Abstract Submitted
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Shock Waves in Hall-MHD[1] GEORGE HAGSTROM, ELIEZER HAMEIRI, Courant Institute of Mathematical Sciences — We study shock waves and discontinuities in Hall-MHD. We characterize planar travelling wave solutions with discontinuities in the absence of viscosity. These solutions arise due to the presence of hydrodynamic characteristics in Hall-MHD. We demonstrate finite-time discontinuity formation for certain types of initial data with discontinuous derivatives. Using matched asymptotic expansions and introducing a small viscosity and heat conductivity, we calculate shock structures corresponding to the discontinuous travelling waves. When these structures exist the dynamical variables at each side of the inner region satisfy the Rankine-Hugoniot conditions of the ion-acoustic shock and also the entropy condition. We also explore the possible existence of solutions with discontinuous magnetic field. A non-algebraic, non-local set of jump conditions is derived under the assumption of $[B] \neq 0$. These conditions are used to study the contact discontinuity and it is shown that massless electrons crossing the surface of discontinuity may enter and leave at different locations. These conditions suggest the possible existence of mathematically novel shocks in Hall-MHD.

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George Hagstrom
Courant Institute of Mathematical Sciences

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