

Estimation of electron density in the lower ionosphere by Medium Frequency Receiver onboard S-310-33 rocket

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S-310-33 rocket was launched at Uchinoura Space Center (USC) at 0:30 a.m. (LT) on January 18, 2004. The main purpose of this rocket experiment is to investigate a generation mechanism of the wavelike structure of airglow.

For achieving this main purpose, it is very important to obtain the electron density profile. The electron density profile was observed by using Fast Langmuir Probe (FLP) onboard the rocket. FLP observed only an altitude higher than about 70km which decreased atmospheric friction.

We loaded Medium Frequency Receiver (MFR), which consists of loop antenna, preamp and detector. We observed two propagation characteristics of MF radio waves, the non-directional beacon (NDB) for navigation at Kanoya air base (238kHz) and NHK Radio Broadcast 2nd channel in Kumamoto (873kHz), between the ground and the ionosphere. The loop antenna was deployed at 61 seconds after the launch, and we found the reflecting altitude at about 80 seconds after the launch. By analyzing the propagation characteristic up to the reflecting altitude, MFR can presume the electron density profile lower altitude than about 70km. We use MF radio wave absorption method in this analysis. This is the method of assuming and correcting the electron density profile by comparing the observed radio wave intensity with that calculated by the Full Wave method.

In addition, the electron density profile was estimated by the ground observation using Yamagawa MF radar at the same time. By comparing Yamagawa MF radar with MFR and FLP, we can obtain the information to improve the precision of electron density measurements with MF radar, and we can verify the usefulness of each observation method.