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Two-fluid and gyroviscosity effects on pressure-driven instabilities FATIMA EBRAHIMI, University of New Hampshire, D.D. SCHNACK, B.E. CHAPMAN, K. CASPARY, University of Wisconsin - Madison — Pressure-driven instabilities in reversed field pinch associated with unfavorable magnetic curvature, which becomes important at high beta, could limit confinement. Recently, a record high plasma beta of 26% for the improved confinement MST has been achieved with no severe side effects. Here we examine in toroidal geometry the behavior of resistive interchange instability using the extended MHD code NIMROD. Equilibrium profiles from MSTFit are fitted and imported into the Grad-Shafranov solver NIMEQ. Two-fluid and MHD stability analysis of the high beta MST plasma is then performed using NIMROD at a Lundquist number of $S=10^6$. We perform computations for two sets of high beta MST equilibria. In the first equilibrium, the Mercier criterion parameter exceeds the ideal stability limit and in the second equilibrium the plasma is ideally stable. We find that when the ideal stability limit is violated, finite Larmor radius (FLR) effects (in the form of ion gyroviscosity and the Hall term in generalized Ohm's law) suppress the growth rate of localized resistive interchange modes, however they are not completely stabilized. Nonlinear two-fluid single helicity computations for pressure-driven modes are also presented. It will be shown that mean flows which are mainly concentrated in the outer half of the plasma volume due to the m=0 mode perturbation, are generated.

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