

UNIVERSITY OF TEXAS AT DALLAS - DEPARTMENT OF PHYSICS

PHYSICS COLLOQUIUM

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in Kusch Auditorium, FN 2.102

Space Plasma Research at The University of Texas at Arlington

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To zeroth order, the Earth's magnetosphere is a comet-shaped magnetic cavity embedded in the solar wind plasma flow. However, plasmas of varying density, composition and energy are in fact found throughout the magnetosphere. The sources for this magnetospheric plasma are the solar wind itself and the terrestrial ionosphere. We will describe recent spacecraft observations and simulations of the characteristics and transport of ionospheric plasma between the topside ionosphere and lower magnetosphere at high latitudes. The ionospheric plasma observations are from instruments aboard the POLAR, DMSP and IMAGE spacecraft, particularly the Thermal Ion Dynamics Experiment (TIDE) on POLAR. The simulations are from our Dynamic Fluid-Kinetic (DyFK) model, which couples a fluid, or moment-based, treatment of the ionosphere in the 120-1100 km altitude range to a semi-kinetic or hybrid (ions as particles) treatment for the transport from 800 km to several R_E . Among the processes incorporated in these DyFK simulations are the effects of ionospheric ionization and thermal electron heating from soft auroral electron precipitation and wave-driven transverse ion heating at higher altitudes. We will discuss observations of field-aligned ionospheric ion flows in the vicinity of auroral forms, near-simultaneous multi-spacecraft observations of topside/magnetosphere field-aligned flows, DyFK simulations of the synergistic effects of soft electron precipitation and transverse ion heating on the outflows and comparisons with observations, and observations of a recurrent "trough" feature in O^+ densities in the polar cap region near 5000 km altitude.

About the speaker: Dr. Horwitz obtained the B. A. in Physics (Highest Honors) from the University of California in San Diego in 1970, and M. S.(1972) and Ph. D.(1976) degrees from the same institution. His Ph. D. dissertation title was "Radial Measurements of Electric Fields in the High Latitude Ionosphere and Other Topics in Auroral Physics." He has authored or co-authored over 130 space physics publications, including several invited review articles, and has served on several science committees and teams. He has served as Space Physics and Aeronomy Section Editor for EOS, the Space Physics Editor for Reviews of Geophysics, and as associate editor of Geophysical Research Letters. Dr. Horwitz joined the Department of Physics at UTA in October, 2004, where he is now Professor of Physics and Chair.