BOSTON UNIVERSITY

Space Physics Seminar
Thursday, March 17, 2016

Investigations of fundamental plasma physics to understand our Heliosphere: Magnetic Reconnection and Non-linear Alfvén waves

Seth Dorfman

Department of Physics & Astronomy
University of California, Los Angeles

Abstract:

From eruptions on the Sun and the evolution of the solar wind to substorms in Earth's magnetosphere, plasma physics phenomena pervade our Sun-Earth system, but many remain poorly understood. I will argue that the investigation of fundamental plasma physics common to all these systems holds keys to unlocking the mysteries of our heliosphere. My talk will focus on two examples: magnetic reconnection and non-linear physics of Alfvén waves.

Magnetic reconnection is an important energy release mechanism to consider in contexts such as magnetic flux loops on the Sun and the Earth's magnetotail. In both cases, a slow build up phase is followed by a quick release of magnetic energy, but this impulsive behavior is not fully understood. I will show results from a dedicated laboratory experiment at Princeton University in which 3-D physics is necessary to explain the observed impulsive events. The experiments have key features in common with space observations that will inform future comparative studies.

Alfvén waves are fundamental modes of a plasma with a magnetic field. The non-linear behavior of these waves may be key in contexts such as the heating of the solar corona and solar wind turbulence. One important non-linear process with a long history of theoretical and simulation studies is a class of parametric instabilities in which a large amplitude Alfvén wave produces various daughter modes. I will show 1) results from recent experiments at the Large Plasma Device at UCLA which represent the first observation of this type of instability in the laboratory and 2) ongoing satellite measurements aimed at determining if Alfvén wave parametric instabilities play a role in our heliosphere.

3:15 pm
Refreshments
CAS Room 500

3:45 pm
Seminar
CAS Room 502

Next Week

- Marilia Samara
  UCLA
- *Why do we shoot rockets at the aurora?!*

http://www.bu.edu/csp/edoutreach/seminar/

C·S·P

725 Commonwealth Avenue
Boston, MA 02215