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Visco-Resistive MHD Modeling Benchmark of Forced Magnetic Reconnection[1] M T BEIDLER, C C HEGNA, C R SOVINEC, J D CALLEN, University of Wisconsin, N M FERRARO, Princeton Plasma Physics Laboratory — The presence of externally-applied 3D magnetic fields can affect important phenomena in tokamaks, including mode locking, disruptions, and edge localized modes. External fields penetrate into the plasma and can lead to forced magnetic reconnection (FMR), and hence magnetic islands, on resonant surfaces if the local plasma rotation relative to the external field is slow. Preliminary visco-resistive MHD simulations of FMR in a slab geometry are consistent with theory [1]. Specifically, linear simulations exhibit proper scaling of the penetrated field with resistivity, viscosity, and flow, and nonlinear simulations exhibit a bifurcation from a flow-screened to a field-penetrated, magnetic island state as the external field is increased, due to the 3D electromagnetic force. These results will be compared to simulations of FMR in a circular cross-section, cylindrical geometry by way of a benchmark between the NIMROD and M3D-C1 extended-MHD codes. Because neither this geometry nor the MHD model has the physics of poloidal flow damping, the theory of [1] will be expanded to include poloidal flow effects. The resulting theory will be tested with linear and nonlinear simulations that vary the resistivity, viscosity, flow, and external field. [1] R. Fitzpatrick, Phys. Plasmas **5**, 3325 (1998)

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