Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Electron diffusion region phase space distribution for collisionless antiparallel reconnection[1] J. NG, J. EGEDAL, A. LE, MIT, PSFC, Camrbridge, MA, W. DAUGHTON, LANL, Los Alamos, NM — Observations in the Earth's magnetotail and kinetic simulations of magnetic reconnection have shown high electron pressure and temperature anisotropy in the inflow of the electron diffusion region. This anisotropy is accurately accounted for in a new fluid closure for collisionless reconnection [1]. By tracing electron orbits in the fields taken from particle-in-cell simulations [2], we study the details of the electron phase space distribution in the region where the fluid model breaks down. At enhanced velocity-space resolution, a highly structured distribution is observed, which causes the violation of the frozen in condition due to the off-diagonal terms of the pressure tensor. We find that while the shape of the distribution and thickness of the region depend on the reconnection electric field, the total current through this layer is determined solely by the inflow pressure anisotropy.

[1] A Le, et. al. Phys. Plasmas 17, 055703 (2010).
[2] W Daughton, et al., Phys. Plasmas 13, 072101 (2006).

[1]This works was supported by NSF CAREER Award 0844620.

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Date submitted: 26 Jul 2010 Electronic form version 1.4