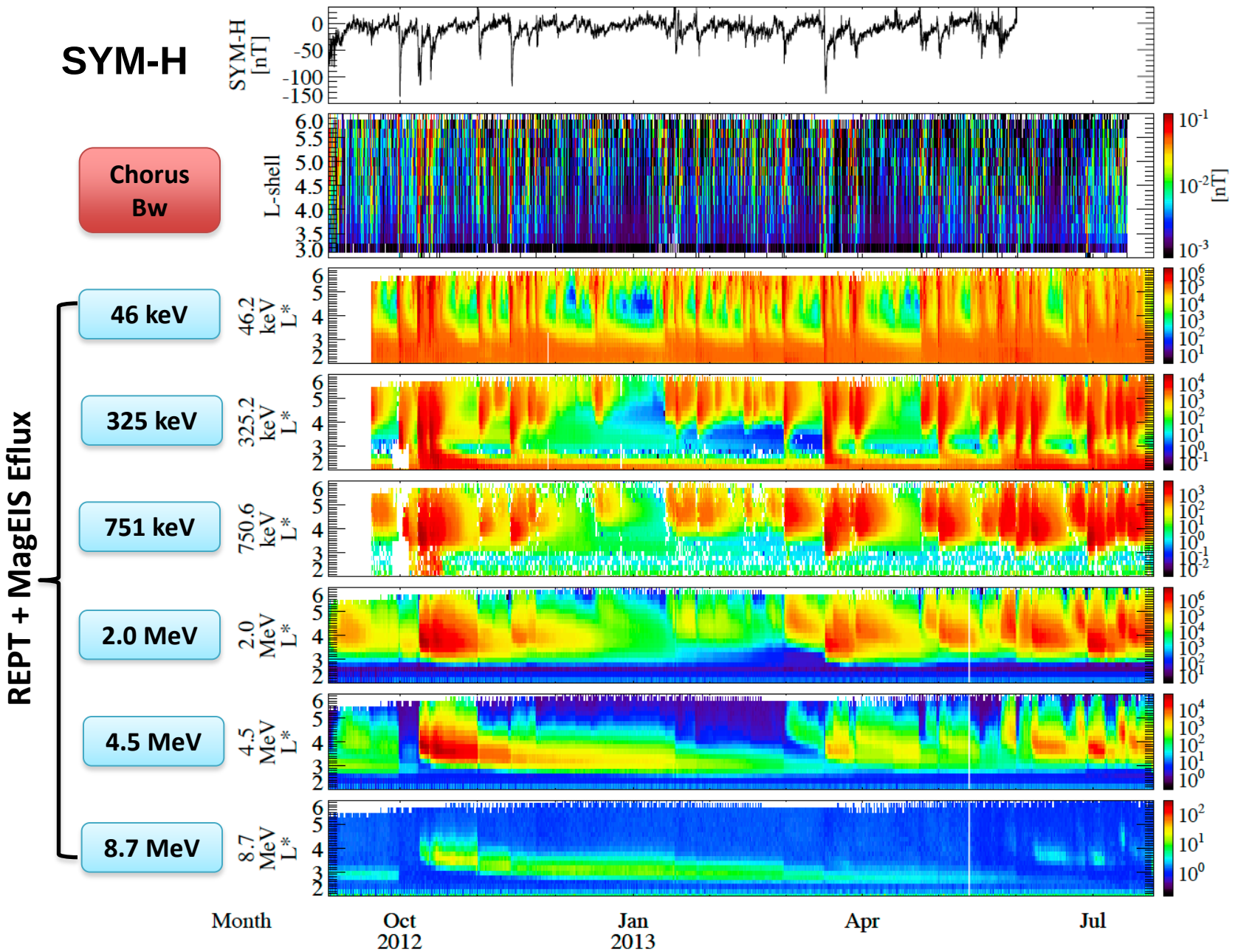
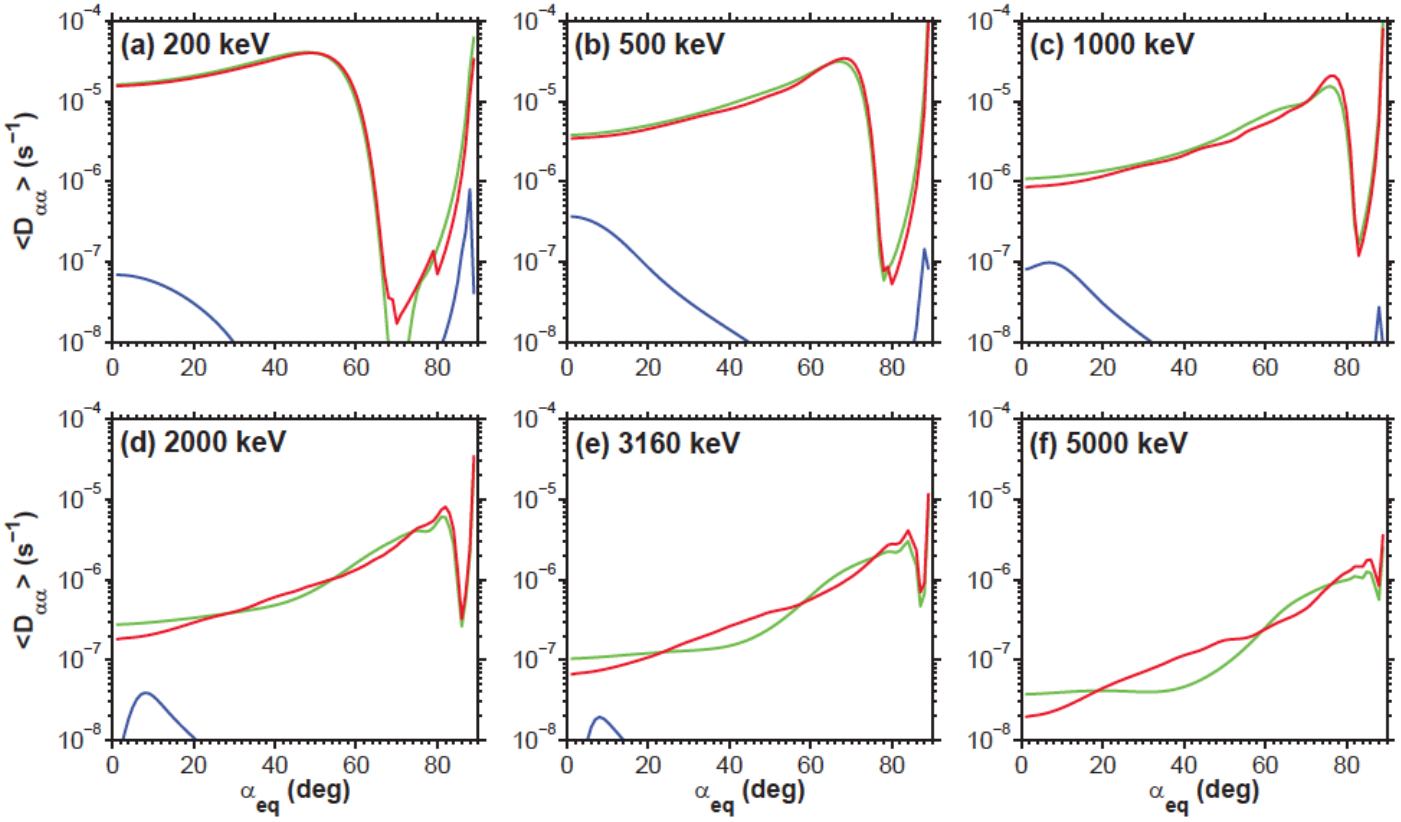
Electron Flux Evolution Over the Past 10 Months



