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:
Parametrization of the kinetic processes responsible for the onset of reconnection in the magnetotail

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Summary:
The mechanism of the onset of magnetic reconnection in the tail of Earth's magnetosphere remains one of the most compelling problems of magnetospheric physics. Missing parametrization of that process is one of the main stumbling blocks in the global MHD modeling of the magnetosphere. In spite of the significant progress in modeling the collisionless reconnection in the simplest antiparallel and guide-field cases, it remains unclear: (1) Where does the reconnection start in the magnetotail? (2) What are the critical plasma and electromagnetic field parameters prior to the onset? (3) How can the kinetic onset conditions be translated into the MHD language? The tools to answer these questions include the new equilibrium models of thin current sheets, nonlocal linear stability analysis codes, and full-particle codes with periodic and open boundaries. They have already been used to demonstrate the possibility of the spontaneous reconnection in the magnetotail, and the theoretical predictions of the destabilizing role of the electron kinetic response have been confirmed by particle simulations with open boundaries, including the effect of different motions of trapped and passing particles. The proposed study is aimed to address the Focused Science Topic D of the NASA LWS TR&T program.

Publication References:

Summary: no summary

Reference: Guzdar, P. N.; Hassam, A. B.; Swisdak, M.; Sitnov, M. I.; (2010), A simple MHD model for the formation of multiple dipolarization fronts, Geophysical Research Letters, Volume 37, Issue 20, CiteID L20102, doi: 10.1029/2010GL045017