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Bound-Preserving Discontinuous Galerkin Methods for Neutrino Transport RAN CHU, Univ of Tennessee, Knoxville, EIRIK ENDEVE, CORY HAUCK, Oak Ridge National Laboratory, ANTHONY MEZZACAPPA, Univ of Tennessee, Knoxville — We aim to develop accurate and robust methods for simulation of multi-dimensional neutrino transport in nuclear astrophysics applications. Specifically, methods that work well in scattering and/or absorption dominated regimes, and in the streaming limit. Here we consider a multi-group two-moment model which evolves the spectral particle density $\mathcal{N}$ and flux $\mathcal{F}$ — angular moments of a phase space distribution function f. Since, by the Pauli exclusion principle, the neutrino distribution function is bounded ($f \in [0,1]$), a realizable set of moments $(\mathcal{N},\mathcal{F})$ must also be bounded. Specifically, $\mathcal{N} \in [\prime,\infty]$ and $(1-\mathcal{N})\mathcal{N} - |\mathcal{F}| \geq \prime$. To achieve high-order accuracy, efficiency (i.e., large time step), and the bound-preserving property, an implicit-explicit (IMEX) discontinuous Galerkin (DG) method has been developed. Here we present details of the mathematical model, the numerical method, and a detailed comparison of several IMEX schemes on relevant test problems.

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