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Effect of parallel electron heat transport on drift and drift-tearing modes in RFP plasmas[1] V.V. MIRNOV, C.C. HEGNA, J.P. SAUPPE, C.R. SOVINEC, Univ of Wisconsin, Madison — Linear numerical simulations were performed for plasma slab with cold ions and hot electrons in a doubly periodic box bounded by two perfectly conducting walls. Within this model, configurations with magnetic shear are unstable to current-driven drift-tearing instability. Additionally, there is an unstable pressure-gradient driven mode that is largely electrostatic in nature, suggestive of a resistive-drift type instability. The simultaneous presence of linear drift-like and tearing instabilities was observed using both two fluid extended modeling with NIMROD and analytical methods. The primary motivation for these studies is to understand the electrostatic transport thought to be present in Madison Symmetric Torus RFP experiments. Our previous analytical studies were performed either in the limit of infinitively large parallel electron heat conduction or in the pure adiabatic regime with an isentropic equilibrium. We report now on a general model with arbitrary equilibrium and finite parallel thermal conduction. Drift mode stability is sensitive to the ratio of density and temperature gradient scales and the instability exists even for pure transverse perturbations. Preliminary analytical results confirm some reduction of the drift-tearing mode growth rate caused by finite electron thermal conduction, consistent with previous works. Results of NIMROD simulations for different regimes of the electron thermal conduction are reported as well.

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