Electron Pitch-Angle Scattering Rates near L ~ 3.2

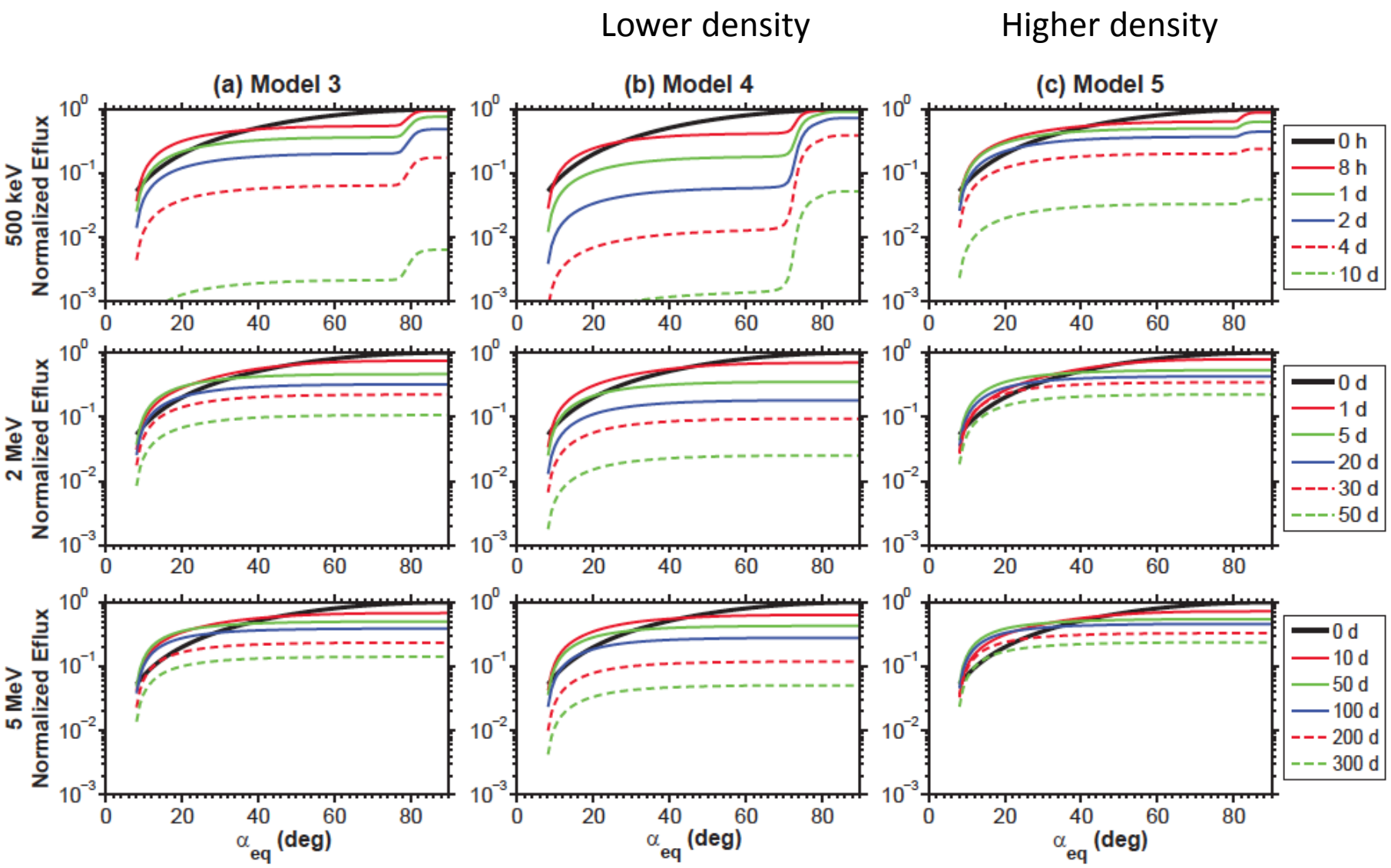


Assume Hiss Amplitude
Bw = 10 pT

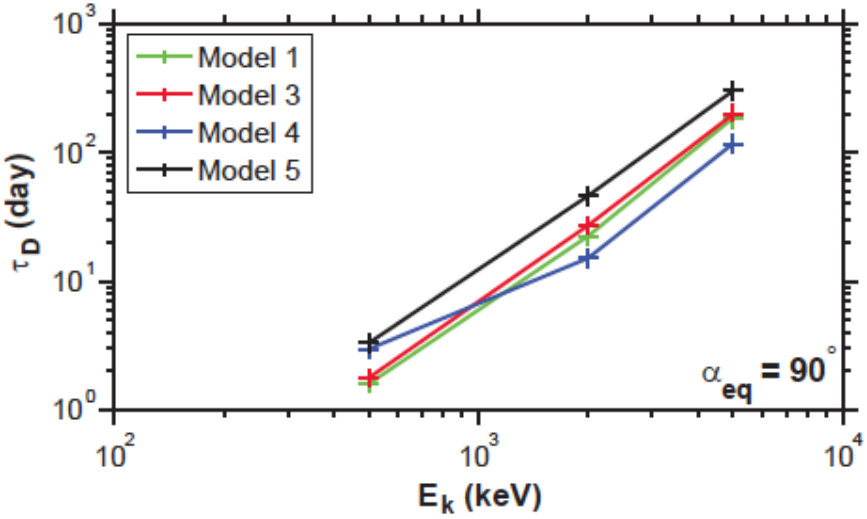
Model #		Wave latitudinal	Wave normal angle model	N_e (cm^{-3})
1	green	$\lvert\lambda\rvert < 45°$	$\psi_m = 0°, \delta\psi = 20°, 0° \le \psi \le 30°$	1020
2	blue	$\lvert\lambda\rvert < 15°$	$\psi_m = 80°, \delta\psi = 82°, 65° \le \psi \le 85°$	1020
