Studying the property of the magnetotail current sheet by new multipoint techniques

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Two new multi-point techniques, which have been developed to study the structure and motion properties of the boundary structures, are reviewed. One new method [Shi et al, GRL, 2005GL022454] analyzes the dimensional character of observed structures using multi-point magnetic field measurements of four or more spacecraft. A second new multi-point magnetic field method [Shi et al, GRL, 2005GL025073] calculates the velocity vector of observed quasi-stationary structures, at every moment. Applying these two methods to the Cluster data, we studied the structure and motion of the magnetotail current sheet. We find not only 1-D but also 2-D structures in the tail current sheet. The maximum variation direction of the magnetic field can be near the z, y as well as x axis, indicating the twist nature of the current sheet. The same thing happened to the motion direction. Initial statistical study revealed that the occurrence of 1-D and 2-D structures is related to the substorm activities. So is the motion of these structures. Because these two new methods can provide instantaneous values on the structure and motion of the boundaries, these results give us some new details on the tail current sheet.