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Lightning‐Generated Whistler Amplitudes Measured by the Van Allen Probes

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This talk will show a statistical analysis of both electric and magnetic field wave amplitudes of very low frequency lightning‐generated whistlers (LGWs) based on the equivalent of 11.5 years of observations made by the Van Allen Probes. We complement this analysis with data from the ground‐based World Wide Lightning Location Network (WWLLN) to explore differences between satellite and ground‐based measurements. We will discuss how LGW mean amplitudes were generally found to be low compared with other whistler mode waves even though there exists extreme events (1 out of 5,000) that can reach 100 pT and contribute strongly to the mean power below L = 2. We will reveal a region of low wave amplitude existing below L=2 thanks to the denser dayside ionosphere, which prevents the intense equatorial lightning VLF waves from propagating through it. Below L = 1.5 at all MLT, LGW amplitudes are found to be weak while the ground‐level lightning activity is maximal. This suggests a difficulty of lightning VLF waves to penetrate / propagate / remain at low L‐shells, certainly due at least to the denser ionosphere during daytime. On the contrary, the mean LGW magnetic power (or RMS) remains nearly constant with respect to L‐shell. We will explain that this is due to strong to extreme LGWs that dominate the wave mean power to the point of compensating the decay of LGW occurrence at low L‐shell. Even though extreme LGW were found to be very powerful, particularly at low L and during night, the mean electric/magnetic power remains low compared with other whistler waves. This implies that LGW resonant effects on electrons are consequently long‐term effects that contribute to “age” trapped inner belt electron populations.