Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Low Collisionality Orderings for Extended MHD[1] J.J. RAMOS, M. I. T. — A fluid theory of collisionless magnetized plasmas can be based on a single expansion parameter, namely the ratio "delta" between the ion gyroradius and the macroscopic lengths perpendicular to the magnetic field [J.J. Ramos, Phys. Plasmas, 12, 052102 (2005)]. The generalization of this theory to the fusion-relevant regimes of low but finite collisionality involves two more independent small parameters, namely the ratio between the electron and ion masses and the ratio between the ion collision and cyclotron frequencies. Such generalization is carried out assuming that these two ratios are comparable to or smaller than the square of "delta." These conditions are well satisfied over a wide range of fusion-relevant plasma parameters, thus providing the basis for an attractive low-collisionality extended MHD model. The first significant order FLR equations for the flow velocities, the stress tensors and the heat fluxes are derived, with a detailed analysis of the collisional terms that need be taken into account. The analysis is valid for general magnetic geometry and fully electromagnetic non-linear dynamics with arbitrarily large fluctuations. It is also valid for strong anisotropies, does not require the distribution functions to be close to Maxwellians and assumes Fokker-Plank collision operators in their complete, quadratic form. Both the fast (sonic or Alfvenic motions) and slow (diamagnetic drift motions) orderings are considered.

[1]Work supported by the U.S. DoE.

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Date submitted: 25 Jul 2006 Electronic form version 1.4