Geophysical Research Abstracts, Vol. 7, 10506, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10506

Particle entry into inner magnetosphere through sash groove as simulated by global three-dimensional electromagnetic particle code with duskward IMF B_{y}

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In a global three-dimensional particle simulation for the magnetoshphere, after a quasi-state is established with an un-magnetized solar wind, we gradually switched on a north-ward interplanetary magnetic field (IMF), which causes a magnetic reconnection in the tail-ward magnetopause in the day-side cusp. In this case that the north-ward IMF is rotated gradually toward dusk-ward, we have investigated the formation and dynamics of magnetospheric “Sashes", a band of weak magnetic field from magnetopause to near magneto-tail that are reported in some satellite observations and global 3D MHD simulations. As the dusk-ward IMF reaches the earth magnetosphere, our present results show the formation of a magnetic groove structures (located on each side on north and south quadrant) at the day-side magnetopause, that causes particles entry into the deep region of the magnetosphere via field lines that go near the magnetopause. The locations of these “Sashes" gradually rotate in the plane near the Earth, and gradually join onto the plasma sheet and the current sheet to form a geometrical feature, called the “Cross-Tail S", which is already observed in previous global 3D MHD simulations. Moreover, in contrast with the global 3D MHD simulations, kinetic characteristics of “Cross-Tail S" are self-consistently analyzed and these new simulation results provide new and more detailed insights on “Cross-Tail S". Furthermore, particle entry events from the magnetosheath to the inner magnetosphere and plasma sheet contribute at later stages to the sub-storm triggering are shown.