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Discontinuous Galerkin Methods for the Two-Moment Model of Radiation Transport EIRIK ENDEVE, CORY HAUCK, Oak Ridge National Lab
— We are developing computational methods for simulation of radiation transport in astrophysical systems (e.g., neutrino transport in core-collapse supernovae). Here we consider the two-moment model of radiation transport, where the energy density E and flux F — angular moments of a phase space distribution function — approximates the radiation field in a computationally tractable manner. We aim to develop multi-dimensional methods that are (i) high-order accurate for computational efficiency, and (ii) robust in the sense that the solution remains in the realizable set $R = \{(E, F) \mid E \geq 0 \text{ and } E - |F| \geq 0\}$ (i.e., E and F are consistent with moments of an underlying distribution). Our approach is based on the Runge-Kutta discontinuous Galerkin method[1], which has many attractive properties, including high-order accuracy on a compact stencil. We present the physical model and numerical method, and show results from a multi-dimensional implementation. Tests show that the method is high-order accurate and strictly preserves realizability of the moments.

[1]Cockburn & Shu 2001, J. Sci. Comput. **16**, 173-261

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