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A generalized energy principle for a magnetorotational instability model EMANUELE TASSI, Centre de Physique Théorique, Marseille, France, PHIL MORRISON, Institute for Fusion Studies, University of Texas at Austin, USA, NATALIA TRONKO, Centre for Fusion Space and Astrophysics, University of Warwick, UK — We study the equilibria of the Magnetorotational Instability system by using the noncanonical Hamiltonian approach [1], since it provides variational principles for equilibria that can be used to assess stability. We show that a reduced system of equations derived in [2] is an infinite-dimensional noncanonical Hamiltonian system. The noncanonical Poisson bracket is identified and shown to obey the Jacobi identity, and families of Casimir invariants are obtained. Explicit sufficient conditions for the energy stability of two classes of equilibria are identified by means of the Energy-Casimir method. Comparison between the stability conditions obtained in the two cases indicates that the presence of an equilibirum magnetic field along the direction of the ignorable coordinate does not introduce destabilizing effects. An analogy is found and physically interpreted between terms of the MRI perturbation energy and terms appearing in the energy principle stability analysis of CRMHD for tokamaks [3].

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