Geophysical Research Abstracts
Vol. 13, EGU2011-3928, 2011
EGU General Assembly 2011
© Author(s) 2011

Using simulations and multipoint observations to unravel reconnection topologies and particle injection sources

Jean Berchem (1), Robert Richard (1), C. Philippe Escoubet (2), Matthew G. G. T. Taylor (2), Harri Lasko (2), Arnaud Masson (2), Ianis Dandouras (3), Henri Reme (3), Frederic Pitout (4), and Elizabeth Lucek (5)

(1) UCLA, IGPP, Los Angeles, CA 90095-1567, United States (jberchem@igpp.ucla.edu, 001 310 2063051), (2) ESA, ESTEC, Noordwijk, 2200 AG, Netherlands, (3) CNRS-UMR 5187 and Université de Toulouse, CESR, 31000, Toulouse, France, (4) Laboratoire de Planétologie de Grenoble, 38041, Grenoble, France, (5) The Blackett Laboratory, Imperial College, London, SW7 2BZ, United Kingdom

The occurrence of discrete structures in the energy-latitude dispersion of precipitating particles observed by spacecraft as they cross the polar cusps offers a unique opportunity for investigating the large-scale topology and dynamics of the merging of the interplanetary magnetic field (IMF) with the geomagnetic field. In particular, consecutive crossings of the cusps made by the Cluster spacecraft in a string of pearl configuration are well suited for investigating the temporal and spatial evolution of the injection sources of precipitating particles as solar wind discontinuities interact with the dayside magnetopause. We present the results of large-scale simulation studies based on Cluster multipoint observations of ion dispersions following rapid changes in the direction of the interplanetary magnetic field. First, we use three-dimensional magnetohydrodynamic (MHD) simulations to follow the evolution of the global topology of the magnetic and electric fields during the events. Subsequently, the time-dependent fields predicted by the MHD simulations are utilized to compute the trajectories of large samples of solar wind ions launched upstream of the bow shock. We assess the results of the studies by comparing Cluster ion measurements with ion dispersions calculated from the simulations along the spacecraft trajectories and discuss the temporal evolution and spatial extent of the injection sources of precipitating particles in the context of the reconnection process at the dayside magnetopause.