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Diamagnetic Effects on Asymmetric Reconnection: A Comparative PIC and Hall MHD Study[1] STEPHEN ABBOTT, KAI GERMASCHEWSKI, AMITAVA BHATTACHARJEE, CICART, University of New Hampshire — We present a comparative study of reconnection in a Harris current sheet with a guide field, modified by the addition of an equilibrium pressure gradient at the reconnection layer to introduce diamagnetic drifts, using Hall MHD and particle-in-cell (PIC) simulations. Previous kinetic studies of a similar configuration in magnetopause conditions showed significant decoupling of X-point and island drift speeds as the pressure gradient was suppressed across the growing island while steepening near the X-point, resulting in reduced reconnection rates. One goal of our comparative study is to investigate how much of the relevant kinetic physics is captured by two-fluid simulations, and differences that occur as the magnitude of the guide field is varied. We also extend the parameter space to stronger guide fields and higher β, relevant to fusion plasmas. Our Hall MHD simulations utilize the Magnetic Reconnection Code (MRC), which features a Generalized Ohm's Law including the Hall term and electron pressure gradient. It supports non-uniform grids and implicit time-stepping. PIC results are provided by the Particle Simulation Code (PSC). We focus on the nonlinear evolution of reconnection rates and the asymmetric structure of the X-point, and test the validity of recent expressions for the asymmetric reconnection rate recently proposed in the literature.

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