

High-pressure region as a key factor on understanding the physical processes around the substorm onset

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Related mission: Mission 3

Abstract:

Substorm is a violent disturbance in the Earth's magnetosphere. The substorm causes energy stored in the magnetotail to be released rapidly and injected into the high latitude ionosphere. Visually, a sudden brightening of auroral arcs could be seen during the substorm. Substorm onset is normally considered as the beginning of substorm expansion phase. Two primary onset mechanisms were proposed previously, one is called Near-Earth Neutral Line (NENL) model, the other one is Current Disruption (CD) model. However, the questions such like what is the trigger of the onset, what is the timing of signature surrounding the onset, are still far from being fully understood. Variation of the plasma pressure is a characteristic feature around the substorm onset. Recent global magnetohydrodynamics (MHD) simulation emphasized the importance of the plasma pressure in the near-Earth plasma sheet in causing magnetospheric and ionospheric substorm. It is suggested that the substorm onset is initiated by the formation of high-pressure region in the inner magnetosphere. In this talk, I would like to present our recent work on sudden pressure enhancement and substorm-time changes of the near-Earth plasma sheet by comparing both THEMIS (Time History of Events and Macroscale Interactions during Substorms) observations and the global MHD simulation.