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Global observation of electric fields in Earth's inner magnetosphere

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Large scale electric fields play an important role in the dynamics of the plasmasphere, the storm-time ring current, and the plasma sheet access to the inner magnetosphere. Local in situ measurements of the electric field provide a detailed yet highly localized picture. Global field maps, often derived by mapping out ionospheric measurements and models, may at times only inadequately predict or completely miss important field structures. Global imaging of the inner magnetosphere can help overcome the sparseness of existing in situ measurements. It can also improve the acccuracy of global electric field maps provided by current models and data assimilation techniques. We are presenting E-field derivations from global imaging of the inner magnetosphere done by IMAGE, combined with in situ plasma measurements. We utilize observations of plasma from thermal energies (plasmasphere) up to a few keV (plasma sheet and ring current), discussing in particular two distinct sets of observations: (1) the sunward motion of the inner edge of the plasma sheet in response to periods of enhanced convection, and (2) the movement of the plasmasphere boundary. In both cases the energies of observed particle populations are low enough such that the plasma motion is controlled by electric rather than magnetic fields. We show that our observations are very sensitive to the global electric field and its changes, capturing the global plasma dynamics and thus revealing the underlying electric field structure.