Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Induced Nonlinear Scattering of Magnetospherically Reflecting Whistlers[1] C. CRABTREE, M. MITHAIWALA, G. GANGULI, NRL, L. RUDAKOV, Icarus, Inc., and UMD, V. GALINSKY, V. SHEVCHENKO, UCSD
— Whistler waves regulate the energetic electron population in the magnetosphere through pitch angle scattering of resonant electrons. Sources of whistlers in the lower magnetosphere ($L \sim 2-3$) include, e.g., lightening discharges, VLF transmitters, and unstable particle distributions. Once the whistler waves are generated, they are maintained in an effective cavity around the lower-hybrid resonant surface where the waves are dissipated. Before the waves are dissipated they pitch angle scatter the resonant electrons. We demonstrate that when the energy density of whistlers exceeds a threshold, which occurs at $\delta B = 30-50$ pT , the process of nonlinear induced scattering by thermal electrons [1] dominates both electron-ion collisional damping and linear Landau damping due to superthermal electrons [2]. This occurs primarily by scattering of waves before the wave-packet settles down on a lower-hybrid surface (where the wave is damped). Consequently, 1) the lifetime of whistler wave turbulence is increased from seconds to 10s of seconds, 2) the whistler wave packets spend more time away from the lower-hybrid surface and thus interact more with energetic electrons [1]. Thus the lifetime of energetic electrons is reduced due to the induced nonlinear scattering of whistler waves. [1] Ganguli et al., PoP, 17, 052310 (2010), [2] Innan et al., JGR, 108, 1186 (2003).

[1]This work is supported by the Office of Naval Research.

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Date submitted: 20 Jul 2010 Electronic form version 1.4