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Analytical and numerical treatment of drift-tearing and resistive drift instabilities in plasma slab[1] V.V. MIRNOV, C.C. HEGNA, J.P. SAUPPE, C.R. SOVINEC, Univ of Wisconsin, Madison — We consider modification to linear resistive MHD instability theory in a slab due to two categories of non-MHD effects: (1) electron and ion diamagnetic flows caused by equilibrium pressure gradients and (2) electron and ion decoupling on short scales associated with kinetic Alfven and whistler waves. The relationship between the expected stabilizing response due to the effects (1) and the destabilizing contribution caused by the dispersive waves (2) is investigated. An analytic solution combining the effect of diamagnetic flows and the ion-sound gyroradius contribution is derived using a perturbative approach. Linear numerical simulations using the NIMROD code are performed with cold ions and hot electrons in plasma slab with a doubly periodic box bounded by two perfectly conducting walls. Configurations with magnetic shear are unstable to current-driven drift-tearing instability. A second linearly unstable resistive drift type mode with largely electrostatic perturbations is also observed in simulations. The resistive-drift mode is suppressed by magnetic shear in unbounded domains but can remain unstable in the simulations with finite slab thickness and perfectly conducting wall. Additionally, the growth rate is sensitive to the magnetic shear length. We analyze whether these modes can be unstable in cylindrical configurations with magnetic shear typical for reversed field pinches.

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