Dipolarization in the deep inner magnetosphere and selective acceleration of O^+ ions

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Magnetic field dipolarization is a distinct phenomenon observed in the magnetosphere at substorm onset. According to previous studies, magnetic field dipolarization can be mostly seen at the geosynchronous altitude or farther down the tail (i.e., radial distance of $>$=6.6 R_E). However, a recent study employing the MDS-1 satellite revealed that when the satellite was positioned close to the auroral breakup meridian, the occurrence probability of dipolarization was about 50% just inside the geosynchronous altitude. Even if the satellite moved farther inside at L=3.5-5.0, the occurrence probability is still as high as ~16%. This result suggests that magnetic field dipolarization in the deep inner magnetosphere is not an uncommon phenomenon. It was also found from the IMAGE satellite data that after dipolarization in the inner magnetosphere, the oxygen flux on the nightside was more greatly enhanced than the hydrogen flux, resulting in the O^+-rich ring current formation.

In this study, we study dipolarization events in the deep inner magnetosphere, using the MDS-1 and AMPTE/CCE satellites. We find that the dipolarization is accompanied by the magnetic field fluctuations that have a period range between the local gyroperiods of He^+ and O^+. When the fluctuations appear, the O^+ flux is enhanced in the energy range of $<$10 keV. We will discuss a possibility that O^+ ions are locally and nonadiabatically accelerated by the fluctuations associated with the dipolarization in the inner magnetosphere.