On the stability of MHD equilibria with flow TOMMASO AN-
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Italy — Three kinds of energy principles arising from the Hamiltonian structure
of the (MHD) equations are used to determine sufficient stability conditions. The
Lagrangian energy principle of Ref.[1] is presented and the stability conditions for
symmetric and non-symmetric perturbations are introduced. Exploiting the non-
canonical Hamiltonian formulation of MHD [2] plasma flows are analyzed in terms
of Eulerian variables. An energy principle in Eulerian form is deduced for equilibria
with a geometric symmetry and sufficient conditions for stability are obtained by
expanding a functional F composed of the sum of the Eulerian energy plus Casimir
invariants to second order. Next, an energy principle based on dynamically accessi-
ble variations [3] that preserve the invariants of the system explicitly is considered.
Dynamically accessible variations do not rely on any symmetry and thus give gen-
eral criteria for stability. Finally, the conditions obtained from the three different
approaches are compared and implications about nonlinear stability are discussed.

[1] E.A. Frieman and M. Rotenberg, Rev. Mod. Phys., 32 898 (1960).
[2] P.J. Morrison and J.M. Greene, Phys. Rev. Lett., 45 790 (1980).
[3] P.J. Morrison, Rev. Mod. Phys., 70 467 (1998).

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