Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Electron pitch-angle scattering by magnetic waves[1] A.N. SIMAKOV, J. DALIGAULT, S.P. GARY, D. LEMONS, K. LIU, D. WINSKE, LANL — Fluxes of relativistic electrons are trapped in the earth's radiation belts and exhausted by loss-cone pitch-angle scattering through interaction with various magnetospheric plasma waves. The high temporal variability of the fluxes is poorly understood and routinely modeled using quasi-linear pitch-angle diffusion theory, which is strictly only applicable for rather low ratios ϵ of the wave energy to the earth's magnetic field energy. Here, we present a novel electron pitch-angle scattering theory valid for arbitrary ϵ. We concentrate on the simplest case of electromagnetic ion cyclotron (EMIC) waves, approximated with a set of time-independent transverse magnetic fluctuations, and obtain a general integro-differential evolution equation for a pitch-angle distribution f. If f evolves weakly on the correlation time scales, the equation reduces to a Fokker-Planck diffusion equation with a *time-dependent* diffusion coefficient D. Quasi-linear theory is recovered as a first-order truncation of the asymptotic expansion in ϵ of electron equations of motion and breaks down for $\epsilon \geq 10^{-4}$ [1]. In particular, D changes scaling around this point from $D \propto \epsilon$ to $D \propto \sqrt{\epsilon}$ and is found to be 16 times smaller that the quasi-linear result for $\epsilon = 10^{-2}$ at time $t = 30$ electron gyroperiods. [1] K. Liu *et al.*, J. Geophys. Res. **115** A04204 (2010).

[1]Work conducted as part of the DREAM project at LANL.

Andrei Simakov
Los Alamos National Laboratory

Date submitted: 13 Jul 2011 Electronic form version 1.4