

Characteristics and origin of structured current sheet in the magnetotail

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Recent multi-point THEMIS observations have evidenced that the current sheet in the tail plasma sheet exhibits various structures and evolutions such as weakening of the magnetic field magnitude at the magnetic equator, a local magnetic field minimum in the near-Earth tail region, and bifurcated current sheet. These appear during a growth phase of substorms and may play an important role in the substorm dynamics, magnetic reconnection, etc. In the present study, we have examined the origins of these structures by comparing the details of the THEMIS observations and the 3D global MHD model. The structured current sheets stated above have been reproduced in the model, while it is found that the formation processes and origin are not always the same as observations. Namely, weakening of the magnetic field magnitude at the magnetic equator is associated with the current sheet thinning, but it was much less effective for the modeled current sheet to compare with the observed thinning. On the other hand, the origin of the bifurcated current sheet may be due to the stretched configuration of the plasma sheet for both observations and the models. These findings enable us to assess the extent and applicability of the present MHD models for simulating the current sheet formation in the magnetotail.

Keywords: substorm, global MHD simulation, plasma sheet, current sheet, bifurcated current sheet, weak magnetic field