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Modeling RFPs from self-consistent steady states of a cylindrical pinch[1] URVASHI GUPTA, CARL SOVINEC, University of Wisconsin - Madison — Most computational modeling of RFP dynamics has focused on resistive diffusion without pressure evolution under the assumption that any pressure-driven effects are small. RFPs, however have bad curvature. Thus, even when Δ' is negative, pressure-gradients can drive both resistive tearing and interchange (Coppi et al, NF 1966). For self-consistent modeling with pressure evolution from an equilibrium pressure gradient, we initialize our model from steady state solutions of the complete set of resistive-MHD equations for a cylindrical pinch with a strong guide field. With no shear in the equilibrium, these 1D profiles form symmetric Ohmic steady states that are in classical particle-transport balance. Two approaches have been adopted for the steady state temperature equation - the first model has a uniform background temperature with no Ohmic source while the second includes an equilibrium temperature gradient with thermal conduction balancing Ohmic heating. 3D non-linear evolution from both these profiles is initially violently unstable to interchange. They develop shear and undergo current-gradient relaxation leading to a final saturated state that is tearing dominant like an RFP. Comparison of time-dependent results from the two profiles is expected to provide information on thermal effects in RFP relaxation.

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