Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Formation and Dynamics of Thin Current Sheets in the Geomagnetic Tail JOACHIM BIRN, M. HESSE, M. HOSHINO, J. HUBA, G. LAPENTA, P. PRITCHETT, K. SCHINDLER, L. YIN, Los Alamos National Laboratory — Satellite observations, theory, and computer simulations show that the formation of a thin current sheet, or the thinning of the magnetotail current sheet to less than the ion inertia length, is necessary to cause fast reconnection. We present MHD theory and simulations that demonstrate that external deformations of the magnetotail, imposed by the solar wind, can lead to the formation of a thin current sheet embedded in the near tail and the loss of MHD equilibrium. Using a variety of fluid and particle simulations, we further compare current sheet thinning and the onset of fast reconnection in response to deformations of a relatively thick current sheet. We find that PIC, hybrid, and Hall-MHD simulations lead to the same fast reconnection rates, apparently independent of the dissipation mechanism, as earlier simulations starting from a perturbed thin current sheet ("GEM challenge"). The similarity of the final states indicates that entropy conservation is satisfied similarly in fluid and kinetic approaches and that Joule dissipation plays only a minor role in the overall energy transfer.

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Date submitted: 27 Sep 2005 Electronic form version 1.4