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Unmagnetized Electron Jets in Reconnection with a Guide Field[1]

A. LE, J. EGEDAL, MIT, PSFC, W. DAUGHTON, LANL — Jets of super-Alfvenic outflowing electrons form in kinetic simulations of anti-parallel reconnection and have been observed in Earth's magnetosphere. A model describes how gradients in the electron pressure tensor, which obeys equations of state that have been verified using kinetic simulations of reconnection in both 2D and 3D, drive the jets. Following the model, the magnitude of the current depends on the upstream electron beta [1,2]. Here, to study the electron layer in the presence of a guide magnetic field, PIC simulation runs are carried out with a range of guide fields. With initial guide fields up to 15% of the upstream reconnecting field, collimated electron outflow jets are driven in the central region by the electron pressure anisotropy as in the model originally based on an anti-parallel geometry. The Hall currents, however, become asymmetric and expel the guide field from the region around the electron layer.

[1] Le A, Egedal J, Daughton W, Drake JF, Fox W, and Katz N, Geophys. Res. Lett. 37, L03106 (2010).

[2] Ng J, Egedal J, Le A, Daughton W, and Chen L-J, Phys. Rev. Lett. 106, 065002 (2011).

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