THE INNER MAGNETOSPHERE EMPIRICAL PLASMA DENSITY MODEL BASED ON RADIO PLASMA IMAGER OBSERVATIONS

B. Reinisch(1), X. Huang(1), P. Song(1), P. Nsumei(1), J. Green(2), D. Gallagher (3)
(1) Environmental, Earth, and Atmospheric Sciences Department, Center for Atmospheric Research,
University of Massachusetts Lowell, MA 01854, Bodo_Reinisch@uml.edu, Fax +1-978-459-7915
(2) NASA Goddard Space Flight Center, Greenbelt, MD 20771, (3) NASA Marshal Space Flight Center, Huntsville, AL 35805

A new Inner Magnetosphere Empirical Plasma density distribution model (IMEP) is being developed using the radio plasma imager (RPI) measurements on the IMAGE satellite. RPI performs radio sounding in the magnetosphere using frequencies between 3 kHz and 3 MHz. IMAGE is on an elliptical polar orbit with an apogee altitude of 7.4 R_E, and a perigee of 1,400 km. The recorded plasmagrams show echo traces that are formed by signals propagating over distances of up to 7 R_E. In many instances these signals propagate along the magnetic field. A newly developed technique inverts the echo traces on the plasmagrams to electron density profiles along the field lines. By using consecutive profiles measured at varying L shells while IMAGE orbits through the plasmapause into the plasmasphere, it becomes possible to develop an empirical plasmasphere density model. Our results show a symmetric plasmasphere density distribution around the magnetic equator at equinox, while higher densities are contained in the winter hemisphere during solstice. When IMAGE is in the polar cap region, the vertical polar cap plasma density distribution is determined. Our results show the density varying with distance as R^{-5} in the polar cap, and to increase exponentially with magnetic activity. Once fully developed, IMEP could be considered a magnetospheric extension of the IRI model.