Project Details

ROSES ID: NNH08ZDA001N
Selection Year: 2009
Program Element: Focused Science Topic

Topic: Integrate Non-MHD/Kinetic Effects on Magnetic Reconnection, Particle Energization, and Plasma Heating into Global Models.

Project Title:
Magnetic Reconnection, Particle Energization, and Plasma Heating in a Global Kinetic Model

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Summary:
Magnetic reconnection, which is a conversion of magnetic energy into plasma wave and kinetic energy, is one of the most important physical processes in geospace. It involves a breaking of the "frozen-in" condition that results from kinetic processes acting on ion and electron scales, yet the release of energy has consequences on meso and global scales. At the Sun, reconnection is believed to be a driver of energetic bursts involved in solar flares and other solar disturbances. As the solar wind with its embedded interplanetary magnetic field (IMF) flows out into the solar system, its interaction with internally magnetized planets creates a magnetosphere in which reconnection is often the dominant form of energy transfer. For the outer planets (i.e., Saturn and Jupiter), corotation dominates the inner magnetospheric region, but for the inner planets, such as Mercury and Earth, magnetic reconnection plays a major role in the configuration of the magnetosphere, its dynamics and the formation of an inner belt of energetic plasma. The goal of this proposal is to apply a global three dimensional (3D) kinetic model of the solar wind interaction with a planetary magnetosphere and examine plasma transport, acceleration and heating that results from reconnection and at shocks. The need for a global kinetic 3D magnetospheric model is urgent and it will have a strong impact on improved space weather forecasting for different solar wind conditions, which is a high priority for the Living with a Star program.

Publication References:

Summary: no summary

Reference:
Trávní?ek, Pavel M.; Schriver, David; Hellinger, Petr; Her?ík, David; Anderson, Brian J.; Sarantos, Menelaos; Slavin, James A.; (2010), Mercury’s magnetosphere-solar wind interaction for northward and southward interplanetary magnetic field: Hybrid simulation results, Icarus, Volume 209, Issue 1, p. 11-22, doi: 10.1016/j.icarus.2010.01.008