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Stochastic Transport in Collisional High-beta Stellarator Equilibrium[1] T. A. BECHTEL, C. C. HEGNA, C. R. SOVINEC, University of Wisconsin - Madison — The nonlinear, extended MHD code NIMROD is employed to simulate self-consistent high beta stellarator physics in the collisional limit. Heat is transported both along and across magnetic fields by finite diffusion operators that are highly anisotropic. This work concentrates on interpreting the transport features of the resulting MHD equilibria through comparison with Rechester and Rosenbluth style transport models. The configuration under investigation is an l=2, M=10 torsatron with vacuum rotational transform near unity. Finite-beta plasmas are created using a volumetric heating source and temperature dependent resistivity. Nonlinear, extended MHD simulations are performed to generate steady state solutions. These 3D self-consistent equilibria show that the magnitude of finite parallel heat conduction has a dominant effect on the temperature profile in regions with stochastic magnetic fields. This conclusion is corroborated by the effective cross-field thermal conduction which is computed a posteriori. Preliminary analysis of this effective transport shows impressive agreement with non-self-consistent analytic models of stochastic field transport. Comparison with the linear MHD equilibrium code, HINT2, as well as more sophisticated transport models is ongoing.

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Torrin Bechtel
University of Wisconsin - Madison

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