2009-2010 Annual Report

Robert L. Richard
Associate Research Geophysicist, IGPP
PhD, UCLA

Awards

Grants awarded:
Co-Investigator on “Consequences of three-dimensional reconnection at the dayside magnetopause” (NASA) 2009-2012
Principal Investigator on " Simulating Energetic Ion Entry and Trapping in the Magnetosphere” (NASA), 2010-2013

Invited talks:
El-Alaoui, M,, Maha Ashour-Abdalla, Raymond J. Walker, Robert L. Richard, Vahé Peroomian, Vassilis Angelopoulos, and Andrei Runov, Plasma Sheet Dynamics During a Substorm: Observations and Global MHD Simulation, International School of Space Simulations 9, Saint-Quentin-en-Yvelines, France, July 3-10, 2009.

Berchem, J., R. L. Richard, C. P. Escoubet, J. M Bosqued, M.G.G.T. Taylor, H. Laakso, A. Masson, I. Dandouras, H. Reme, F. Pitout, M. Dunlop, and E. Lucek, Global simulations of an abrupt rotation of the interplanetary magnetic field, International School of Space Simulations 9, Saint-Quentin-en-Yvelines, France, July 3-10, 2009.

Ashour-Abdalla M, J.-M. Bosqued, M. El-Alaoui, V. Peroomian, M. Zhou, R. L. Richard, R. J. Walker, A. Runov, and V. Angelopoulos, Large-Scale Kinetic Simulations of Ion Energization Observed by THEMIS during Substorms, International School of Space Simulations 9, Saint-Quentin-en-Yvelines, France, July 3-10, 2009.

Richard, R. L., M. El-Alaoui, M. Ashour-Abdalla, and R.J. Walker, Simulation studies of the entry and propagation of solar energetic particles (SEPs) into the magnetosphere, International School of Space Simulations 9, Saint-Quentin-en-Yvelines, France, July 3-10, 2009.

Escoubet, C. P., J. Berchem, R. Richard, M. G. G. T. Taylor, F. Pitout, K. J. Trattner, B. Grison, H. Laakso, A. Masson, M. Dunlop, I. Dandouras, H. Reme, and A. Fazakerley, Multi-point measurements of the cusp region: Cluster observations and simulations, International School of Space Simulations 9, Saint-Quentin-en-Yvelines, France, July 3-10, 2009.

Research Activities

During this year, I have studied Solar Energetic Particle entry and trapping in the magnetosphere by using global magnetohydrodynamic (MHD) and large scale kinetic (LSK) simulations (large scale particle tracing). I have worked on ion acceleration in the dayside magnetosphere using MHD and LSK for observed (mainly Cluster) events. I have collaborated in studies of observed (primary dataset was Themis) substorms and associated dipolarizations using MHD simulations and ion and electron LSK. I have collaborated on studies of turbulence in MHD simulations. I have assisted on studies of electrons at Mercury.

Teaching Service

No teaching during the period.
Reviewed NASA proposal.

Publications

Richard, R. L., M. El-Alaoui, M. Ashour-Abdalla and R. J. Walker, Modeling the entry and trapping of solar energetic particles in the magnetosphere during the November 24-25, 2001 storm, J. Geophys. Res., 14, A04210, doi:10.1029/2007JA012823. 2009.

Ashour-Abdalla, M., J.-M. Bosqued, M. El-Alaoui, V. Peroomian, M. Zhou, R. L. Richard, R. J. Walker, A. Runov1, and V. Angelopolous1,4 A Simulation Study of Particle Energization Observed by THEMIS Spacecraft during a Substorm, J. Geophys. Res., 114, A09204, doi:10.1029/2009JA014126, 2009.

El-Alaoui, M., M, Ashour-Abdalla, R. J. Walker, V. Peroomian, R. L. Richard, V. Angelopoulos, and A. Runov, Substorm Evolution as Revealed by THEMIS Satellites and a Global MHD Simulation, J. Geophys. Res., 114, A08221, doi:10.1029/2009JA014133, 2009.

Zhou, M, M. Ashour-Abdalla , X. Deng , M. El-Alaoui , R. Richard, Modeling substorm ion injection observed by THEMIS and LANL in the near earth magnetotail, J. Geophys. Res., submitted, 2010.

El-Alaoui, M., M, Ashour-Abdalla, R. L. Richard, M. L. Goldstein, J. M. Weygand, and R. J. Walker, Global Magnetohydrodynamic Simulation of Turbulence in the Plasma Sheet, J. Geophys. Res., submitted, 2010.