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Current sheet extension and reconnection scaling in collisionless, hyperresistive, Hall MHD[1] B.P. SULLIVAN, A. BHATTACHARJEE, Y.M. HUANG, Center for Integrated Computation and Analysis of Reconnection and Turbulence, UNH, Durham, NH — We present Sweet-Parker type scaling arguments in the context of collisionless, hyper-resistive, Hall magnetohyrdodynamics (MHD). The predicted steady state scalings are consistent with those found by Chacón et al. [PRL 99, 235001 (2007)], and Uzdensky, [PoP 16, 040702 (2009)], though our methods differ slightly. As with those studies, no prediction of electron dissipation region length is made. Numerical experiments confirm that both cusp like & extended geometries are realizable. Importantly, the length of the electron dissipation region (taken as a parameter by several recent studies) is found to depend on the level of hyper-resistivity. Although hyper-resistivity can produce modestly extended dissipation regions, the dissipation regions observed here are much shorter than those seen in many kinetic studies. The thickness of the dissipation region scales in a similar way as the length,so that the reconnection rate is not strongly sensitive to the level of hyperresistivity. The length of the electron dissipation region depends on electron inertia as well.The limitations of scaling theories that do not predict the length of the electron dissipation region are emphasized.

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