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Capturing marginally collisional effects with the 13N-moment plasma model[1] SEAN MILLER, URI SHUMLAK, University of Washington — Fluid-based plasma models have typically been applied to parameter regimes where a local thermal equilibrium is assumed. While this parameter regime is valid for low temperature applications, it begins to fail as plasmas enter the collisionless regime and kinetic effects dominate the physics. This research extends the validity of the collisional fluid regime using an anisotropic 13-moment fluid model derived from the Pearson type-IV probability distribution. The model explicitly evolves the heat flux hyperbolically alongside the density, momentum and an energy tensor to capture dynamics usually restricted to costly Boltzmann models. Each particle species is modeled individually and collectively coupled through electromagnetic and collision operators. Electromagnetic fields are evolved using Maxwell's equations. The model is implemented within the the University of Washington's WARPXM code for use on accelerated clusters using an unstructured central essentially non-oscillatory finite volume method, and is currently being extended to an unstructured discontinuous Galerkin method.

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Sean Miller
University of Washington

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