Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

What Can We Learn About Electron Distributions From Measurements of Weak Bipolar Fields?* MARTIN V. GOLDMAN, DAVID L. NEWMAN, University of Colorado, ANDRÉ MANGENEY, Observatoire de Meudon, Paris, France — A given bipolar field that is stationary in a co-moving frame can correspond either to an ion soliton or an electron phase-space hole. In the limit of weak potential, ϕ, with $e\phi_{\max}/T_e \ll 1$, either of these structures can have the asymptotic shape $\phi = \phi_{\max}\mathrm{sech}^4(\mathrm{x}/\alpha)$. For ion solitons, the half width ($\propto \alpha$) depends on $\phi_{\max}$, whereas for electron holes the half-width is independent of $\phi_{\max}$. We show analytically for holes in this limit that $\phi_{\max}$ depends on the (finite) energy derivative of the trapped distribution at the separatrix, while α depends only on a "screening" integral over the untrapped distribution. Idealized trapped and passing electron distributions are shown to be *inferrable* from the speed, amplitude, and shape of weak bipolar waveform measurements. For measurements[1] of hundreds of weak bipolar field events in Earth's cusp, the theory is shown to be consistent with the most frequently observed *half-width* between bipolar field peaks, and with various other features of the measured[1] distribution of hole velocities vs hole half-widths.

* Work supported by NSF, NASA, and DOE, and submitted in part to *Phys. Rev. Lett.* as "Theory of Weak Bipolar Fields and Electron Holes with Space Applications," (2007).

[1] Franz, J.R., *et al.*, *J. Geophys. Res.* **110**, A09212, 2005.

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Date submitted: 29 Aug 2007

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