International Session (Oral) | Symbol P (Space and Planetary Sciences) | P-EM Solar-Terrestrial Sciences, Space Electromagnetism & Space Environment

[P-EM04_28PM2]New Perspectives on Earth's Inner Magnetosphere

Convener:*Danny Summers(Dept of Math and Stats,Memorial University of Newfoundland), Yusuke Ebihara(Research Institute for Sustainable Humanosphere, Kyoto University), Yoshizumi Miyoshi(Solar-Terrestrial Environement Laboratory, Nagoya University), Chair:Yoshizumi Miyoshi(Solar-Terrestrial Environement Laboratory, Nagoya University)

Mon. Apr 28, 2014 4:15 PM - 6:00 PM 311 (3F)

Earth's inner magnetosphere is a complex, dynamic plasma environment which includes the radiation belts, ion/electron ring current, plasmasphere, and ionosphere at auroral/sub-auroral latitudes. This session invites papers on all facets of inner magnetosphere research, including recent observations from space and ground, simulations, modeling and theory. Reports of particle, wave, and field data from the Van Allen Probes are particularly welcome, in addition to observations from other satellite missions such as THEMIS, POES, Cluster, and Akebono as well as ground-based facilities such as SuperDARN and magnetometers. Papers related to the planned JAXA mission ERG are also especially encouraged. The ERG satellite, with an expected launch in 2015-2016, will explore in particular how relativistic electrons are generated in the inner magnetosphere during disturbed geomagnetic conditions. Both science-related and instrument-related papers on ERG are solicited, including ground-based observations and simulations. Recent advances in the analysis of magnetospheric wave-particle interactions via particle simulations and nonlinear theory are also welcome.

5:45 PM - 6:00 PM

[PEM04-P01_PG]Retrieval of plasmaspheric He+ density field-aligned distributions from EUV imaging data

3-min talk in an oral session

*Kunihiro KEIKA[1], Pontus C. BRANDT[2], Anthony TOIGO[2], Demajistre ROBERT[2] (1.Solar-Terrestrial Environment Laboratory, Nagoya University, 2.The Johns Hopkins University Applied Physics Laboratory)

Keywords:Plasmasphere, Helium ion density, Inner magnetosphere, Plasma refilling, Forward modeling

We retrieve the spatial distributions of He+ density (n_{He+}) in the Earth' s plasmasphere from EUV imaging data, by using a forward modeling technique. We use a parametric model for the density distribution to simulate line-of-sight integrated He+ densities (i.e., EUV images), and then find parameters that give the best fit to real EUV images. The parametric model used in this study is described as a function of L and magnetic latitude (λ): $n_{He+} = n_0 (L_0/L)^{alpha\_L} \times (r_0/L_0 \cos\lambda^2)^{alpha\_f}$, where n_0 and L_0 are He^+ density and L value at the inner boundary of this model (i.e., the topside ionosphere), and α_L and α_f are parameters that represent L and field-aligned dependence of He^+ density, respectively. In this paper, we evaluated how well our forward model can retrieve the He^+ density spatial distribution, by performing the following analysis. (1) EUV emission intensities were simulated through the EUV camera response function, given a vantage point of the IMAGE satellite. (2) EUV images were simulated for a large number of (α_L, α_f) pairs: α_L was chosen from 4.0 to 6.0 with 0.1 increment, and α_f was from 0.0 to 2.0 with 0.1 increment. (3) The EUV image corresponding to the (α_L, α_f)=(5.0, 1.0) pair was chosen as our synthetic EUV image. After noise was added to the synthetic image, the forward modeling was applied to all simulated images made in (2). The reduced χ^2 (χ_r^2) was used to determine how well simulated image data fit to the synthetic image. The results of this analysis confirm that the He^+ density distributions can be retrieved with good certainty within |40 deg.| MLAT. However, beyond this magnetic latitude it is difficult to determine the L dependence or field-aligned dependence of plasmaspheric He^+ density. Next,

in order to decouple the synthetic data from the parametric formula, we will use density distributions provided by physics-based ionosphere/plasmasphere models as our synthetic data. We will also apply our forward simulation model to real EUV image data from the EUV imager onboard the IMAGE spacecraft.