

Future magnetospheric missions: strategies for ultimate understanding of the magnetosphere

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Survey of the equatorial magnetotail with the GEOTAIL spacecraft has led to a considerable advance in our knowledge of the processes responsible for an explosive energy release in the magnetotail known as a substorm. Particularly, the timing and the average position of near-Earth reconnection have been studied extensively for the first time. However, owing to the intrinsic disadvantage of the single spacecraft measurement, temporal and spatial variations have not been resolved from each other, and the important question of what triggers the reconnection remained unanswered as yet. As a matter of fact, we do not have an answer yet to the long-standing question of whether reconnection triggers current disruption or current disruption triggers reconnection.

The only way to resolve spatial and temporal variations is to make use of more than one satellite in formation flight. Another key to the future mission is to have better time resolution in order to clarify electron dynamics, since GEOTAIL observations indicated that electron dynamics may be the key to the dissipation processes required for triggering reconnection.

Based on these considerations we are now discussing the plan for the next magnetospheric missions. These future missions share the same general perspective with the CAWSES international project since the ultimate understanding of the magnetosphere as a totality is the goal of both undertakings. Particularly, the coupling between the magnetosphere and ionosphere, which may be essential to the process of current disruption, cannot be studied with spacecraft alone. Close collaboration between space and ground observations is necessary and anticipated.

In this presentation, we are going to discuss the formation flight mission having the apogee of about 30 Re which is aimed at detailed understanding of tail reconnection and current disruption. We also discuss a possibility of an earlier inner magnetosphere mission with very small, piggyback type satellites, which is aimed at the physics of energetic particles and the plasmasphere. We will also discuss the coordination among the ongoing magnetospheric missions, GEOTAIL and Akebono, these future missions and ground observations for the CAWSES project.