

Abstract Submitted
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Ertel's vorticity theorem and new flux surfaces in multi-fluid plasmas¹ ELIE HAMEIRI, Courant Institute - NYU — Based on an extension to plasmas of Ertel's classical vorticity theorem in fluid dynamics, it is shown that for each species in a multi-fluid plasma there exists a set of nested surfaces that have this species' fluid particles confined within them. Variational formulations for the plasma evolution and its equilibrium states are developed, based on the new surfaces and all of the dynamical conservation laws associated with them. It is shown that in the general equilibrium case, the energy principle lacks a minimum and cannot be used as a stability criterion. A special limit of the variational principle yields single-fluid magnetohydrodynamic plasma equilibria and can be used to approximate the equilibrium state of a two-fluid plasma in a perturbative way.

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