Statistical properties of dipolarization propagation: Cluster and Double Star observations

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During the magnetospheric disturbances, the magnetic field topologies in the magnetotail often change drastically, so called dipolarization. The dipolarization seems to be caused by the disruption of currents near-Earth tail or by the bursty bulk flows (BBFs) passages in the mid-tail. However, the relations between two are still controversial.

Cluster (apogee at X~-19Re) and Double Star TC1 (apogee at X~-12Re) observe periodically the near-to-mid tail regions at the same time. We statistically investigate the relation of dipolarizations in two different points. The dipolarization events are selected from the TC1 observation during 4 months in 2005 summer and compared with the field topology changes at Cluster. Since the corresponding Cluster observations produce propagation vector by 4 spacecraft timing analysis, the useful information are gained using two basic assumptions of the propagating objects, i.e., (1) concentric circle propagation and (2) localized planar structure propagation. Each of assumptions seems to suit to the current disruption-associated and the BBF-associated dipolarization, respectively. Using the gained information, e.g. (1) the center position and start time of the propagation or (2) the minimum size of plain structure and acceleration/deceleration of propagation, we assess the availability of each assumption and discuss the extent and distribution of the dipolarization.