

# **Estimation of electron density profile in ionospheric D and lower E region by Rocket observation and Full wave analysis of LF and MF radio waves**

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Electrons in ionospheric D region are closely related to neutral dynamic meteorology and chemistry including such as hydrated ion and NO<sub>x</sub>, though the electron density is very small, about ten – several thousand /cc. Therefore, it has the possibility to find a new physical knowledge in mesosphere and lower ionosphere.

Radio wave propagation characteristics in ionospheric D and lower E region are affected by an electron density profile. As a inverse problem, the electron density profile can be estimated by radio wave propagation characteristics measured by a sounding rocket.

S-310-33 sounding rocket was launched at Uchinoura Space Center (USC) at 0:30 a.m. (LT) on January 18, 2004. We observed magnetic field intensities of two radio waves transmitted from Kanoya air base (238kHz) and NHK Kumamoto 2nd ch. (873kHz) by using radio wave receivers onboarded the rocket. Both of the magnetic field intensities were absorbed suddenly at 89km altitude.

The propagation characteristics in the ionosphere are calculated by using Full wave method. It needs the electron density profile previously to calculate the propagation characteristics by Full wave method. The electron density profile is estimated by according the radio wave propagation characteristics calculated by Full wave analysis with the observed one. This estimation technique is called radio wave absorption method.

We found the thin ionospheric layer of about 1km at the altitude of 89km. The electron density in this region is  $2.6 \times 10^3$  /cc. The electron density compared with one at 88km, it was large number more than three times or more at least.