Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Compressible gyrofluid simulations of collisionless reconnection[1]
F.L. WAELBROECK, Inst. Fusion Studies, U. Texas at Austin, D. GRASSO, CNR-INFM, Dpt. Energetica, Politecnico di Torino, E. TASSI, CPT, CNRS - U. Marseille, Luminy, L. COMISSO, CNR-INFM, Dpt. Energetica, Politecnico di Torino
— Ion temperature plays an important role in collisionless magnetic reconnection, where it can both raise the stability threshold and, once the mode is unstable, accelerate its growth. We have investigated magnetic reconnection with a recently constructed noncanonical Hamiltonian formulation of a four-field electromagnetic gyrofluid model. The new model extends previous Hamiltonian models in two ways: (1) It retains the effect of ion compressibility, enabling the description of sound waves and drift Kelvin-Helmholtz instabilities, and (2) It accounts for the role of magnetic curvature, enabling the description of geodesic acoustic modes (GAM) and ballooning modes. We find that in order for the Poisson bracket to satisfy the Jacobi identity, we must halve the coefficient of the curvature term in the parallel momentum equations. We present the resulting Casimir invariants and show them to be associated to four Lagrangian invariants advected by distinct velocity fields. Examination of the invariants helps to understand the changes in the reconnection dynamics as a function of the plasma beta and the ratio of species temperatures.

[1]Funded by U.S. DOE Contract No. DE-FG03-96ER-54346.

F.L. Waelbroeck
Inst. Fusion Studies, U. Texas at Austin

Date submitted: 27 Jul 2011 Electronic form version 1.4