

EMPIRICAL ELECTRON DENSITY MODELS FOR THE INNER MAGNETOSPHERE

BODO REINISCH, Patrick Nsumei, Xueqin Huang, Jiannan Tu

University of Massachusetts, Lowell, MA, USA

The radio plasma imager (RPI) onboard NASA's IMAGE satellite measured the electron density distribution in the inner magnetosphere using remote sensing radio sounding techniques from 2000 to 2005. The echo traces in the plasmagrams of signals that propagated along magnetic field lines were inverted into electron density profiles along the field line. In contrast to previous in situ measurements, from which electron density profiles were composed statistically, the entire RPI profile is obtained from one plasmagram recorded in less than a minute. Empirical models of the electron density distribution in the plasmasphere and the polar cap region were developed from the ensemble of profiles describing the plasma distribution. The RPI Ne data show that the electron density distribution in the polar cap depends on the geocentric distance, geomagnetic activity, and solar illumination. Our analysis of polar cap Ne data shows that although an increase in geomagnetic activity leads to an enhanced Ne, the enhancement is found to be altitude dependent such that the enhancement in Ne is most pronounced at higher altitudes. On the other hand, the observations show a strong solar illumination control of Ne at lower altitudes. RPI Ne data show that in the polar cap at geocentric distance of about 2 RE, the average Ne is larger on the sunlit side than on the dark side by a factor of 3 – 4 both for quiet and disturbed conditions. At ~ 2.5 RE the effects of these two factors on Ne are comparable. In the plasmasphere the data coverage is not very extensive but it is sufficient to describe the latitudinal variations. A hemispheric asymmetry was observed with higher densities in the winter hemisphere during solstices. Attempts have been made to connect the plasmasphere models to the topside ionospheric models derived from ISIS topside sounder data using Vary-Chap representations.

Plasmasphere density profiles, Polar cap density profiles, radio sounding

Bodo Reinisch, University of Massachusetts, Center for Atmospheric Research, 600 Suffolk St., Lowell MA 01854, 978-934-4903, Bodo_Reinisch@uml.edu