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Angular Dependent Rebalance Factor Method for Solving the S_N Transport Equations in *X-Y* Geometry

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Abstract

The angular dependent rebalance (ADR) factor method is extended to the two-dimensional neutron transport problems and applied to acceleration of three nodal transport methods (i.e., constant-linear (C-L), simplified linear-discontinuous (SLD), and bilinear discontinuous (BLD)) and three non-nodal spatial differencing schemes (i.e., step scheme (SS), step characteristic (SC), and constant-constant (C-C)) where the spatial distributions of the angular flux are assumed to be flat in mesh interior and mesh edges. In ADR, the rebalance factor is defined as the ratio of the angular fluxes of the same phase point in two iterates and it is angular dependent. In this paper, the S_2 approximation for the angular dependency of the rebalance factor is used. The resulting S_2-like lower-order equation is solved by three iterative methods (four-cyclic (FC), conjugate gradient (CG), and bi-conjugate gradient stabilized (Bi-CGSTAB) methods). The numerical tests show that the ADR method can be used effectively for all tested transport methods.

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Asymptotic Derivation of the Multigroup Modified Time-Dependent Simplified *P2* Equations

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Abstract

The multigroup modified time-dependent simplified P2 (SP2) equations are derived as the higher order asymptotic approximations to the multigroup time-dependent transport equation in a physical regime in which the conventional multigroup time-dependent diffusion equations are the leading-order asymptotic approximation. The derivation is performed in general three-dimensional geometry.