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# Probability Distributions of Whistler-Mode Chorus Wave Amplitudes Observed in the Inner Magnetosphere

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Whistler-mode chorus waves are known to be important for local acceleration of radiation belt electrons in the inner terrestrial magnetosphere. Many predictive radiation belt simulations include whistler-mode wave-particle interactions using quasi-linear diffusion coefficients to quantify energy and pitch angle scattering.

Empirical diffusion coefficient amplitudes scale with wave power, which is often determined using the simple mean or root mean square (RMS) of spacecraft wave power observations in a given location (L-shell range and magnetic local time sector) for given geomagnetic conditions.

However, numerous researchers have observed that the distribution of whistler-mode chorus wave power in the inner magnetosphere peaks at low values ($\sim10^{-5}$ $nT^2$) with a strong tail toward high values (up to $\sim1$ $nT^2$). For strong-tail distributions, the mean or RMS often does not capture the central tendency of the distribution and may poorly describe the wave amplitudes encountered by a particle traversing the magnetosphere.

In this work, we use Van Allen Probes data to quantify the probability distributions of whistler-mode chorus wave power encountered by particles on closed drift paths in the inner magnetosphere. We estimate the number of times that a given particle samples each wave power distribution as well as the timescales over which the probability distributions evolve, and we compare distributions derived with and without considering wave power organization by plasmapause location.

Finally, we explore the use of observed wave power probability distribution functions to define empirical quasi-linear diffusion coefficients for radiation belt simulations.