Abstract Submitted
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Preliminary MHD Validation Studies on MST[1] C.M. JACOBSON, A.F. ALMAGRI, K.J. MCCOLLAM, J.A. REUSCH, J.P. SAUPPE, J.C. TRIANA, University of Wisconsin-Madison — Quantitative validation of visco-resistive MHD models using MST takes advantage of its well-diagnosed, standard RFP plasmas. These plasmas are largely governed by MHD relaxation activity, so that a broad range of validation metrics can be evaluated. Nonlinear simulations using the single-fluid MHD code DEBS at Lundquist number $S = 4 \times 10^6$ produced equilibrium relaxation cycles in qualitative agreement with experiment, but magnetic fluctuation amplitudes $\tilde{b}$ were at least twice as large as in experiment. The extended-MHD code NIMROD was used previously at $S = 8 \times 10^4$, which is below MST's operational lower limit of $S \geq 5 \times 10^5$. The predicted $\tilde{b}$ from NIMROD was about half as large for a two-fluid case as for a single-fluid, suggesting that a two-fluid model may be necessary for quantitative agreement with experiment. Comparisons of linear and nonlinear DEBS and NIMROD runs at low S are presented, focusing on how their different numerical algorithms affect their performance. Experimental equilibrium and fluctuation measurements at low S from an insertable magnetic probe are compared with simulation results. Future scaling studies of $\tilde{b}$ as a function of S are planned using NIMROD at low S complemented by DEBS at higher S.

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