ON ROBUSTLY CONVERGENT AND EFFICIENT ITERATIVE METHODS FOR ANISOTROPIC RADIATIVE TRANSFER

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ABSTRACT

This talk considers the iterative solution of linear systems arising from the discretization of the anisotropic radiative transfer equation with discontinuous elements on the sphere. In order to achieve robust convergence behavior in the discretization parameters and the physical parameters we employ a preconditioned Richardson iteration in Hilbert spaces. We discuss the convergence of the resulting scheme. The preconditioner is constructed in two steps. The first step borrows ideas from matrix splittings and ensures mesh independence. The second step uses a subspace correction technique to reduce the influence of the optical parameters. The correction spaces are build from low-order spherical harmonics approximations generalizing well-known diffusion approximations. We discuss in some detail the efficient implementation of the scheme, including the treatment of the scattering operator. The effectiveness of the method is shown in numerical examples.

References

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[2] Olena Palii, Matthias Schlottbom. *On a convergent DSA preconditioned source iteration for a DGFEM method for radiative transfer*, Computers & Mathematics with Applications, vol. 79 (12), 2020. doi: 10.1016/j.camwa.2020.02.002

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