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Nonlinear evolution of $m = 1$ and higher m tearing modes in tokamaks in cylindrical and slab models STEPHEN ABBOTT, KAI GERMASCHEWSKI, University of New Hampshire — The m=1 tearing mode is widely believed to be responsible for sawtooth crashes in tokamaks and, more broadly, as a paradigm of fast reconnection in collisionless plasmas. In past research, we have shown that including the Hall current in a generalized Ohm's Law will in fact exhibit nonlinear explosive growth behavior, though the accelerated evolution competes with pressure-gradient introduced diamagnetic flows that can slow down or even suppress the instability. In this work, we quantify the impact of various parameters on the evolution of the $m = 1$ mode, particularly in terms of the following length scales: ion sound radius, dissipation layer width, and pressure gradient scale length. We also consider higher poloidal mode numbers and compare the cylindrical extended MHD fluid model to corresponding single and double tearing modes in slab geometry, employing both fluid and kinetic simulations using the Magnetic Reconnection Code (MRC) and Particle Simulation Code (PSC).

Stephen Abbott
University of New Hampshire

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