

Relation between the ring current energy and the SYM-H index

Masahito Nose[1]; Shinichi Ohtani[2]; Pontus Brandt[2]; Toshihiko Iyemori[3]; Kunihiro Keika[4]; Dae-Young Lee[5]; Edmond C. Roelof[2]; Donald G. Mitchell[2]

[1] DACGSM, Kyoto Univ.; [2] JHU/APL; [3] WDC for Geomag., Kyoto Univ.; [4] IWF/OeAW; [5] Chungbuk National Univ.

Using data from the high-energy neutral atom (HENA) imager onboard the IMAGE satellite, we examined relation between ring current energy and the SYM-H index during the storm main phase. The energy range of the energetic neutral atom (ENA) flux data used here is 16-120 keV for hydrogen and 180 keV and lower for oxygen. From the period of 2000 to 2002, we selected 24 time intervals of the storm main phase during which the IMAGE satellite was located at a geocentric distance larger than $6 R_E$ and a geomagnetic latitude higher than 45 degree. According to the Dessler-Parker-Sckopke (DPS) equation, it is expected that the ring current energy increases as the SYM-H index decreases. However, from analysis of the 24 individual intervals, we found only 10 intervals in which the ENA flux was negatively-correlated with the SYM-H index (negative correlation event); that is, variations of the ENA flux and the SYM-H index are consistent with the DPS equation. There were 10 events having no clear correlation between the ENA flux and the SYM-H index, and 4 events which contradict the DPS equation (positive correlation event). GOES magnetic field data showed that the magnetic field line was more stretched for the positive correlation event than the negative correlation event. When the ENA flux is plotted as a function of the SYM-H index, we found that there seem to be a smooth upper envelope but no such smooth lines for the lower limit. We will discuss what mechanisms caused the above observational results.