



Occurrence Characteristics of Large Amplitude Whistler Mode Chorus Waves Observed by the Arase Satellite

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Whistler-mode chorus is electromagnetic waves in nature observed in the frequency range from 0.1 to 0.8 times of electron gyrofrequency, f_{ce} , and they frequently appear in the dawn and noon side magnetosphere [1]. Chorus waves often have a gap of wave power at $0.5 f_{ce}$, and the waves below and above $0.5 f_{ce}$ are called lower-band (LBC) and upper-band chorus (UBC), respectively. These waves have been considered as the primary driver of the electron dynamics in the Earth's inner magnetosphere, since they can resonate with electrons in the wide energy range and cause the acceleration and loss of these electrons [2].

Characteristics of the waves such as the wave normal angle, wave power, and their spatial distributions have been investigated using the data processed by Onboard Frequency Analyzer (OFA) [3], which is one of the receivers of the Plasma Wave Experiment (PWE) [4] onboard the Arase satellite. We have found that there are large amplitude (> 100 pT) tails in the occurrence frequency distributions of the wave magnetic field power of nightside LBC and UBC with wave vector close to the local magnetic field. The large amplitude tails appear near the magnetic equator, and the large amplitude waves are less frequently observed above the magnetic latitude of 10 degrees. The tails are not present in the occurrence frequency distributions of the wave power of the dayside LBC and UBC. The wave power occurrence frequency distributions of nightside LBC and UBC can be fitted well by a bimodal distribution.

To understand the cause of the bimodal occurrence frequency distributions, we first consider the occurrence characteristics of large amplitude waves. We have investigated when large amplitude LBC and UBC waves are observed by using the data from Medium Energy Particle experiment-electron analyzer (MEP-e) [5] and PWE. We have found that the large amplitude waves are accompanied by electron injections observed by MEP-e near the equator. Even though electron injections are observed by MEP-e at the off-equatorial region, large amplitude waves are not observed by PWE. Within the electron injection event near the equator, the amplitudes of LBC and UBC are highly fluctuated in the amplitude range from 1 pT to > 100 pT. Thus it is speculated that microscopic rather than macroscopic views may be important to understand the generation of large amplitude chorus waves.

References

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