

New Insights into Dissipation in the Electron Layer During Magnetic Reconnection

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(Submitted on 31 Dec 2009)

Detailed comparisons are reported between laboratory observations of electron-scale dissipation layers near a reconnecting X-line and direct two-dimensional full-particle simulations. Many experimental features of the electron layers, such as insensitivity to the ion mass, are reproduced by the simulations; the layer thickness, however, is about 3-5 times larger than the predictions. Consequently, the leading candidate 2D mechanism based on collisionless electron nongyrotronic pressure is insufficient to explain the observed reconnection rates. These results suggest that, in addition to the residual collisions, 3D effects play an important role in electron-scale dissipation during fast reconnection.

Comments: 17 pages, 4 figures

Subjects: **Instrumentation and Methods for Astrophysics (astro-ph.IM)**;
Solar and Stellar Astrophysics (astro-ph.SR)

Journal reference: Geophys. Res. Lett. Vol. 35 (2008), L13106

Cite as: [arXiv:1001.0082v1](https://arxiv.org/abs/1001.0082v1) [astro-ph.IM]

Submission history

From: Hantao Ji [[view email](#)]

[v1] Thu, 31 Dec 2009 05:21:39 GMT (272kb,D)

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