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The field aligned current generated by upflow ions in the near earth magnetotail

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We know that the upflow ions originally from the night-side auroral oval entered the plasma sheet along the open-close field lines. This upflow ions have important effect on the dynamic process of the magnetotail. Both 3-dimensional resistive MHD and Hall MHD simulations are carried out to study the effect of the upward ions flow during quiet timesąčOur simulation results showed that the upflow mainly effect the near-earth dynamic process of the magnetotail, especially the generation of the filed-aligned current(FAC). The FAC generated by upflow presents multi-layer structures from low to high-latitude and anti-symmetry between the dusk-dawn sides. the current strenth of the FAC depends not only on the up-flowing ions energy flux transfer into the plasma sheet, but also on the velocity of the up-ions flow.

Compared the resistive MHD and Hall MHD simulation results, we found that By and FAC have the same evolutive process and distribution during the simulation, which means that By have important role in near-earth dynamic process. In addition, Hall terms have important effect on the dynamic process in the magnetotail too.

The simulation results proved us that upflow ions have important effect in coupling process of the magnetosphere and the ionosphere. During the late growth phase, if there formed the thin current sheet in the magnetotail by the convection electric field, the up-ions flow could trigger the onset process.