Effects of Electron inertia on the Waves in Hall Magnetohydrodynamics

B. DASGUPTA, DASTGEER SHAIKH, G.P. ZANK, The University of Alabama in Huntsville — Electromagnetic waves in Hall Magnetohydrodynamics (HMHD) exhibit a variety of complex and interesting features. Earlier works have shown the mode conversion of incompressible MHD shear Alfvén wave into a compressible, the fast wave becoming mostly electromagnetic and the slow wave becomes almost a fluid-dynamical wave. These features have been supported partially by numerical simulations of Shaikh & Zank (ApJ,640,L195,2006). Also, recent numerical simulations on solar wind turbulence show some interesting features for the power spectra, like the predominance of Whistler cascades in the range $kde < 1$, where $k$ is the wave number and $de$ is the electron inertial length. In this work, we first consider the linear dispersion relation for a complete two-fluid plasma with a finite electron mass. We analyze the different branches of the dispersion relation for different ranges of $kde$, i.e., $kde > 1$ and $kde < 1$, in addition to the ranges $kdi > 1$ and $kdi < 1$. The wave characteristics, revealing many significant features, are discussed.

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