3	red	$\lvert\lambda\rvert < 45°$	as shown in Table 1	1020

$\lvert\lambda\rvert$ (°)	ψ (°)	ψ_m (°)	$\delta\psi$ (°)
0° – 5°	0° – 20°	0°	15°
5° – 10°	0° – 30°	10°	20°
10° – 15°	0° – 40°	20°	25°
15° – 20°	10° – 50°	30°	25°
20° – 25°	20° – 60°	40°	35°
25° – 30°	30° – 70°	50°	40°
30° – 35°	40° – 80°	60°	50°
35° – 40°	50° – 80°	70°	60°
40° – 45°	55° – 85°	80°	70°

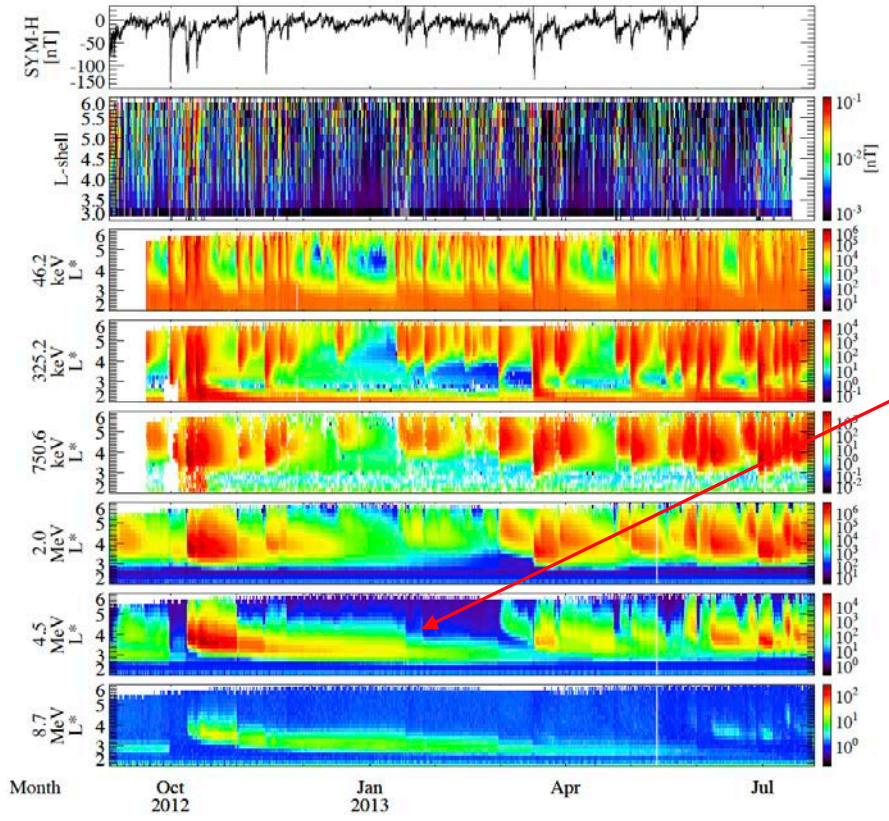
Temporal Evolution of the Electron Pitch Angle Distribution

