

Abstract Submitted
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A Lagrangian perspective on the stability of ideal MHD equilibria with flow¹ YAO ZHOU, J.W. BURBY, HONG QIN, Princeton Plasma Phys Lab — We take a careful look at two approaches to deriving stability criteria for ideal MHD equilibria. One is based on a tedious analysis of the linearized equations of motion, while the other examines the second variation of the MHD Hamiltonian computed with proper variational constraints. For equilibria without flow, the two approaches are known to be fully consistent. However, for equilibria with flow, the stability criterion obtained from the constrained variation approach was claimed to be stronger than that derived using the linearized equations of motion. We show this claim is incorrect by deriving and comparing both criteria within the same framework. It turns out that the criterion obtained from the constrained variation approach has stricter requirements on the initial perturbations than the other. Such requirements naturally emerge in our new treatment of the constrained variation approach using the Euler-Poincaré structure of ideal MHD, which is more direct and simple than the previous derivation from the Poisson perspective.

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