Radiation characteristics of upper-band and lower-band chorus emissions in the generation region deduced from the Arase observation

*Seigo Hayashi[1], Satoshi Kurita[2], Hirotsugu Kojima[2], Yoshiya Kasahara[3], Shoya Matsuda[4], Ayako Matsuoka[5], Iku Shinohara[4], Yoshizumi Miyoshi[6]

1. Undergraduate School of Electrical and Electronic Engineering, Kyoto University, 2. Research Institute for Sustainable Humanosphere, Kyoto University, 3. Graduate School of Natural Science and Technology, Kanazawa University, 4. ISAS/JAXA, 5. Graduate School of Science, Kyoto University, 6. Institute for Space-Earth Environmental Research, Nagoya University

Chorus waves are plasma waves that propagate along the geomagnetic field line. The waves are observed at frequencies below the electron cyclotron frequency (fce), and they often have a minimum in wave power at 0.5fce. Those observed above 0.5fce are called upper-band chorus (UBC), while those observed below 0.5fce are called low-band chorus (LBC). Chorus waves are excited near the magnetic equator and propagate to the polar region. Previous studies show that LBC frequently change their radiation direction within the generation region. However, the radiation characteristics of UBC in the generation region and the differences between UBC and LBC have not yet been clarified. The purpose of this study is to clarify the radiation characteristics of UBC and LBC in the generation region by analyzing the data obtained by the Arase satellite.
The Arase satellite has nine instruments on board. In this study, we use the background magnetic field data acquired by the MGF(Magnetic field experiment) and the electromagnetic waveform data acquired by the WFC (Waveform capture) of the PWE (Plasma wave experiment). Using the data acquired by the Arase satellite, we focused on the power spectrum of the electric and magnetic fields and the Poynting vector along the direction of the background magnetic field. Our results show that the Poynting flux ratio of northward to southward waves of UBC and LBC varies with the distance between the magnetic equator and the Arase satellite. Comparing the radiation direction of UBC with that of LBC, in many cases, we find that the generation region of these waves is located at the different directions relative to the satellite location. The results revealed by this study suggest that the radiation timing and generation region of UBC and LBC are different. We propose that the collection of localized UBC and LBC generation points forms the entire generation region of Chorus waves.

Keywords: Arase satellite, whistler mode, chorus, inner magnetosphere

