Abstract Submitted
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Numerical methods for anisotropic heat transport in high-temperature plasmas[1] ERIC HELD, JEONG-YOUNG JI, Utah State University, CARL SOVINEC, University of Wisconsin-Madison, PSI CENTER COLLABORATION, CEMM COLLABORATION — The highly anisotropic nature of heat transport in high-temperature, magnetized plasmas yields stiff systems of algebraic equations upon spatial discretization. High-order, 2-D finite elements have had substantial success resolving extreme anisotropies even without grid and magnetic field alignment. We discuss further improvements in the spatial representation offered by a mixed finite-element method (MFEM) which solves simultaneously for temperature, T, and an auxiliary scalar related to the large parallel heat flux, $q_{\|}$. The successful application of iterative solves for the ill-conditioned, MFEM system has led to the development of a direct, continuum solution to the lowest-order drift kinetic equation. A fully implicit solve for the coefficients of a basis function expansion in the velocity variables couples to the T advance in the same manner as the auxiliary scalar of the MFEM method. The convergence properties of various velocity bases are discussed and the physical predictions of the continuum and diffusive MFEM solutions are compared for a number of test problems.

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