Modeling of high speed ion beams observed by Cluster and Double Star

Maha Ashour-Abdalla (1,2), Jean-Michel Bosqued (3), Mostafa El-Alaoui (1), Takayuki Umeda (1), Vahé Peroomian (1), Philippe Louarn (3)

(1) Institute of Geophysics and Planetary Physics, University of California, Los Angeles, California, USA, (2) Department of Physics and Astronomy, University of California, Los Angeles, California, USA, (3)Centre d'Etude Spatiale des Rayonnements, CNRS, Tououse Cedex 4, France (mabdalla@igpp.ucla.edu / Fax: +1-310-206-3051 / Phone: +1-310-825-8881)

On October 08, 2004, the Cluster and Double Star spacecraft crossed the near-Earth (12-19 R_E) magnetotail neutral sheet during the recovery phase of a small, isolated substorm. Although they were separated in time and distance, both Cluster and Double Star observed steady, but highly-structured Earthward-moving $>$1000 km/s high speed H^+ beams in the PSBL. To model the similarities and differences in the properties of the observed beams, we first modeled the entire magnetosphere by using a global MHD simulation driven by solar wind observations. Next the simulation results were compared to the observed large scale behavior of the central plasma sheet/plasma sheet boundary layer (CPS/PSBL) during successive substorm phases. Finally a large scale kinetic approach in which particle trajectories are followed in the electric and magnetic fields from the global MHD simulation was used to investigate the origin and stability of the high-speed beams and their observed spatial layering. We interpret these results in terms of non-adiabatic acceleration mechanisms acting near a recently-created extended X-line. Quantitative comparisons will be made between the results of the large scale modeling and the data from the different satellites in terms of fields and distribution functions.