Abstract Submitted
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Formal Derivation of Model for Electron Anisotropy in Expanding Flux Ropes and Collisionless Magnetic Reconnection[1] J. EGEDAL, A. LE, O. OHIA, F. DIAZ, MIT, W. DAUGHTON, LANL, V.S. LUKIN, NRL — Based on mainly heuristic arguments and an understanding of single electron motion within reconnection regions an approximate solution to the Vlasov equation was previously obtained [1]. This solution accounts for the anisotropy in the electron distribution that develops non-linearly due to trapping in magnetic wells and parallel electric fields, and it has been used as closure yielding general equation of state for the parallel and perpendicular electron pressures [2]. The model has been confirmed in kinetic simulations and through measurements by spacecraft in the Earth magnetotail [3]. It has also formed the basis for new fluid simulations that for the first time reproduces the detailed geometry of the reconnection region seen in kinetic simulations including elongated current sheets [4]. Here we report on a new rigorous derivation of the model using the drift kinetic equation, emphasizing its broad range of validity and application.

[1] J Egedal et al., J. Geophys. Res., 113, A12207 (2008).
[2] A Le et al., Phys. Rev. Lett., 102, 085001 (2009).
[3] J Egedal et al., J. Geophys. Res., 115, A03214 (2010).
[4] O Ohia et al., Phys. Rev. Lett (in press 2012).

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