On the Hall term of the generalized Ohm's law in the distant tail

Yasuhiro Takei[1], Toshifumi Mukai[1], Yoshifumi Saito[1], Hajime Hayakawa[1], Koichiro Tsuruda[1]

[1] ISAS

Frozen-in theory generally holds in the magnetosphere. Thus the electric field equals the ion convection electric field in the magnetosphere. We have found, however, the existence of the events with large differences between the double-probe electric fields and the ion convection electric fields in the distant magnetotail. We have analyzed the electric field to evaluate the generalized Ohm's law by using the magnetic data and the electric field data and the ion and electron moments obtained by GEOTAIL. As the result, we have found that the differences between double-probe electric fields and ion convection electric fields are generated by the Hall term near the reconnection site.

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We have the correction formula of the double-probe electric field obtained by comparison with the ion bulk velocities in the previous study. The empirical formula is only adapted in the y component of the double-probe electric field. So we evaluate the y component of the generalized Ohm's law in the spacecraft coordinate.

We use the magnetic field data obtained by MGF, the electric field data obtained by ED and the ion and electron moments data obtained by LEP. Data selection criteria are noted here: (1) From September 1993 to October 1994. (2) In the distant magnetotail(Xgsm<-50Re) (3) 0.01<Ni<2 [/cc] (4) Ti>50 [eV] (5) 0.9<Ni/Ne<1.1.

As the result, we have found that:

(1) In the distant tail the ion frozen-in condition holds.

(2) But in some events the electric fields with large differences against the ion convection electric fields are observed. Then in many cases the Hall term of the generalized Ohm's law exists.

(3) The Hall term is observed: Geomagnetically active; Xgsm>-100Re; Near the boundary of the plasma sheet.

These results suggest that the Hall term is generated by the Hall current system near the reconnection site.