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# Decay of the storm-time ring current

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Southward component of the interplanetary magnetic field results in an enhancement of the magnetospheric convection electric field. Long-lasting enhancement of the convection conveys hot plasma from the near-earth magnetotail into the inner magnetosphere, resulting in an accumulation of the hot plasma and an enhancement of the plasma pressure. Then, the ring current flows in azimuth. The ring current induces a world-wide disturbance of the geomagnetic fields, so that the ring current is regarded as a symbol of magnetic storms. The ring current also inflates the inner magnetosphere, and modifies the convection electric field. The increase in the ring current is understood to the enhancement of the magnetospheric convection, whereas the decrease in the ring current is under debate. The ring current consists of ions with energy ranging between ~1 keV and ~a few 100s keV. Previously, seven loss processes of the ions have been thought. The fates of the ions are (1) neutral atoms due to charge exchange, and (2) precipitation into the ionosphere. The purpose of this study is to evaluate the loss rates, and investigate quantitatively the decay of the ring current. In the simulation, the loss rate due to the charge exchange was evaluated by assuming the cross section of the charge exchange and neutral hydrogen density. The loss rate due to the precipitation was evaluated by assuming that the ions are scattered by a field line curvature. In the observation, the loss rate due to the charge exchange was evaluated by integrating energetic neutral atoms emitted from the ring current. The energetic neutral atoms were observed by the IMAGE satellite. The loss rate due to the precipitation was evaluated by integrating the energy flux of precipitating protons that were derived from multi-wavelength auroral imaging by the IMAGE satellite. We will show the simulation and observation results, and discuss the decay of the ring current.

Keywords: Magnetic storms, Inner magnetosphere, Simulation, Satellite observation, Ring current, Proton aurora