Abstract Submitted
for the APR07 Meeting of
The American Physical Society

Force-Free Magnetohydrodynamic Waves: Non-Linear Interactions and Effects of Strong Gravity. PARKER TROISCHT, Hartwick College — The propagation and non-linear interactions of magnetohydrodynamic waves are considered in the force-free limit, where the inertia of the conducting matter which enforces the MHD condition $E \cdot B = 0$ can be neglected in comparison with the inertia of the electromagnetic field. By extending the analysis beyond the WKB approximation, we are able to study the non-linearities induced by a gravitational field. Here, the perturbed electromagnetic field is treated as a fluid of infinite conductivity. We calculate the scattering of a torsional (Alfven) wave by a gravitational potential, and demonstrate a nonlinear coupling with a compressive (fast) wave which is second order in the amplitude of the Alfven wave. In a cylindrically symmetric spacetime with slow rotation, the coupling is second order in $g_{t\phi}$ and first order in the amplitude of the wave. Finally, we show how spacetime curvature modifies the collision between two torsional waves, in both the weak- and strong-field regimes.

Parker Troischt
Hartwick College

Date submitted: 12 Jan 2007 Electronic form version 1.4