BOSTON UNIVERSITY

SPACE PHYSICS SEMINAR

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Stormtime Plasma Redistribution: Geospace Processes and Effects

Thursday, February 7, 2013
725 Commonwealth Ave.
Refreshments at 3:30pm in CAS 500
Talk begins at 4:00pm in CAS 502

Abstract:

Storm-time thermal plasma redistribution provides an excellent example of the cross-discipline, system-level Geospace problems which are a focus of the recent CEDAR Strategic Plan. Plasma redistribution is a multistep, system-wide process involving the equatorial, low, mid, auroral, and polar latitude regions, and significant magnetosphere-ionosphere coupling and feedback. During geomagnetic storms the equilibrium of production and loss which maintains average ionospheric characteristics is greatly perturbed. High-latitude disturbance electrodynamics penetrates to the equator uplifting the dayside ionosphere and greatly enhancing total electron content (TEC). At mid latitudes, magnetospheric ring current enhancements generate strong poleward-directed subauroral polarization stream (SAPS) electric fields in the evening sector as field-aligned currents close through the low-conductivity ionosphere. These SAPS electric fields drive a broad flow channel which transports high-TEC ionospheric plasma poleward and noonward to the footprint of the cusp. At higher altitudes, the SAPS flow erodes the outer plasmasphere, creating the plasmaspheric drainage plumes which extend sunward to the dayside magnetopause. In the ionosphere, the greatly enhanced fluxes of cold plasma traverse the cusp and enter the polar cap forming the polar tongue of ionization and providing a rich source of heavy ions for the magnetospheric injection and acceleration mechanisms which populate the magnetotail and ultimately the stormtime ring current. This system-wide process leads to changes in the evolution of geospace storms and produces significant space weather effects.