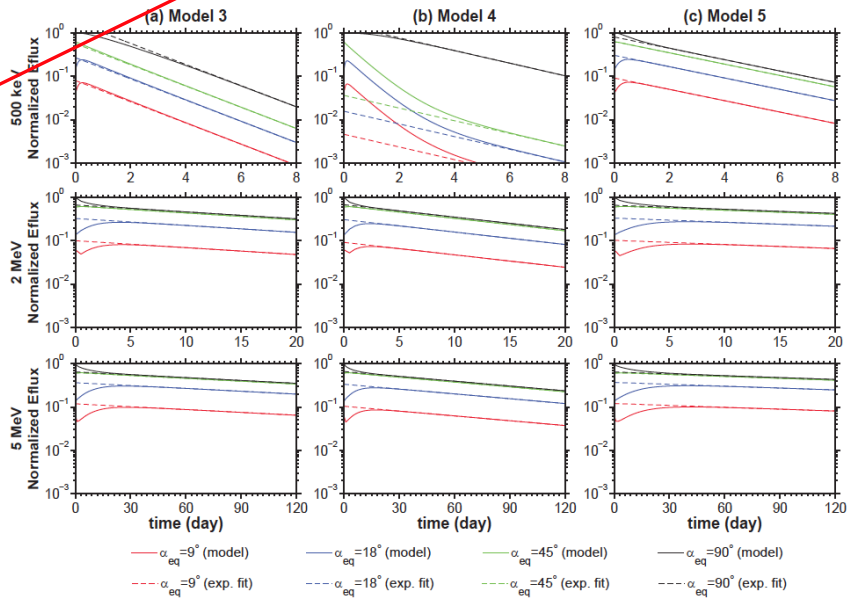


Temporal Decay Rates From Hiss Scattering Assuming B_{wave} = 10 pT

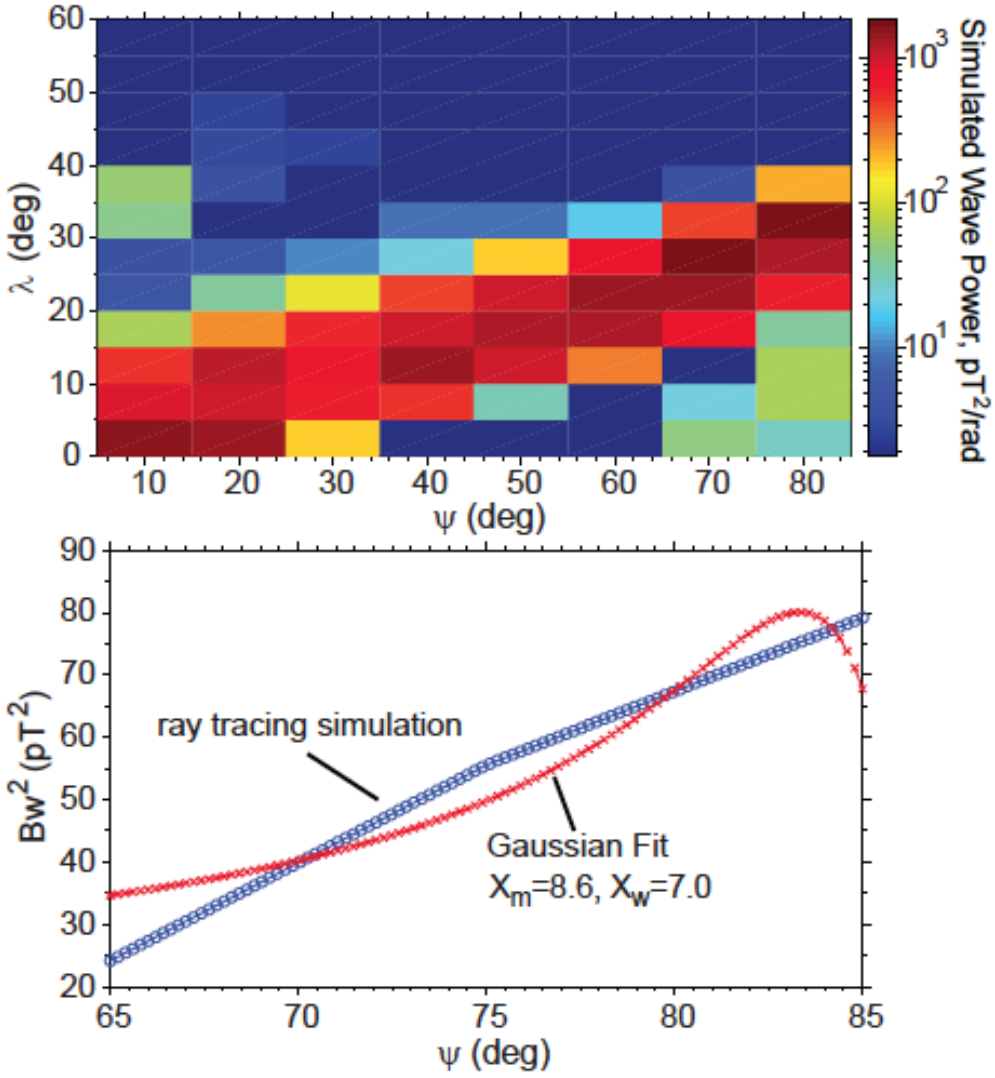


Decay lifetimes
~ few days at 500 keV
~ 100 days at 5 MeV.





