Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Formation of Whistler-Mode Cavity in the Magnetosphere by Nonlinear Induced Scattering[1] C. CRABTREE, NRL, L. RUDAKOV, Icarus Research Inc., G. GANGULI, M. MITHAIWALA, NRL, V. GALINSKY, V. SHEVCHENKO, UCSD — In the Earth's dipole magnetic field whistler-mode waves originating in the ionosphere with frequencies relevant to pitch angle scattering of relativistic electrons quickly propagate toward the hydrogen lower-hybrid resonant surface in the magnetosphere. The perpendicular wave-vector increases such that wave packets become quasi-electrostatic, experience large Landau and collisional damping, and quickly become less effective at pitch angle scattering. Recently Ganguli et al. [1] showed that through nonlinear (NL) induced scattering by thermal electrons in low β plasmas the direction of the wave-vector of whistler-mode waves can change substantially with only a small change in the frequency. Here we apply this mechanism to demonstrate that when the turbulent whistler-mode energy density is large enough, NL scattering allows a portion of whistler-mode waves to return toward the ionosphere and reduces the perpendicular wave-vector such that the corresponding linear damping is reduced and the wave's ability to pitch angle scatter relativistic electrons is revived. Through multiple NL scatterings and ionospheric reflections a long-lived wave cavity in the Earth's magnetosphere may be formed with the appropriate properties to efficiently pitch-angle scatter trapped relativistic electrons.

[1] Ganguli et al. PoP (2010)

[1]Supported by ONR.

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Date submitted: 26 Jul 2011 Electronic form version 1.4