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Flow profile relaxation in two-fluid RFP modeling[1] C.R. SOVINEC, J.P. SAUPPE, University of Wisconsin-Madison, J.R. KING, Tech-X Corp. — Relaxation theories based on two-fluid modeling predict inherent coupling between changes in magnetic field and plasma flow profiles [1]. Rutherford scattering measurements of majority ion flow suggest that this effect may be realized during sawtooth relaxation events in MST [2], when flow parallel to the magnetic field increases in the core and decreases in the edge. To investigate FLR effects on RFP relaxation, we use the NIMROD code to evolve 3D fluctuations consistently with profile evolution. Our previous two-fluid computations with warm-ion effects show relaxation-induced changes in parallel flows that are directionally consistent with the experimental result with respect to the magnetic-field orientation [3]. However, MST is run with opposite magnetic helicity, which is relevant for dynamo. Here, we investigate the influence of background flow profiles, which are present in MST but not in our previous computations. Computational diagnostics of Hall dynamo, fluctuation-induced Reynolds stress, and gyroviscous forces are used to assess forces that affect the mean flow in the simulated results.

[1] For example, C. C. Hegna, PoP 5, 2257 (1998).
[2] A. Kuritsyn, et. al., PoP 16, 55903 (2009).
[3] J. R. King, BAPS 56, No. 16, JI2 4 and PoP submitted (2011).

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