Abstract Submitted
for the 4CF06 Meeting of
The American Physical Society

Effects of Generalized Ion Stress on Plasma Sound Waves

MICHAEL ADDAE-KAGYAH, ERIC HELD, Utah State University — Details of two key effects of the generalized parallel ion stress tensor ($\Pi_{||}$) on magnetized plasmas, namely sound wave damping and viscous heating, are presented. Kinetic-based derivation of $\Pi_{||}$, employing an expansion of the particle distribution function, forms the theoretical basis of this study. The goal of this research is to incorporate kinetic physics into the physical models of high-temperature plasmas. Here, a hybrid fluid/kinetic model is applied to the simulation of plasma systems, via the use of the generalized stress closure in the closing of fluid equations. The NIMROD code is used to run the simulations designed to highlight the finite physical effects of the generalized $\Pi_{||}$. Runs involve scans of plasma parameters that correspond to various degrees of plasma collisionality. Analogous simulations, involving the local form of $\Pi_{||}$, are also run for comparison. Diagnostics of the parallel viscosity, damping rates, and energies are made. It is concluded that the generalized $\Pi_{||}$ and the local $\Pi_{||}$models produce similar results at high collisionality, whilst the formerpredicts more realistic values at low collisionality.

Michael Addae-Kagyah
Utah State University

Date submitted: 11 Sep 2006

Electronic form version 1.4