

# SPACE AND COSMIC RAY PHYSICS SEMINAR

*University of Maryland  
Computer & Space Sciences Building, Room 2400  
4:30 PM Monday, May 9th, 2005  
Coffee, Tea & cookies 4:00-4:30 PM*

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## **The Interaction of the Interstellar Medium with the Sun and other Stars**

The local interstellar medium (LISM) plays an influential role in the physics of the outer heliosphere and is instrumental in determining the large-scale structure of the heliosphere. The basic physics of the solar wind – LISM interaction will be reviewed and the global structure of the heliosphere will be described. The critical role of neutral interstellar atoms will be emphasized. The modeling of the interaction of the partially ionized local interstellar medium with the solar wind is complex and rich in details. An ideal model on global heliospheric scales typically includes the magnetohydrodynamics of the encounter of two hydrogen plasma winds (solar and interstellar wind, with magnetic fields), modified by the interaction with neutral atoms of interstellar origin. This nonlinear interaction gives rise to feedback on the plasma distributions via the pickup process, and to an essentially non-Maxwellian neutral distribution function throughout the heliosphere. The latter requires a complex treatment of the neutrals in the numerical models. We give an overview of current efforts to model the global heliosphere and some key results, including the filtration of interstellar neutrals at heliospheric boundary regions before entering the inner heliosphere. Recent results related to time-dependence of the heliosphere, instability of the heliopause, the inclusion of the interplanetary magnetic field, a more sophisticated treatment of collisional effects, and results which incorporate galactic cosmic rays will be described.

A suite of observations, (i) Lyman-alpha absorption spectra towards nearby stars; (ii) the predicted timing of the turn-on of radio emissions in the outer heliosphere; (iii) solar cycle variation in the solar wind ram pressure and the frequency with which interplanetary shocks occur, and (iv) pickup ion and neutral atom measurements, will be used in an attempt to constrain heliospheric global structure and the plasma physical processes governing the outer heliosphere. We will conclude with (i) an historical perspective of the travels of the Sun through the galaxy, emphasizing the possibility that the Sun experienced many different environments, suggesting that heliospheric conditions are constantly changing and may have been very different in times past (and future!), and (ii) the implications of these results for other stars in different local interstellar environments.

**<http://space.umd.edu/seminars>**

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