Supporting Information for "Cross-Scale Modeling of Storm-Time Radiation Belt Variability "

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Additional Supporting Information (Files uploaded separately)

1. Description for Dataset S1

Text S1. We provide a brief description of the methods used to produce the bounce-averaged diffusion coefficients shown in Figure S1. The diffusion coefficients are calculated using a dipole magnetic field at L=4.12. We used the MLT-averaged density from (Sheeley et al., 2001) at the selected L-shell. Additionally, we assumed the density is constant with magnetic latitude. The wave amplitude was set to 100 pT. The wave spectrum was assumed to be a Gaussian between 0.05-0.55 f_{ce} and centered at 0.3 f_{ce}. The figure compares results from three separate calculations. The oragnge curve included

oblique wave propagation. The wave normal distribution was assumed to be a Gaussian distribution peaked at 0° with a width of 30° and a cutoff at 45°. The diffusion rates include resonance with $n = \pm 10$ cyclotron harmonics. The wave region extends to 20° magnetic latitude and the wave amplitude was held constant with latitude. The two other models calculated the bounce-averaged diffusion rates assuming the waves propagate parallel to the magnetic field. The dashed black curve maintained the wave region within within 20° magnetic latitude with constant wave amplitude, similar to the full calculation with oblique wave propagation. The solid black curve extended the wave region to 45° magnetic latitude and used a wave amplitude profile in magnetic latitude defines as: $f(\lambda_{MLAT}) = B_{W,eq} \exp\left[\left(\frac{\lambda_{MLAT}^2}{2\sigma}\right)^P\right]$,where $B_{W,eq}$ is the equatorial wave amplitude set at 100 pT, $\sigma = 0.4$, and $P = 2.5$.

Data Set S1.

References

Sheeley, B. W., Moldwin, M. B., Rassoul, H. K., & Anderson, R. R. (2001). An empirical plasmasphere and trough density model: Crres observations. *Journal of Geophysical Research: Space Physics*, *106*(A11), 25631-25641. Retrieved from `https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2000JA000286` doi: https://doi.org/10.1029/2000JA000286

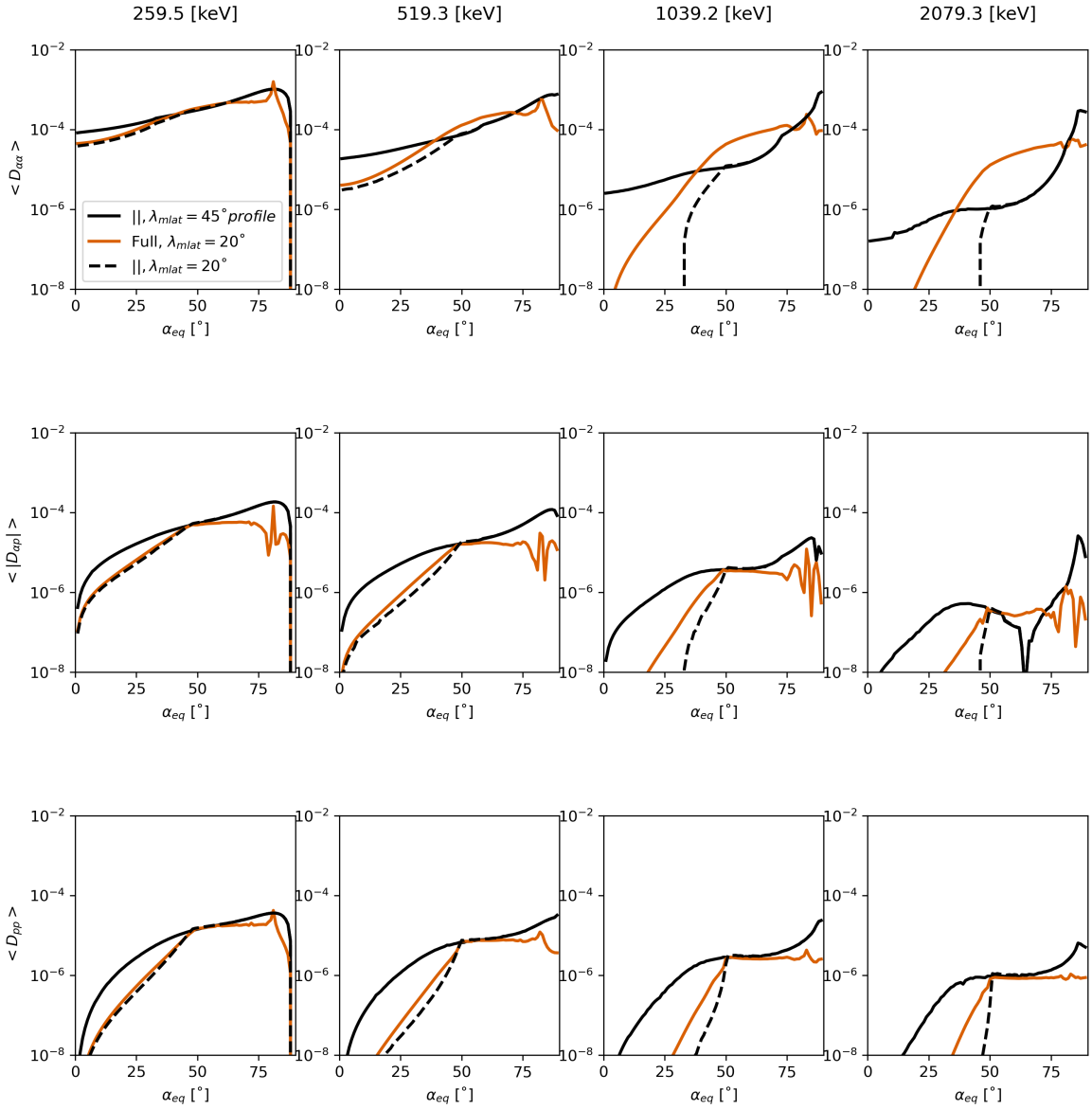

Figure S1. Bounce averaged diffusion coefficients as a function of equatorial pitch angle for resonance with lower band chorus waves. The orange curve shows the full calculation, which includes oblique wave propagation and accounts for resonance with ±10 harmonics and constant wave amplitudes within 20° magnetic latitude. The black curves shows the bounce-averaged diffusion rates assuming the waves propagate parallel to the magnetic field. The dashed black curve shows the results when the wave amplitudes are constant within 20° magnetic latitude. The solid black curve extends the wave region to 45° magnetic latitude using the profile described above.