Wave Normal Distribution of Hiss at L ~ 3.2 from Ray Tracing



Bortnik et al., 2011

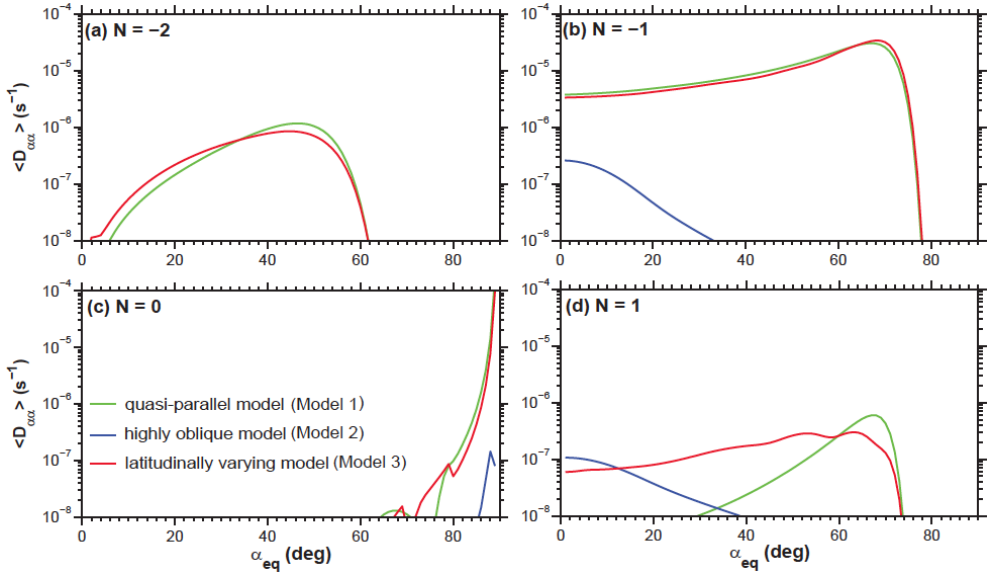
Hiss in the plasmasphere during relatively modest geomagnetic activity has amplitude ~ 10 pT.

