regime—corresponding to neutrino trajectories traversing terrestrial distances L « 1700 km—the potential role of invisible neutrino decay in improving the determination of the Earth's density profile.

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