Abstract Submitted
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Scaling of Reconnection and Stability of Current Sheets in Large Systems[1] A. BHATTACHARJEE, H. YANG, N. BESSHO, X. QIAN, Center for Integrated Computation and Analysis of Reconnection and Turbulence, and Center for Magnetic Self-Organization, University of New Hampshire — The scaling of collisionless reconnection in two-dimensional large systems has been a subject of considerable interest recently. We have carried out a sequence of simulations using the same initial conditions for large systems using resistive MHD, Hall MHD and PIC techniques. It is shown that the dynamics of thin current sheets is sensitive to the mechanism that breaks field lines (spatially uniform resistivity, electron inertia, and/or electron pressure tensor), and that velocity shear along the thin current sheets plays an important role in controlling their geometry and stability. In the resistive MHD model, the long thin current sheet spanning Y-points become near-explosively unstable to secondary tearing, producing plasmoids. In Hall MHD, the nonlinear dynamics changes qualitatively, as the Y-points contract spontaneously to form X-points thwarting the secondary tearing instabilities seen in the resistive MHD study. A steady state is then realized due to a balance between the spatial gradients of the current density and the velocity shear. Collisionless PIC simulations show a very different dynamics, exhibiting the tendency to form extended thin current sheets and secondary tearing instabilities, as found by W. Daughton and coworkers [Phys. Plasmas **13**, 072101 (2006)].

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