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Topologies of the Distant Tail under Various Northward IMF conditions

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The topologies of distant tail under various northward interplanetary magnetic field (IMF) conditions are investigated by a 3D simulation model of the magnetosphere. When the solar wind has a low dynamic pressure and the IMF has a relative large magnitude, the distant tail is significantly flattened along the direction of the IMF clock angle due to the anisotropic pressure of the IMF, and the current sheet follows the same direction (probably larger than the IMF clock angle).

When IMF has northward component, magnetic reconnection between the IMF and the terrestrial field may occur on the tail magnetopause [1], and the fluxes of tail field continue to decrease. Due northward IMF and asymmetric reconnections about the two lobes are not necessary for the shrinking of the magnetotail, which is different from former result [2]. For the IMF with a relative large Bz component (simultaneously has comparative By and Bx components) and the solar wind with a relative low dynamic pressure, the open field lines of the tail lobes may totally disappear in 2-3 hours, and a closed magnetosphere with a tail shorter than $100R_E$ may be reached. The closed magnetotail has a fishtail topology, and the end is blunt and deep-flattened. The cross section behind the closed magnetotail shows a very elongated and flattened shape, magnetic field like the IMF, and without current sheet or plasma sheet; these characters may be defined by observations as the signatures to a closed magnetotail.

Keywords: magnetotail; MHD simulation; magnetic reconnection; northward IMF.

References

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