RELATIONSHIP BETWEEN THE PLASMA WAVE AND THE ELECTRON DENSITY ESTIMATED FROM THE GEOTAIL SPACECRAFT POTENTIAL

K. Ishisaka[(1)], T. Okada[(2)], T. Miyake[(3)], H. Hayakawa[(4)], H. Matsumoto[(5)], T. Mukai[(6)]

[(1)] Toyama Prefectural University, 5180 Kurokawa, Kosugi, Toyama, 939-0398 Japan, E-mail : ishisaka@pu-toyama.ac.jp

[(2)] As (1) above, but E-mail : okada@pu-toyama.ac.jp

[(3)] As (1) above, but E-mail : miyake@pu-toyama.ac.jp

[(4)] Institute of Space and Astronautical Science, Sagamihara, Kanagawa, 229-8510 Japan, E-mail : hayakawa@stp.isas.ac.jp

[(5)] Radio Science Center for Space and Atmosphere, Kyoto University, Uji, Kyoto, 611-0011 Japan, E-mail : matsumot@kurasc.kyoto-u.ac.jp

[(6)] As (4) above, but E-mail : mukai@stp.isas.ac.jp

ABSTRACT

The electron density estimated from spacecraft potential has the plasma particles of low energy that the particle instruments cannot measure in the magnetospheric plasma. The low energy particle instruments (LEP) onboard Geotail spacecraft cannot measure the plasma particles less than 32 eV. We can obtain the low energy plasma distribution by comparing the electron density estimated from the spacecraft potential and the plasma density measured by the LEP. And we investigate the relationship between the low energy plasma distribution and the generation of plasma waves in the magnetosphere and the solar wind.

INVESTIGATION AND CONCLUSION

The spacecraft potential measured by single probe system onboard Geotail spacecraft correlates closely with the electron density surrounding the spacecraft. We have obtained an empirical formula to show their relation in the solar wind and almost all the regions of the magnetosphere, except for the high-density plasmasphere. The empirical formula is effective in the range of spacecraft potential from few volts up to 90 V, corresponding to the electron density from 0.001 to 50 /cc. The electron density estimated from spacecraft potential has the plasma particles of low energy that the particle instruments cannot measure in the magnetospheric plasma. The low energy particle instruments (LEP) onboard Geotail spacecraft cannot measure the plasma particles less than 32 eV. Therefore, We can obtain the low energy plasma distribution by comparing the electron density estimated from the spacecraft potential (N_s/c) and the plasma density measured by the LEP (N_LEP). N_s/c – N_LEP (= N_low) indicates the quantity of low energy plasma particle less than 32 eV. On the other hand, the generation of plasma waves depends on the energy of plasma particle. In particular we investigate the relationship between the low energy plasma distribution (N_low) and the generation of plasma waves in the magnetosphere and the solar wind.

When Geotail spacecraft was flying from the magentosheath to magnetosphere in the dayside and dawn side region, the intense plasma waves called chorus are clearly seen. At the same time that chorus generates, N_low is increased. Therefore, it seems that there is a good correlation between the low energy plasma distribution and plasma waves. In this study, we investigate the correlation between the N_low and plasma waves in the solar wind and the near tail magnetosphere. And we discuss that the plasma waves depend on the low energy plasma distributions using the measurements data of the spacecraft potential, the low energy particle instruments and the plasma wave instruments onboard Geotail spacecraft.