Abstract Submitted
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A Gas-kinetic Scheme for the Two-Fluid MHD Equations with Resistivity[1] STEVEN ANDERSON, SHARATH GIRIMAJI, Texas A&M University, EDUARDO DA SILVA, DIOGO SIEBERT, JUAN SALAZAR, Universidade Federal de Santa Catarina - Joinville — The two-fluid MHD equations are a simplified model of plasma flow wherein a mixture of two species (electrons and ions) is considered. In this model, unlike single-fluid MHD, quasi-neutrality is not enforced, Ohm's Law is not used, and the fluids are not in thermal equilibrium - thus both fluids assume their own density, velocity, and temperature. Here we present a numerical scheme to solve the two-fluid MHD equations based on an extension of the gas-kinetic method. In contrast to previous implementations of the gas-kinetic scheme for MHD, the solution of the non-equilibrium distribution function for each gas at the cell interface is extended to include the effect of the electromagnetic forces as well as the inter-species collisions (resistivity). Closure of the fluid equations with the electromagnetic fields is obtained through Maxwell's equations, and physically correct divergences are enforced via correction potentials. Maxwell's equations are integrated via a simple Lax-Friedrichs type flux-splitting. To separate integration of the source and flux terms in the governing equations we use Strang splitting. Some numerical results are presented to demonstrate accuracy of the scheme and we discuss advantages and potential applications of the scheme.

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