



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

Keigo Ishisaka,\*<sup>(1)</sup> Takumi Abe<sup>(2)</sup>, Atsushi Kumamoto<sup>(3)</sup>, Makoto Tanaka<sup>(4)</sup>  
Akimasa Yoshikawa<sup>(5)</sup> and Hiroki Matsushita<sup>(5)</sup>

(1) Toyama Prefectural University, Toyama, Japan

(2) JAXA/ISAS, Kanagawa, Japan

(3) Tohoku University, Miyagi, Japan

(4) Tokai University, Kanagawa, Japan

(5) Kyushu University, Fukuoka, Japan

The Sq current system occurs in the lower ionosphere in the winter daytime. The center of the Sq current system is appeared the specific plasma phenomenon such as electron heating, strong electron density disturbance. The S-310-37 sounding rocket experiment had been performed in the past, however it was not possible to observe the electric field component. Because the photoelectron emitted from the rocket surface exist around the rocket, and is affected the electric field measurement. It is very difficult to remove the influence of the photoelectron from the observed data. If it is possible to put the electrode of the electric field sensor outside of the region where there becomes the photoelectron around the rocket body, the influence of the photoelectron can be reduced. Therefore, the antennas need a length as long as possible to observe the electric field. Accordingly, the antennas of S-310-44 sounding rocket is 4m tip-to-tip that is twice as length than the antennas of S-310-37 sounding rocket. The purpose is to reduce the influence of the photoelectron moreover to measure the electric field more accuracy.

It was carried out S-310-44 sounding rocket experiment at 12:00 LT on January 15, 2016. 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 100 Hz and the waveform of AC electric field up to 6400 Hz in the altitude from 100 km to 160km. There was not seen the effect by photoelectron in the DC electric field data. Therefore, it is possible to investigate the plasma dynamics in the Sq current system. The observed DC electric field is included in the induced electric field ( $v \times B$  electric field) in addition to the natural electric field. The  $v \times B$  electric field is caused by the rocket to pass through the magnetic field. It is necessary to remove the  $v \times B$  electric field from the observed data in order to determine the electric field vector near the Sq current system. The  $v \times B$  electric field is calculated by using the attitude of the rocket and the magnetic field data from the IGRF. Consequently, we could obtain the vector of DC electric field along the trajectory of S-310-44 sounding rocket. The electric field vector seems to increase at the altitude near the Sq current system. Then, AC electric field in the frequency range from 2 kHz to 3 kHz look to enhance at the altitude of about 100 km. This AC electric field component observe during the rocket ascent only. Therefore, it is possible that the AC electric field component is the plasma wave related to the Sq current system.

In this presentation, we will describe the DC electric field vector and AC components obtained by S-310-44 sounding rocket. Then, we discuss about the generating mechanism of Sq current system using the result of the electric field and other observation result.