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Extended Measurements of Current-Momentum Relaxation in the Madison Symmetric Torus[1] J.C. TRIANA, A.F. ALMAGRI, J.S. SARFF, J.P. SAUPPE, C.R. SOVINEC, University of Wisconsin - Madison — Direct measurements of the turbulent emf and stresses associated with tearing-induced fluctuations in MST reveal coupled current and momentum relaxation in the RFP. These forces were previously measured in the edge of MST plasmas ($\frac{r}{a} > 0.85$), showing that the Hall $\frac{1}{ne}\langle\tilde{\mathbf{j}}\times\tilde{\mathbf{b}}\rangle_{||}$ and MHD $\langle\tilde{\mathbf{v}}\times\tilde{\mathbf{b}}\rangle_{||}$ terms are both large but dominate Ohm's law at different radii. A robust deep-insertion probe has been developed to measure the radial profile of the Hall term to $\frac{r}{a} > 0.45$ in 200 kA plasmas. The modal composition of the emf/stress is inferred using pseudospectral (cross-correlation) analysis with the spectrum measured with a toroidal magnetic array at the plasma surface. Extended MHD simulations with parameters comparable to the experiment have been performed using NIMROD, revealing intricate behavior of the Hall dynamo profile across the plasma radius. The extended profile measurements using the deep-insertion probe allow more complete comparisons with computational predictions and provide constraints for future simulations. The DEBS (single fluid MHD) code is also used to compare results for different plasma models.

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