Magnetospsheric Phenomena for the Dipole Tilt Including IMF By and Bz Components

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Magnetospheric dynamics is dominantly controlled by magnetic reconnection between the geomagnetic field and the interplanetary magnetic field (IMF). The dayside magnetic reconnection in the magnetospehre has been often explained due to two different models, antiparallel merging and subsolar merging (component merging) models. However, it was not clearly understood which is more dominantly occurring at the dayside magnetopause. It is expected that the difference of the two models becomes more remarkable by including the dipole tilt and IMF By component.

Observations of FTEs at the dayside magnetopause are usually explained by subsolar merging (component merging), on the other hand observation of ionospheric convection are often explained by antiparallel merging. It has not been clearly concluded from the observations which more dominantly occurring at the dayside magnetopause. However, many global MHD simulations have showed that antiparallel merging occurs more dominantly. There is not always clear evidence which is dominant from observations. The SuperDARN observation has demonstrated that there is some difference in the polar cap phenomenon. In the summer polar region the convection throat is narrower, on the other hand that is wider in the winter polar region. The feature can demonstrate which type of reconnection is occurring more dominantly at the dayside magnetopause.

We have studied such a phenomenon by using a high resolution and time-dependent three-dimensional global magnetohydrodynamic (MHD) simulation of interaction between the solar wind and the earth's magnetosphere when the dipole tilt, By component and Bz component of the IMF are included in the whole volume of simulation box. As the results of simulation, reconnection sites separate into northern dawn and southern dusk (or northern dusk and southern dawn) by IMF By component, and they shift sunward in summer hemisphere and tailward in winter hemisphere. Also, we have shown the simulation results for the polar cap potential and convection pattern to compare with the SuperDARN observation.