

Nonlinear Magnetosphere-Ionosphere Coupling in Near-Earth Space During an ICME-Driven Storm

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Localized potential electric field modification is identified in the Van Allen Probes data during magnetic storm times, when significant energetic plasma (above a keV) is injected into the inner magnetosphere. This modification is from the closure of field-aligned currents through the ionosphere in a region of low conductance just equatorward of the auroral oval. Observations from the Van Allen Probe instruments HOPE, EMFISIS, and EFW are presented for several magnetic storms, showing the relationship of the plasma pressure peak and the magnetic field distortion to the local electric field vector. An assessment of the intensity of the nonlinear feedback on the electric field is made by determining its deviation from the large-scale potential electric field, as observed by EFW outside of the pressure peak. The coupling that emerges is in agreement with numerical simulations of near-Earth space that predict strong perturbation of the local electric field near pressure peaks.