Common Hamiltonian and topological properties of extended MHD models[1] GEORGE MILOSHEVICH, IFS, UT Austin, MANASVI LINGAM, Princeton/Harvard, PHILIP MORRISON, IFS, UT Austin/IPP Garching — Extended MHD, a 1-fluid model endowed with 2-fluid effects (electron inertia and Hall drift) possesses a Hamiltonian structure [1-4]. This formulation is described, as it unifies different classes of extended MHD models (including those that have mutually exclusive effects) [2]. The unification is further highlighted by showing that these models possess common topological invariants that are the generalizations of the fluid/magnetic helicity [3]. They can be expressed naturally in a knot-theoretic framework via the Jones polynomial by exploiting techniques from Chern-Simons theory. It is also shown that extended MHD exhibits other commonalities such as: generalized Kelvin circulation theorems, and the existence of two Lie-dragged 2-forms closely connected with generalizations of the fluid vorticity.

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