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Microinstabilities and Electron Holes in Current Sheets[1] MARTIN V. GOLDMAN, DAVID L. NEWMAN, University of Colorado at Boulder, JAMES F. DRAKE, University of Maryland — Magnetic reconnection simulations (3D PIC) reveal electric field structures explained in terms of Buneman instabilities.[1] The waves driven by the current sheet trap the electrons forming electron phase space holes (localized bipolar $E_{\|}$). Under certain conditions the holes can provide the small-scale dissipation necessary for fast magnetic reconnection.[1] Current sheets inevitably exhibit shear near their edges. Using 2D Vlasov simulations and linear global theory, we address the role of shear (variation in $v_{\|}$ across B) on both the linear and nonlinear evolution of 2-D Buneman instabilities assuming conditions similar to those employed in the 3D reconnection simulations. The Vlasov simulations are initialized with strongly magnetized Maxwellian electrons drifting relative to unmagnetized ions. The 2D Vlasov simulation results (with and without shear) are compared with the 3D reconnection results. In the weakly sheared linear regime, Poisson's eqn becomes a Mathieu equation for the eigenpotentials, which compare well with simulation results. A small amount of shear can significantly alter nonlinear hole evolution.[2]

[1]Drake, et al., *Science*, 299, 873-877 (2003)
[2]Goldman, et al., COSPAR04-A- 02395; D3.5-0015-04, (2004).

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