Storm-time convection in the plasma sheet: particle transport during substorm and non-substorm intervals

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It is generally accepted that, during magnetic storm, particles are injected from the nightside plasma sheet into the inner magnetosphere, forming the enhanced ring current. Recent modeling studies have shown that particle injection driven by substorm does not contribute much to the net content of the ring current, and instead, enhanced convection directly driven by the solar wind-magnetosphere coupling play a predominant role in controlling the overall variation of the ring current intensity. However, our previous study revealed that convection electric field in the storm-time plasma sheet still stays at a small level and that the regime of earthward particle transport is governed by two modes of electric field, that is, substorm-associated, short-lived inductive electric fields with large fluctuations and a relatively steady, weak duskward electric field prevailing for the rest of time interval. We conduct a statistical study on these electric fields to estimate the amount of earthward particle transport caused by them utilizing plasma and field data obtained by the Geotail spacecraft. These results are classified by the phase of magnetic storm as well as the solar wind-IMF parameters. On the basis of these results, we discuss how these two electric fields contribute mutually to the particle injection into the ring current region.