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PEM29-P16 Room:Convention Hall Time:May 22 18:15-19:30

Changes of the electron temperature in the region of high electron with Fixed Bias Probe on the S-310-40 Sounding Rocket

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The electron temperature and electron density are important parameters as the basic characteristics of the ionospheric plasma, which has been observed by the sounding rocket, scientific satellite and ground-based radar for several decades. However, there are many unresolved problems about spatial distribution and temporal variation of the plasma. The S-310-40 sounding rocket was launched from Uchinoura Space Center at 23:48:00 on December 19, 2011 to investigate high-density plasma layer in the nighttime lower ionosphere, which can cause extra ordinal propagation of Medium Frequency radio wave. Among eight onboard instruments, Fixed Bias Probe (FBP) measures incident current to the probe in high time resolution, which is suitable to observe small-scale electron density perturbation. Fast Langmuir Probe (FLP) measures the current-voltage relationship of a cylindrical probe with a length of 200 mm and a diameter of 3 mm.

The electron density and temperature were derived from the current-voltage relationship through the rocket flight. The altitude profile of the electron density shows an existence of the high electron density layer at the altitude of ˜100 km. A comparison with the ordinal sporadic E layer suggests that electron density inside the high density layer are not as large as sporadic E. The electron temperature inside the high density layer is observed to be 20 % lower than that in the surrounding region. In addition, the thickness of the layer is 2-3 times larger than the averaged thickness of the sporadic E layer. Therefore, the high density layer seems to have different feature compared to well-known sporadic E layer. In order to confirm this result and also to investigate the detailed energy distribution of electrons, we try to evaluate validity of fitting procedure to the current-voltage relationship obtained inside the high-density layer.

In the past, data points above the noise level in the probe current were used to estimate the electron temperature by evaluating a gradient of the electron current in the semi-logarithmic plot. The electron density was calculated by evaluating the electron saturation current in addition to a retarding region of the electron current. However, when the electron energy distribution is different from Maxwellian and has different gradient depending on the electron energy, the estimated temperature may be different from a real value. Therefore, we have tried to analyze a variation pattern of the electron current with the probe voltage in the retarding region. In this presentation, we report a result of the detailed evaluation and discuss an interpretation of the result.