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Marginal stability analysis for the interchange mode in a constant transverse magnetic field[1] JUPITER BAGAIPO, PARVEZ GUZDAR, ADIL HASSAM, University of Maryland, College Park — The ideal interchange instability in a plasma immersed in a constant transverse field is studied near marginal stability. Reduced equations for a strong axial field are used to find the tradeoff between the deviation from marginality and residual convection. Nonlinear numerical simulations of this system in dissipative MHD showed a neighbouring equilibrium with weak convection. This has motivated calculations to find a method to predict $|\vec{B}_{\perp} - \vec{B}_{crit}|$, the deviation of the field from marginality, as a function of residual convective flux. Such a formulation would find application in assessing the B-field tolerances in stellarator coil design. We carry out an expansion in small perturbations in the field amplitude about marginality to find nonlinear analytic solutions. To lowest order, solving an eigenvalue equation yields the critical field for marginal stability, $\vec{B}_{crit}$. To third order, a time-evolution equation for the amplitude is found (for $kL \sim \mathcal{O}(\infty)$). We attempt to solve for the short and long wavelength evolution and compare the result to a numerical solution. Our results and method are compared with previous works by Beklemishev, Cowley, and Waelbroeck.

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