

## HAO Colloquium Series

(Refreshments served)

**Speaker:** Peter Damiano, PPPL

**Time:** 1:30–2:30 pm

**Date:** Wednesday, October 16, 2013

**Location:** CG1 – 1214 North Auditorium (also webcast at <http://www.fin.ucar.edu/it/mms/cg-live.htm>)

**Title:** Kinetic simulations of electron acceleration in Alfvénic Aurora

**Abstract:**

Alfvén waves couple the magnetosphere and ionosphere on a range of scales from global scale Field Line Resonances (FLRs) to dispersive scale waves that are thought to power the broadband aurora. Poynting flux within these waves feeds the acceleration of electrons to carry the parallel current (where wave energy is lost to particle energization) and ionospheric Pedersen currents where Joule dissipation occurs. In this presentation, we summarize results of 2D simulations of both FLRs and dispersive scale Alfvén waves in a dipolar magnetic field topology using a hybrid gyrofluid-kinetic electron model. This model is an extension of the self-consistent hybrid MHD-kinetic electron model (Damiano et al., 2007) that has been generalized to include ion gyroradius effects based on the kinetic-fluid model of Cheng and Johnson (1999). For global scale waves, it is found that mirror force effects self-consistently result in parallel potential drops sufficient to accelerate electrons to keV energies (in order to carry the field aligned current) and the wave energy dissipated in this acceleration can damp the wave in a few Alfvén cycles (Damiano and Johnson, 2012, 2013). The perpendicular Poynting flux associated with the parallel electric field disperses wave energy perpendicular to the magnetic field leading to a broadening of the parallel current region as electrons are accelerated along adjacent field lines. We also present recent results of the propagation of dispersive scale Alfvén wave pulses from a magnetotail source region to the ionosphere. It is found that the consideration of ion gyroradius effects significantly shortens the propagation time of the wave to the ionosphere and we elucidate the characteristics of the electron energization. Time permitting, the relevance of these investigations to electron acceleration by Alfvén waves in solar coronal plasmas will also be reviewed.