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Extended MHD Simulations of Tearing Instabilities and the Dynamo Effect in the Reversed-Field Pinch K. GERMASCHEWSKI, J. DEARBORN, A. BHATTACHARJEE, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire — Observations on MST indicate the importance of the Hall current in sawtooth crashes and the dynamo effect in a RFP. We employ our Magnetic Reconnection Code (MRC) to perform fully 3D extended MHD simulations in the RFP, including the Hall current and electron pressure gradient in a generalized Ohm's law. The MRC is an MPI-parallelized finite-volume based simulation code that integrates the extended MHD equations. It supports arbitrary curvilinear coordinate mappings, allowing it to be adapted to cylindrical and toroidal geometries. In order to overcome restrictive time-step limits, it uses implicit time integration. We have benchmarked the code for linear tearing instabilities, and performed fully nonlinear simulations. Due to the presence of the Hall current, novel vortical flows are seen in the vicinity of rational surfaces, akin to those seen in recent sawtooth studies in tokamaks, when the peak of the current density separates from the stagnation point of the flow. We calculate the dynamo field by averaging, and compare simulations with observations.

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