

Implicit Riemann Solvers for the Pn equations

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Abstract

The spherical harmonics (Pn) approximation to the transport equation for time dependent problems has previously been treated using Riemann solvers and explicit time integration. Here we present an implicit time integration method for the Pn equations using Riemann solvers. Both first-order and high-resolution spatial discretization schemes are detailed. One facet of the high-resolution scheme is that a system of nonlinear equations must be solved at each time step. This nonlinearity is the result of slope reconstruction techniques necessary to avoid the introduction of artificial extrema in the numerical solution. Results are presented that show auspicious agreement with analytical solutions using time steps well beyond the CFL limit.

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