

Abstract Submitted
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A general metriplectic framework and dissipative extended magnetohydrodynamics¹ BAPTISTE COQUINOT, Département de Physique, École Normale Supérieure, 24 rue Lhomond, 75005, Paris, P. J. MORRISON, Department of Physics and Institute for Fusion Studies, The University of Texas at Austin, Austin, Texas 78712-1060, USA — General equations for conservative yet dissipative (entropy producing) extended magnetohydrodynamics (XMHD) are derived from two-fluid theory. Keeping all terms generates unusual cross-effects, such as thermophoresis and a current viscosity that mixes with the usual velocity viscosity. While the Poisson bracket of the ideal version of this model have already been discovered, we determine its metriplectic counterpart that describes the dissipation. This is done using a new and general thermodynamic point of view for deriving dissipative brackets, a means of derivation that is natural for understanding and creating dissipative brackets. Finally the formalism is used to study dissipation in the Lagrangian variable picture where, in the context of XMHD, nonlocal dissipative brackets naturally emerge.²

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²For preprint see arXiv:1906.08313 [physics.flu-dyn].

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