We use this value for our Simulation, but results can be scaled to observations during specific events.

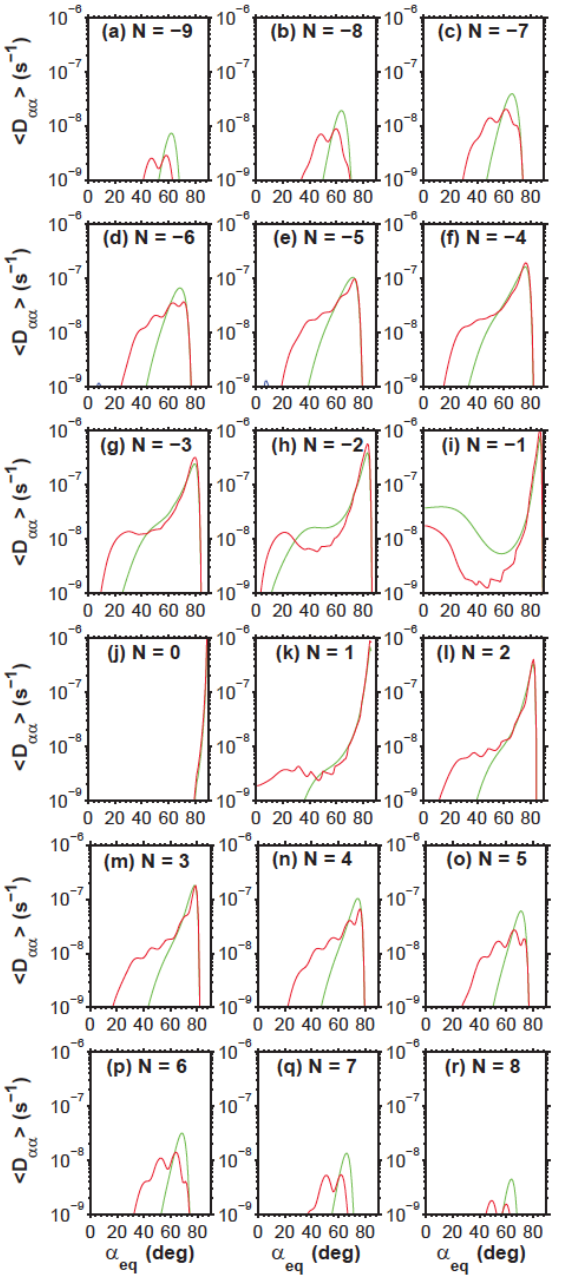
Contributions From Different Harmonic Scattering

