

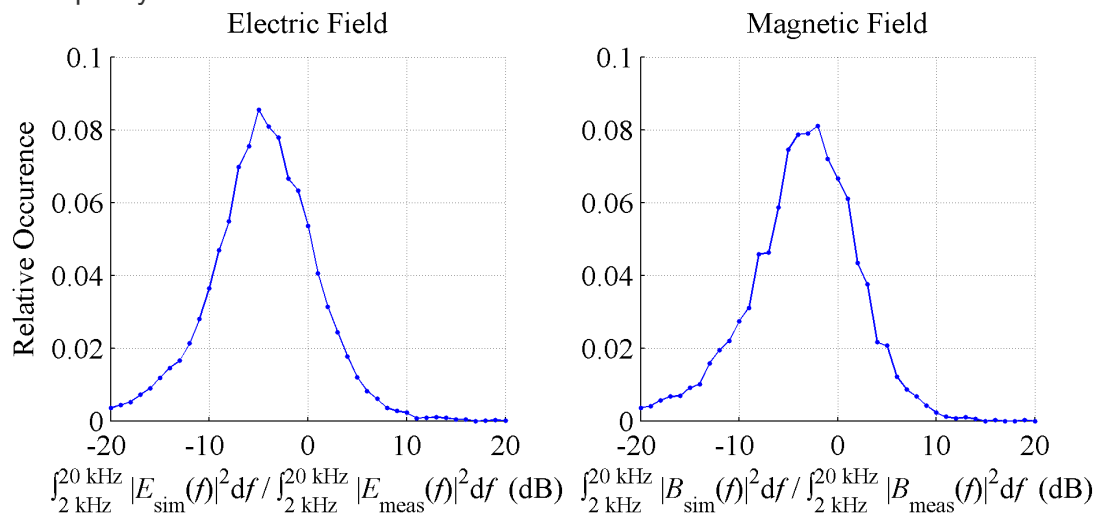
## AE31B-3415 Whistler Observations on DEMETER Compared with Full Electromagnetic Wave Simulations

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Nikolai Lehtinen

Wednesday, 17 December 2014 08:00 AM - 12:20 PM  
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Terrestrial Very Low Frequency (VLF) electromagnetic radiation, which strongly impacts the Van Allen radiation belt electron dynamics, is injected across the ionosphere into the Earth's plasmasphere from two primary sources: man-made VLF transmitters and lightning discharges. Numerical models of trans-ionospheric propagation of such waves remain unvalidated, and early models may have overestimated the absorption, hindering a comprehensive understanding of the global impact of VLF waves in the loss of radiation belt electrons. In an attempt to remedy the problem of a lack of accurate trans-ionospheric propagation models, we have used a full electromagnetic wave method (FWM) numerical code to simulate the propagation of lightning-generated whistlers into the magnetosphere and compared the results with whistlers observed on the DEMETER satellite and paired with lightning stroke data from the National Lightning Detection Network (NLDN). We have identified over 20,000 whistlers occurring in 14 different passes of DEMETER over the central United States during the summer of 2009, and 14,000 of those occurred within the 2000 km x 2000 km simulation grid we used. As shown in the attached figure, which shows a histogram of the ratio of the simulated whistler energy to the measured whistler energy for the 14,000 whistlers we compared, the simulation tends to slightly underestimate the total whistler energy injected by about 5 dB. However, the simulation underestimates the DEMETER measurements more as one gets further from the source lightning stroke, so since the signal to noise ratio of more distant whistlers will be smaller, possibly additive noise in the DEMETER measurements (which of course is not accounted for in the model) may explain some of the observed discrepancy.



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