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Plasma Transport with Higher-Moment Models in PERSEUS.[1] JASON HAMILTON, CHARLES SEYLER, Cornell University — The traditional approach to deriving plasma transport coefficients is to perturb a near-Maxwellian distribution function and solve a Fokker-Planck or similar equation to first order in the perturbation parameter, typically the Knudsen number. This not only assumes high collisionality but also steady state solutions for non-equilibrium variables such as the heat flow and stress tensor, which destroys the hyperbolicity of the system of equations. While these near-Maxwellian transport coefficients are accurate in their appropriate regime, this technique provides parabolic equations that are computationally expensive to solve and does not extend itself well to plasmas of low collisionality. By expanding the distribution function in terms of the moments, one obtains hyperbolic equations that do not have the same restrictions on Knudsen number, and thus may provide more accurate transport coefficients in a broader parameter regime. We present our implementation of a regularized 13-moment model in the PERSEUS code as well as results from validation tests in both the high and low Knudsen number regimes.

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