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Neutrino Reactions in Supernova Nucleosynthesis (NUSTAR)

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We study the effect of neutrino microphysics on nucleoysnthesis in core-collapse supernovae. In particular, we show how neutrinos connect the nuclear physics of the core of a protoneutron star to the nucleosynthesis in the low density neutrino driven wind. We find that a consistent implementation of neutrino interactions with the underlying equation of state leads to a neutronrich matter out flow. The neutron richness of the outflow is directly related to the nuclear symmetry energy. The nucleosynthesis in the ejecta can reproduce the weak r-process pattern that is observed in metal poor stars. We also investigate the impact of additional opacity sources relevant for electron antineutrinos and muon neutrinos. These include inverse neutron decay and charged-current reactions for muon neutrinos. Our calculations explicitely account for weak magnetism in neutrino nucleon interactions without any kinematical approximation. We find that these reactions are signicant contributions to total neutrino opacities and should therefore be implemented in future core-collapse supernova simulations. Andreas Lohs is a member of H-QM Helmholtz graduate school and supported by GSI and HIC for FAIR. This work is partly supported by Deutsche Forschungsgemeinschaft through contract SFB 634.

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