Abstract Submitted
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Proof of a necessary condition for stability in kinetic magnetohydrodynamics[1] J.J. RAMOS, Massachusetts Institute of Technology — The linear kinetic magnetohydrodynamic (KMHD) theory of Kruskal-Oberman and Rosenbluth-Rostoker does not have a self-adjointness property. As a result, the standard proofs that an instability follows if some trial perturbation makes the incremental potential energy negative, do not work in KMHD. So, the comparison theorem showing that the Kruskal-Oberman, Rosenbluth-Rostoker KMHD potential energy is less than the potential energy in the double-adiabatic theory of Chew-Goldberger-Low, by itself cannot be construed as a rigorous proof that stability in the double-adiabatic fluid theory is a necessary condition for stability in KMHD. This work derives rigorously a necessary condition for KMHD stability: it proves that, if an isotropic-pressure equilibrium is unstable in the double-adiabatic fluid theory, an explicit initial condition for the KMHD system can be devised which will grow in time without bound. Besides being rigorous, the present necessary condition for KMHD stability is tighter than the one associated with the classic comparison theorem, because it requires the equilibrium to be stable in the double-adiabatic theory including minimization with respect to the parallel component of the fluid displacement instead of just setting the parallel displacement equal to zero.

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