## Wave and Particle Characteristics of Earthward Electron Injections Associated with Dipolarization Fronts

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A comprehensive examination of particle and wave data from multiple THEMIS satellites has been made of an electron injection structure in the magnetotail as it propagated Earthward from  $-20 R_E$  to  $-11 R_E$ . The electron injection, which was closely associated with a dipolarization front and bursty bulk flows, occurred within a thin plasma boundary layer and had both perpendicular and parallel energization, with very little energy dispersion. The thin plasma boundary layer had a thickness comparable to the ion inertial length and displayed different plasma characteristics at different locations. Strong electromagnetic waves between the lower hybrid frequency and the electron gyrofrequency, and electrostatic waves up to the electron plasma frequency were observed within the thin plasma boundary layers. Near the electron injection region, nonlinear electrostatic structures such as electrostatic solitary waves and double layers were also observed. The observations show that non-ideal, non-linear and kinetic behavior is intrinsic to the electron injections with multi-scale coupling.