

PEM027-P08

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Reproducing substorm-related changes of the near-Earth magnetotail field structure in a global MHD simulation

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We reproduce the magnetospheric reconfiguration under a southward and duskward interplanetary magnetic field (IMF) condition by a numerical magnetohydrodynamics (MHD) simulation.

To investigate the relative displacements of the geomagnetic conjugate points, we trace both footprints of the geomagnetic field lines during the magnetospheric reconfiguration under positive and negative IMF By conditions. Several substorm-like features, namely the formation of a near Earth neutral line, fast Earthward flows and tailward release of the plasmoid, occur about 1 hour after southward turning of the IMF. The field line traced from the near-Earth magnetotail was strongly distorted toward dusk (dawn) in the north and toward dawn (dusk) in the south after the substorm onset under the positive (negative) IMF By conditions. The maximum relative displacement in the longitudinal direction of both footprints is 4.5 (5.5) hours in magnetic local time for the positive (negative) IMF By case.

While observational studies have indicated that the IMF orientation is the main controlling factor of the relative displacement of the conjugate points, this simulation study with constant IMF orientation shows that the substorm-related magnetic field variations and the field aligned currents (FACs) are likely to play a major role.

Keywords: aurora, substorm