Efficiency of ion acceleration in near-Earth plasma sheet during substorm

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Rapid enhancements of energetic ions during a substorm are one of the unsolved issues in the inner magnetospheric research. Previously, two distinct processes have been suggested to explain the enhancements. The first one is transport from the near-earth plasma sheet, and the other one is local acceleration. To test the latter process, we traced oxygen ions under the electric and magnetic fields that are self-consistently obtained by the global MHD simulation developed by Tanaka et al. (2010, JGR). We focus on efficiency of acceleration of oxygen ions in the near-Earth plasma sheet. Forward test particle simulation reveals the fact that ions are efficiently accelerated more than 200 keV in 10 minutes under two IMF conditions (positive and negative IMF By) when we launched the ions at 8.5Re to dawn. The ion gains kinetic energy as high as 192 keV and 201 keV under positive By and negative By, respectively. The ions gain more energy under negative IMF By than under positive IMF By. We will discuss the overall efficiency of ion acceleration in terms of phase space density of ions by using backward test particle simulation as well as its dependence on IMF and mass for quantitative understanding of substorm-time behavior of ions in the inner magnetosphere.