

Characteristic of the dayside and nightside reconnection region in the Earth's magnetosphere

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We have investigated the magnetic reconnection at the dayside of the magnetosphere ($X=0\sim 20$ Re) and at the nightside ($X=-30\sim -10$ Re) by using Geotail observations. Especially, we concentrate on the dayside magnetic reconnection event that has not been intensively studied compared to the nightside reconnection. In the case of nightside reconnection, the lobe plasma conditions in the northern and southern lobes are generally the same. Therefore, it is expected that the symmetric reconnection will occur. On the other hand, in the case of dayside reconnection, the reconnection mixes different plasmas (magnetosphere and solar wind plasmas). Thus, the asymmetric reconnection will occur in the dayside of the magnetosphere. We chose the reconnection events investigating the occurrence of simultaneous flow and magnetic field reversals by using the Geotail data. Then, we studied the energy exchange between plasma and electric field. The quadrupole structure produced by the Hall effect near the magnetic neutral line by using the magnetic field data is also studied. We analyzed 36 nightside reconnection events. In 13 events, we found that the velocity distribution function of ions shows two-component signature (cold inflow and hot outflow), which is the typical feature observed in the magnetic reconnection region. In addition, we identified 12 ion heating events near the neutral line. In the same way, we analyzed 26 dayside reconnection events. We could not find two-component and heating signatures of ions near the neutral line. The quadrupole magnetic field structure (B_y , GSM) due to the Hall effect also shows different characteristics between the dayside and nightside reconnection. In the case of dayside reconnection event, only 10 events out of 26 events show the quadrupole signature, and the others had different characteristics from quadrupole. Based on these results, we will discuss the difference between symmetric reconnection and asymmetric reconnection.

Keywords: magnetic reconnection, Hall effect, asymmetry, Geotail spacecraft