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Nonlinear Solvers for Neutrino-Matter Coupling in Nuclear Astrophysics Applications[1] EIRIK ENDEVE, PAUL LAIU, AUSTIN HARRIS, Oak Ridge National Lab, RAN CHU, University of Tennessee — We develop methods for simulation of multi-dimensional neutrino transport in nuclear astrophysics applications; e.g., core-collapse supernovae and binary neutron star mergers. The computational cost associated with simulations of these events is largely dominated by modeling the neutrino-matter coupling, and efficient solvers and implementations are needed for high-fidelity simulations. In the context of a multi-group two-moment model employing discontinuous Galerkin phase space discretization and implicit-explicit time integration[2], we present results from a comparison of various nonlinear solvers for four-momentum and lepton exchange due to emission and absorption, scattering, and pair processes. We also discuss preliminary results from porting these algorithms to GPUs.

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[2]Chu et al. 2019, *JCP*, **389**, 62

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