During geomagnetic storms statistical analysis of field-aligned distribution of plasma density in the plasmasphere

Takahiro Ikeda[1]; Yukitoshi Nishimura[2]; Takayuki Ono[3]; Masahide Iizima[4]; Atsushi Kumamoto[5]

[1] Dept. Geophys, Tohoku Univ.; [2] Dept. Geophys, Tohoku Univ.
; [3] Department of Astronomy and Geophysics, Tohoku Univ.; [4] Geophysical Inst., Tohoku Univ.; [5] Tohoku Univ.

http://stpp1.geophys.tohoku.ac.jp

The statistical analysis of field-aligned distribution of plasma density in the inner plasmasphere has been performed by using huge amount of the Akebono plasma wave data from 1989 to 1998. For statistical analysis, we made an average of plasma density structure with spatial resolutions of 500 km along field line within the L-shell range of L=1-3.

During geomagnetically quiet periods, the plasma density distribution in the noon sector (MLT is from 9 to 16) agree with the diffusive equilibrium model above 4,000 km along field line, but they are not consistent below 4,000 km for every L-shells. When L is large, this difference is also large. On the other hand, the midnight (MLT is from 22 to 4) plasma density distribution agree with the diffusive equilibrium model, and both densities are nearly identical above 4,000 km.

During geomagnetic storms, plasma density decreases to 500/cc above the altitude range of 4,000 km, but doesn't change below 4,000 km. The variation of density data is large near the equator region, the distribution of minimum density agrees with the exospheric equilibrium theory which is another density distribution model. The present results possibly means that most of the measured density distribution is interpreted as a transition state of plasmaspheric refilling period; plasma flows out from ionosphere with a super sonic speed.

Based on the present study, it will become possible to obtain more accurate empirical plasmasphere model, to understand the structure and dynamics of the cold plasma in the inner magnetosphere.