Abstract Submitted
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Hamiltonian and Action Principle Formalisms for Gyroviscous models[1] MANASVI LINGAM, PHILIP J. MORRISON, Institute for Fusion Studies, The University of Texas at Austin — A general procedure for constructing action principles for continuum models via the generalized Hamilton's principle of mechanics is described. In [1], this procedure is employed to construct a class of actions, which includes several hydrodynamics and magnetohydrodynamics(MHD) models. The conditions under which the conservation of energy, linear and angular momentum hold are presented. The generalized formalism is used to develop a simple model with intrinsic angular momentum. In [2], the action principle for a specific 2D gyroviscous MHD model is developed, which is identical to a reduced version of Braginskii's fluid equations. The procedure explains the origin of the gyromap, used in deriving previous gyrofluid models. A systematic reduction procedure yields the Hamiltonian structure of this model through the noncanonical Poisson bracket. The construction procedure yields classes of Casimir invariants, which are then used to derive variational principles for equilibria with flow and gyroviscosity. It is shown that the model can be modified to obtain other reduced models in the literature.

[1] M. Lingam and P.J. Morrison, "The gyroviscous fluid" (in preparation)
[2] P. J. Morrison, M. Lingam and R. Acevedo, arXiv:1405.2326 (to appear in Physics of Plasmas)

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