Geophysical Research Abstracts
Vol. 14, EGU2012-11038, 2012
EGU General Assembly 2012

How important are earthward moving flux ropes for understanding substorm initiation and associated particle energization?

I. I. Vogiatzis (1,2), O. E. Malandraki (3), Q.-G. Zong (1,7), X.-Z. Zhou (4), T. E. Sarris (2), E. T. Sarris (2), H. Zhang (5), and T. A. Fritz (6)

(1) Peking University, Institute of Space Physics and Applied Technology, Beijing, China (ivogiatz@ee.duth.gr), (2) Department of Electrical and Computer Engineering, Democritus University of Thrace, Xanthi, Greece, (3) Institute of Astronomy and Astrophysics, National Observatory of Athens, Athens, Greece, (4) Institute of Geophysics and Planetary Physics, University of California, Los Angeles, CA, USA, (5) Physics Department and Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK, USA, (6) Center for Space Physics, Department of Astronomy, Boston University, Boston, MA, USA, (7) Center for Atmospheric Research, University of Massachusetts Lowell, Lowell, MA, USA

We have investigated a number of substorm events during major conjunctions of the THEMIS spacecraft for the tail seasons of the mission. We present simultaneous observations from various instruments onboard the THEMIS spacecraft during the events. We focus particularly on events when at least one of the THEMIS spacecraft is adjacent to the neutral sheet where convectional plasma flows are observed. The events demonstrate clear dipolarization signatures accompanied by high-speed earthward plasma flows and intense wave activity. We present evidence that flux ropes are embedded within the high-speed earthward convective plasma sheet flows. This fact has important implications since the leading edge of the flux rope having south polarity can impulsively merge with the north polarity field of the stretched magnetotail leading to mutual erosion of both magnetic structures. The merging of the vertically oriented oppositely-directed field lines, known as "anti-reconnection", can lead to local cross-tail current reduction and flux rope dissipation. These observations are very important in explaining the mechanism triggering near-Earth dipolarization and particle acceleration to supra-thermal energies.