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A general metriplectic framework: application to dissipative extended MHD[1] BAPTISTE COQUINOT, Ecole Normale Suprieure, PHILIP J. MORRISON, University of Texas at Austin — We discuss the metriplectic framework, a generalization of the Hamiltonian framework that includes dissipation [1]. Results and methods of this framework and applications to plasma physics will be given. 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. Starting from the known Poisson bracket for the ideal version of this model, 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. This new method is an important step for the metriplectic framework since it systematically generates the brackets of a large class of physical systems. Finally the formalism is used to study dissipation in the Lagrangian variable picture where, in the context of extended magnetohydrodynamics, nonlocal dissipative brackets naturally emerge.
[1] B. Coquinot P. J. Morrison, J. Plasma Phys. **86**, 835860302 (2020).

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