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Theoretical Model for Electron Bulk Heating Resulting from Magnetic Reconnection ARI LE, LANL, JAN EGEDAL, University of Wisconsin–Madison, WILLIAM DAUGHTON, LANL — A new model predicts that the electron bulk heating resulting from collisionless magnetic reconnection scales directly with the upstream ratio of magnetic to electron pressure. The heating process involves two stages. First, the inflowing electrons are adiabatically trapped and heated by a parallel electric field [1]. Next, the electrons gain energy from the reconnection electric field as they undergo complex meandering motions in the electron diffusion region. Although these collisionless mechanisms lead to complex electron velocity distributions [2], a fluid treatment predicts the net electron heating and is in excellent quantitative agreement with both kinetic simulations and recent spacecraft observations [3].

[1] Egedal et al., Phys. Plasmas 20, 061201 (2013)
[2] Ng et al., Phys. Rev. Lett. 106, 065002 (2011)
[3] Phan et al., Geophys. Res. Lett. 40.17, 4475-4480 (2013)

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