$$\omega - k_{ll} v_{ll} = - N\Omega_{gyro}/\gamma$$

500 keV

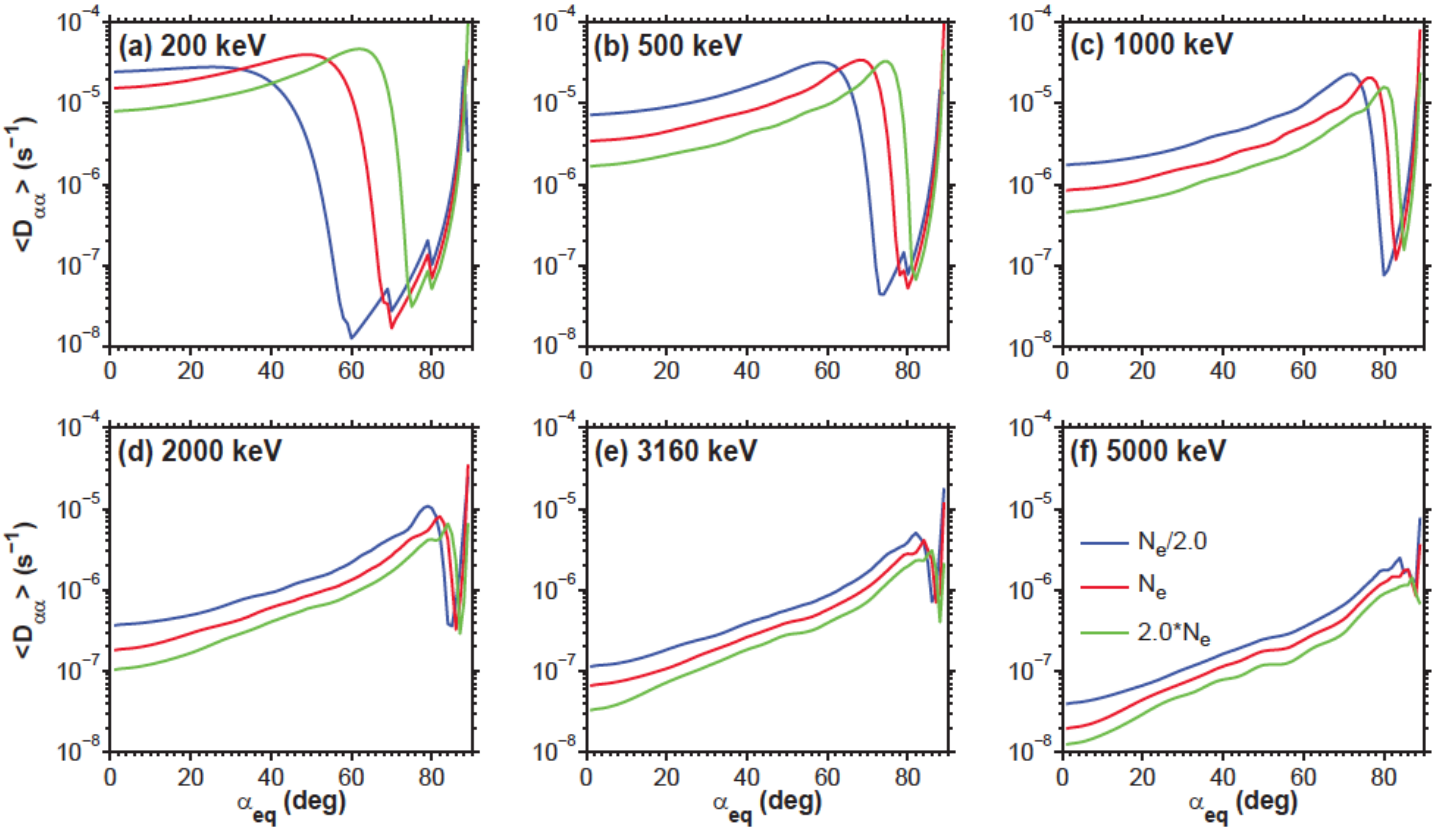


5 MeV



500 keV scattering dominated by N=-1 cyclotron resonance
But many different harmonics contribute at 5 MeV

Role of Plasmapheric Density



Lower density leads to more rapid scattering near the loss cone, and a wider scattering bottleneck at energies below 1 MeV.