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Multi-Scale Interaction of a Tearing Mode with Drift Wave Turbulence: A Minimal Self-Consistent Model CHRIS MCDEVITT, PAT DIAMOND, University of California at San Diego — A minimal self-consistent model of the multi-scale interaction of a tearing mode with drift wave turbulence is presented. For simplicity, we consider a tearing instability in a cylindrical plasma interacting with electrostatic drift waves. Wave kinetics and adiabatic theory are used to treat the feedback of tearing mode flows on the drift waves via shearing and radial advection. The stresses exerted by the self-consistently evolved drift wave population density on the tearing mode are calculated by mean field methods. The principal effect of the drift waves is to pump the resonant low-m mode via a negative viscosity, consistent with the classical notion of an inverse cascade in quasi-2D turbulence. We study, two types of low-m, resonant structures. The first is a localized, electrostatic vortex mode, the width of which is set by resistively dissipated magnetic field line bending, and whose growth rate is given by $\gamma = \left(|\nu_T|^{2/3} / \eta^{1/3} \right) (v_A q_y / L_s)^{2/3}$, where ν_T is the turbulent viscosity. The second is like a usual tearing mode, which matches the interior layer (with negative viscosity) to an MHD exterior, via Δ' . Outgoing wave boundary conditions are imposed in order to effect the match. The growth rate in the turbulent viscosity dominated regime is given by $\gamma = \left(\eta^{5/6} / |\nu_T|^{1/6} \right) (q_y v_A / L_s)^{1/3} \Delta'$.

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