



## **Analysis of Electric Field observed near Sq Current System by S-310-44 sounding Rocket**

K. Ishisaka\*(1), T. Abe(2), A. Kumamoto(3), and M. Tanaka(4)

(1) Toyama Prefectural University, Toyama, Japan, e-mail: [ishisaka@pu-toyama.ac.jp](mailto:ishisaka@pu-toyama.ac.jp);

(2) Institute of Space and Astronautical Science (ISAS) / Japan Aerospace Exploration Agency (JAXA),  
Kanagawa, Japan; e-mail: [abe.takumi@jaxa.jp](mailto:abe.takumi@jaxa.jp)

(3) Tohoku University, Miyagi, Japan, e-mail: [kumamoto@stpp.gp.tohoku.ac.jp](mailto:kumamoto@stpp.gp.tohoku.ac.jp)

(4) Tokai University, Kanagawa, Japan, e-mail: [tanaka.m@tokai-u.jp](mailto:tanaka.m@tokai-u.jp)

The Sq current system occurs in the lower ionosphere in the winter daytime. The Sq current system is appeared the specific plasma phenomenon such as electron heating, strong electron density disturbance. Therefore, it is important to measure directly the DC electric field and the plasma waves in the ionosphere. The S-310-44 sounding rocket experiment was carried out at Uchinoura Space Center in Japan on January 2016 in order to investigate the unique phenomena near the Sq current focus. This rocket passed through near the Sq current system. In addition, scientific instruments that are equipped on this sounding rocket also operated normally. The electric field detector was able to observe the DC electric field up to 100 Hz and the waveform of the plasma waves up to 6400 Hz in the altitude from 100 km to 160 km. We also measured directly plasma in the ionosphere by the various scientific instruments onboard the S-310-44 sounding rocket. It was found that the electron temperature at the altitude from 100 km to 110 km was about 150 K larger than the background by using the fast Langmuir probe measurement. This high electron temperature was observed during the rocket ascent only. This phenomenon suggests an existence of electron heating region near the Sq current focus.

The DC electric field vector near the Sq current focus was calculated from electric field components observed using the double-probe method. It was found that the electric field was increasing up to about 10 mV/m with the westward component in a region where the electron temperature is high at the altitude of about 100 km. Then, the spectrum of AC electric field in the frequency range from 2 kHz to 3 kHz look to enhance at the altitude of about 100 km. This electric field component observes during the rocket ascent only. Therefore, it is possible that the electric field component is the plasma wave related to the Sq current system. We guess the large DC electric field and the spectrum of the VLF band electric field are related for the Sq current system.

In this study, we discuss about the generating mechanism of the Sq current system using the results of DC/AC electric field and other observation results.