Propagation property of the Loran-C radio waves inside the plasmasphere

Hiroaki Okamoto[1]; Takayuki Ono[1]; Masahide Iizima[2]; Atsushi Kumamoto[3]; Jyunpei Uemoto[4]; Takahiro Ikeda[5]

[1] Department of Astronomy and Geophysics, Tohoku Univ.; [2] Geophysical Inst., Tohoku Univ.; [3] Tohoku Univ.; [4] Geophys Sci, Tohoku Univ; [5] Dept. Geophys, Tohoku Univ.

The result of Akebono PWS observation contains many signals from the ground transmitters of telecommunications and broadcasts. One of the most intense man-made signals observable inside the plasmasphere is ocean navigation system Loran-C at 100kHz. Due to the dispersion relation of whistler mode plasma waves inside plasmasphere region, when local cyclotron frequency is lager than 100 kHz, any radio wave with the frequency of 100 kHz is not observed by Akebono PWS system. There are two possible mechanisms of this phenomenon. First, the radio wave is damped near the electron cyclotron frequency due to the wave-particle interaction. Second, the radio wave with a propagation angle smaller than some cone angle cannot reach the satellite position.

In this study, we examined character of Loran-C wave in the plasmasphere by statistical analysis. We also examined the propagation property of whistler mode waves by using ray tracing method in cold plasma. It is reveals that the latter mechanism cannot cause this phenomenon. So, this result indicates that it is caused by cyclotron damping due to wave-particle interaction. Based on the present result, it is verified that the cut off feature of the Loran-C radio wave is usable to the determination of the electron temperature inside the plasmasphere.