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Variational analysis of linear stability of flowing equilibria based on action-angle representation[1] MAKOTO HIROTA, Tohoku University, PHILIP J. MORRISON, The University of Texas at Austin, YUJI HATTORI, Tohoku University — Stabilizing/destabilizing effects of flows on plasma equilibria are generally difficult to understand systematically, because the energy principle (or the Rayleigh-Ritz variational method) is no longer applicable to flowing equilibria. To be precise, the energy principle gives only a sufficient condition for stability due to the presence of negative energy modes. It is therefore hard to prove instability of flowing plasmas analytically. In this work, we present an advanced variational approach which is formulated based on our recent knowledge about the action-angle variables for continuous spectra as well as discrete ones. We demonstrate that this approach gives a necessary and sufficient condition for Kelvin-Helmholtz instability of shear flow. The Vlasov-Poisson and MHD systems can be analyzed similarly while symmetries and certain conditions of equilibrium profiles need to be assumed.

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