磁気嵐時におけるプラズマシート電子地球側境界に関する研究

大木 研人 [1]; 熊本 篤志 [2]; 加藤 雄人 [3]
[1] 東北大・理・地球物理; [2] 東北大・理・地球物理; [3] 東北大・理・地球物理

Study of the plasma sheet electron inner boundary during the magnetic storm

Kento Ohki[1]; Atsushi Kumamoto[2]; Yuto Katoh[3]
[1] Dept. Geophys., Grad. Sch. Sci., Tohoku Univ.
; [2] Dept. Geophys, Tohoku Univ.; [3] Dept. Geophys., Grad. Sch. Sci., Tohoku Univ.

The locations of the inner boundary of the plasma sheet electrons during magnetic storm have been analyzed by using the dataset from Time History of Events and Macroscale Interactions during Substorms (THEMIS) satellites. The dependence of the location of the inner boundary of the plasma sheet electrons on geomagnetic indices such as Kp and AE was investigated in several previous studies [Korth et al., 1999; Jiang et al., 2011]. As for the convection electric, a simple model such as Volland-Stern model [Volland, 1973; Stern, 1975]is suggested.

In this study, we investigated the locations of the inner boundary of the plasma sheet electrons by using the electron flux data of 9 keV obtained by Electrostatic Analyzer (ESA) onboard the THEMIS satellites during the magnetic storms and compared these with the open/close boundary of the drift path of the electrons with Volland-Stern convection electric field model [Volland, 1973; Stern, 1975] using the test particle simulation to suggest the new electric field model during the magnetic storm.

From the analysis of the inner edge observed by THEMIS-A during the magnetic storm on June 17, 2012 (Case 1) and observed by THEMIS-A during the magnetic storm on October 1, 2012 (Case 2) around 21:00 MLT, we found that the observed inner edgewas located nearer to the Earth than that expected based on Volland-Stern electric field due to some additional electric field. The geocentric distance of open/close boundary, Rmodel, is estimated to be 5.46 in Case 1, and 6.41 in Case 2. In Case 1, the geocentric distance of the inner edge in the magnetic equatorial plane, Robs, is 4.01, which is far less than Rmodel = 5.46, while in Case 2 Robs is 6.10, which is as large as Robs = 6.41.

Also from another analysis of the inner edgeobserved by THEMIS-E during the magnetic storm on June 17, 2012 (Case 3) and observed by THEMIS-D during the magnetic storm on July 9, 2012 (Case 4) around 20:00 MLT, similar results are obtained: Robs = 4.30 and Rmodel = 5.50 in Case 3, while Robs = 6.00 and Rmodel = 6.18 in Case 4. These results suggest that in the sector from 18:00 to 24:00 MLT, some electric field appears in addition to large-scale magnetospheric convection electric field around 4 RE and within 6 RE.

In the future, it will be necessary to suggest the electric field model including the additional electric field during the magnetic storm.