SPACE AND COSMIC RAY PHYSICS SEMINAR

University of Maryland
Computer & Space Sciences Building, Rm 2400
4:30 PM Monday, November 24, 2003
Tea & cookies 4:00-4:30 PM

Judith T. Karpen

Naval Research Laboratory
Washington, DC

A Holistic View of Solar Prominences: From Formation to Eruption

Solar prominences (also called filaments) are massive (~10^{16}g) features composed of dense (> 10^{11}cm^{-3}), cool (~10^4 K) plasma, which seem to float high up in the tenuous (~10^9cm^{-3}), hot (~10^6 K) solar corona. They often resemble a long arched wall with widths ranging from 10^8 to 10^9 cm, heights ranging from 10^{10} cm down to the chromosphere itself, and lengths that can be of order the Sun's circumference. Typical prominence lifetimes range from hours to months, usually disappearing by expulsion during large coronal mass ejections (CMEs). Hence, understanding the magnetic structure of prominences is essential for understanding how and why CMEs—the major solar drivers of geomagnetic disturbances—occur. Furthermore, identifying the origins of prominence plasma structure can yield important clues about the long-sought mechanism for coronal heating.

There are three central issues concerning the physics of prominences: how does mass condense in the corona, how is it supported, and why does it erupt? Based on recent observations, the NRL Solar Theory group has developed a coherent picture in which prominences are straightforward consequences of just two properties of the Sun's corona: magnetic shear localized near neutral lines, a well-observed fact; and heating concentrated near the chromosphere on scales much less than the prominence field-line length, as indicated by recent TRACE observations. I will describe our models for prominence formation and eruption, present supporting evidence from recent, state-of-the-art 1D hydrodynamic and 3D MHD simulations, and compare our predictions with current observations.

Sponsored by: Department of Physics, University of Maryland, and the Institute for Physical Science and Technology, University of Maryland. For information call Matthew Hill at (301) 405-6209 or go to the following website: http://space.umd.edu/seminars/Fall_2003_Seminar.html (A PDF file of this abstract is available for download at this URL.)

For free parking please park in lot DD or anywhere on levels 1-2 in lot B (the big parking garage) after 4.00 pm. Make sure that you park in a spot WITHOUT a parking meter.