



DC Electric Field and Plasma Waves Measurements near the Sq Current System by S-310-44 Sounding Rocket

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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 the center of the Sq current system. In addition, scientific instruments that are equipped on the rocket also operated normally. The electric field detector was able to observe the DC electric field up to 100Hz and the waveform of the plasma waves up to 6400Hz in the altitude from 100km to 160km. We also measured directly plasma in the ionosphere by the various scientific instruments onboard the S-310-44 sounding rocket.

In this paper, we report on the latest observation results on DC electric field and low frequency plasma wave spectrum by Electric Field Detector (EFD) which is one of scientific instrument onboard S-310-44 sounding rocket. The DC electric field intensity has been increased at the region, where existed Sq current focus. Next, 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 observe during the rocket ascent only. Therefore, it is possible that the electric field component is the plasma wave related to the Sq current system. 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 suggests an existence of electron heating region in the Sq current focus. Therefore we guess the large DC electric field and the spectrum of the VLF band electric field are related for the Sq current system.

Finally, we discuss about the generating mechanism of Sq current system using the result of the electric field and other observation result.