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あらせ衛星観測に基づく磁気音波の空間分布解析

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Spatial Distribution of Magnetosonic Waves Observed by the Arase Satellite

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Magnetosonic waves are a type of plasma wave observed at frequencies below several hundred Hz and play a role in accelerating ions through wave-particle interactions. Investigating the characteristics and spatial distribution of magnetosonic waves is important for understanding energy transport processes in geospace. Magnetosonic waves are classified into two types based on the properties of their amplitude modulation: one is the structureless magnetosonic wave, which does not exhibit periodic amplitude modulation, and the other one is the rising tone magnetosonic wave which repeatedly shows a periodic amplitude modulation with a period of a few minutes. Several previous studies using Van Allen Probes data have conducted event analyses on these two types of magnetosonic waves. However, the factors contributing to their different spectral structures have not yet been clarified. In order to clarify them, we conduct a statistical analysis of the two types of magnetosonic waves using data obtained by the Electric Field Detector (EFD), a sub-instrument of Plasma Wave Experiment (PWE) aboard the Arase satellite. We examined 1546 events of magnetosonic waves from the electric field spectra obtained by PWE/EFD, using over five years data from March 2017 to January 2022, and investigated their occurrence frequency and average intensity distribution. We found that rising tone magnetosonic waves were mainly observed outside the plasmasphere while structureless magnetosonic waves were observed both inside and outside the plasmasphere. This suggests the presence of a clear boundary in the distribution of the two types of magnetosonic waves. In this presentation, we focus on the relationship between the characteristics of magnetosonic waves and the plasmapause location, as well as their correlation with geomagnetic indices, and discuss the factors that change the characteristics of magnetosonic waves.