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Sterile neutrino signatures in core-collapse supernova simulations[1] MACKENZIE WARREN, MATTHEW MEIXNER, GRANT MATHEWS, University of Notre Dame, JUN HIDAKA, National Astronomical Observatory of Japan, TOSHITAKA KAJINO, National Astronomical Observatory of Japan, University of Tokyo — We have explored the impact of a fourth right handed sterile neutrino on core-collapse supernovae. We utilize a relativistic hydrodynamic spherical supernova model. We show that it is possible that oscillations between a sterile neutrino and electron neutrino (or their antiparticles) will enhance the supernova explosion energy by efficiently transporting neutrino energy from the core to just behind the shock. We have considered a range of masses and mixing angles, including those consistent with sterile neutrino dark matter. We find that the supernova explosion energy can be significantly increased due to the rapid transport of electron antineutrinos as sterile neutrinos from the core to behind the shock where they convert back to active neutrinos. This mechanism enhances the neutrino heating in the region behind the shock and leads to increased luminosities of all three neutrino flavors in addition to an enhanced explosion kinetic energy. We also show that the inclusion of sterile neutrinos leads to a unique oscillatory behavior in the emergent neutrino luminosities from the cyclic depletion of the neutrino density due to oscillations to a sterile neutrino.

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