



## **Nonlinear Alfvén Waves in Plasmas with Collisional Damping and Density Gradients**

**E. Nordblad** and K. Stasiewicz

Swedish Institute of Space Physics, Uppsala, Sweden (eno@irfu.se / Phone: +46 18-4715934)

Recent theory of linear and nonlinear magnetohydrodynamic waves [1,2] is generalized to include effects of electron-ion collisions and density gradients. We show how the dispersion diagrams are modified for different collision rates, and model the transformation of nonlinear waves in regions of non-uniform density. It is found that the propagation of nonlinear waves is not significantly affected when collision frequencies are low compared to the electron gyrofrequency. Furthermore, density gradients are seen to turn linear waves into nonlinear ones and vice versa. The implications for drift waves are also examined. The results are applicable to the lower ionosphere and the solar chromosphere.

[1] Stasiewicz, K., J. Geophys. Res. 110, A03220 (2005)

[2] Stasiewicz, K., Phys. Rev. Lett. 96, 175003 (2006)