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Nonlinear evolution of the Resistive Kink Mode and its Nonlinear Stabilization[1] KAI GERMASCHEWSKI, AMITAVA BHATTACHARJEE, University of New Hampshire — We use the Magnetic Reconnection Code (MRC) to study the nonlinear dynamics of $m = 1$ kink-tearing modes. The MRC a state-of-the art simulation code that implicitly integrates the system of extended MHD equations including a generalized Ohm's law in arbitrary curvilinear coordinates. We employ an inexact Newton method for the solution of the nonlinear implicit equations. The inner linear solve is handled by SuperLU, where the Jacobian matrix is symbolically derived and implemented by a code generator. We demonstrate that nonlinearly the Hall term creates spontaneously an X-point-like reconnection configuration, which enhances the reconnection rate nonlinearly, as does the electron pressure gradient. On the other hand, the electron pressure gradient is also responsible for imposing diamagnetic rotation and its stabilizing effect. We present high-resolution simulations in different regimes that show the impact of the various terms leading to either explosive behavior or nonlinear stabilization. In addition, we will also present first simulation results for the nonlinear evolution of m=1 tearing modes in a reverse field pinch configuration.

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