



Fluid and Particle Aspects of Magnetotail Dynamics

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Using a combination of magnetohydrodynamic (MHD), particle-in-cell (PIC), and test particle simulation, we explore aspects of magnetotail dynamics associated with substorms and bursty bulk flow events. MHD theory and simulations indicate how moderate tail boundary deformations may lead to the formation of very thin current sheets embedded in the tail plasma sheet. PIC simulations confirm this fact and demonstrate how this process can lead to the onset of reconnection and substorms. MHD simulations further show how flow bursts from the reconnection site penetrate to Earth and generate localized electric fields, which may act as local acceleration mechanism. Test particle simulations in the MHD fields demonstrate how these fields accelerate charged particles and affect injections of energetic ions and electrons.