Project Details

ROSES ID: NNH07ZDA001N
Selection Year: 2008
Program Element: Focused Science Topic

Topic: Focused science topics for Strategic Goal 3 (Near Earth Radiation): Toward combined models of acceleration, loss and transport of energetic electrons and protons in the magnetosphere

Project Title:
Empirical Model of Electrons and Ions at the Inner Edge of the Plasma Sheet

PI Name: Thomas Sotirelis
PI Email: tom.sotirelis@jhuapl.edu
Affiliation: JHU/APL
Project Member(s):
- Gjerloev, Jesper W; Co-I; Johns Hopkins University
- Angelopoulos, Vassilis ; Collaborator; IGPP/UCLA

Summary:
Currently, simulations of radiation belt formation and ring current dynamics have no reliable estimate of the seed populations at their outer boundary. We propose to construct the first empirical model of both electron and ion properties at the inner edge of the plasma sheet. The temperature, density and pressure will be observed at low altitude, and empirically fit as a function of solar wind/interplanetary magnetic field parameters, and auroral boundary indices. The behavior near the time of substorm onset will receive separate treatment. Simultaneous high and low-altitude observations will assess the uncertainty involved in estimating high-altitude properties from low-altitude observations. The resulting model will provide a crucial input to first principle models of radiation belt formation and ring current dynamics, by providing estimates of the particle populations at their outer boundary.

Model formulation will be guided by the results of several correlation studies, between plasma sheet properties, and solar wind/interplanetary magnetic field parameters and various indices. The model will be calculated by fitting analytical expressions for the temperature, density and pressure to the assembled observations, separately for individual local time bins. THEMIS observations will be used to estimate the high-altitude location of the plasma sheet s inner edge and to verify the expected correspondence between high and low altitude observations.

The following science questions will be addressed:

1) How are the properties of the inner edge of the plasma sheet impacted by solar wind driving?

2) What is the relationship between the high and low altitude extensions of the near-Earth plasma sheet.

Publication References:

no references