

ABSTRACTS (MASTER THESIS)

Study of Electron Cyclotron Harmonic waves in the Earth's inner magnetosphere**(Graduate School of Engineering, Laboratory of Space Electromagnetic Environment Exploration, RISH, Kyoto University)****Airi Shinjo**

The present study focuses on Electron Cyclotron Harmonic (ECH) waves observed by the Arase satellite. ECH waves are commonly observed in the low latitude region just outside the terrestrial plasmapause. They are purely electrostatic and their frequency spectra show harmonic structures. The Arase satellite is equipped with the high-performance plasma wave receiver called PWE (Plasma Wave Experiments). They can observe the electric field waveforms with high time resolutions for a longer time period than that by former satellites. Utilizing this advantage, we examined new spectral features of the ECH. The most striking point in the newly found spectral features is that each harmonic spectrum shows further fine spectral structures. The time variation of each fine spectrum frequency is completely independent.

We applied a new method to estimating phase velocities of ECH waves using phase differences of waveforms observed by two monopole electric field antennas. This method is so-called "interferometry method." It is effective when the wavelength is in the same order of the length of the electric field antenna. The electric field data of the Arase satellite is two-dimensional. We estimated the direction of phase change by using the satellite spin dependence. Using this spin dependence, we calculated the phase velocity projected on the spin plane and converted it to the absolute value of the phase velocity. In addition, we attempted to estimate the temperature of low-energy electrons from the obtained phase velocities consulting linear dispersion relations of the ECH waves.

In conclusion, we succeeded in calculating the phase velocities and low energy temperatures by applying these methods to the ECH observed by the Arase.

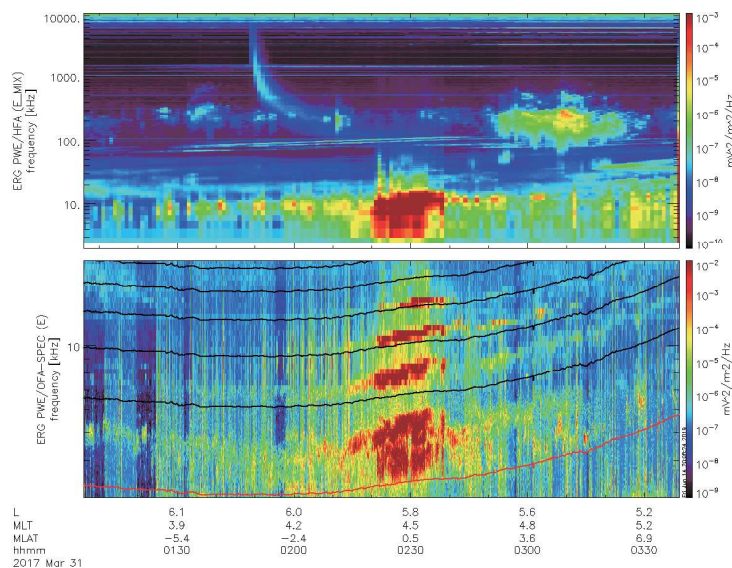


Figure 1. Frequency-time spectrogram of the ECH waves observed by the Arase satellite.