

# Electron density observation by Yamagawa MF radar during WAVE2004 campaign-examination on the collision frequency -

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On January 1st, 2004, a rocket (S-310-33) was launched to reveal the feature of wave-like structure in the MLT region. Fast Langmuir Probe and Medium Frequency Receiver on the rocket observed the electron density. Yamagawa MF radar also observed winds and electron density during this campaign. In this study, we notice the collision frequency between electrons and neutrals, and try to improve the accuracy of derivation of the electron density for better comparisons between the rocket data and MF radar data.

The methods to estimate electron density from partial reflection of medium or high frequency radio wave from the ionospheric D-region was proposed in 1950s and established in 1970s. These methods, which are applied for MF radar observations, are called differential absorption experiment (DAE) or differential phase experiment (DPE), and are still used without significant improvements though many years have passed. Recently our knowledge about the mesosphere and lower thermosphere has increased, and the observational technique has developed. Now it will be possible for us to improve these methods to increase the accuracy of derivation of the electron density.

In this study, we notice the collision frequency between electrons and neutrals, which is needed in the calculation of the refraction ratio to derive the electron density. The present model of the collision frequency is very simple and is proportional to the atmospheric pressure. Vuthaluru et al. [2002] estimated the collision frequency using Buckland Park MF radar in Australia, and showed that the derived one was larger than the present simple model. We will estimate the collision frequency using Yamagawa MF radar and try to build a new model. Applying a developed DAE method, it will be possible to compare rocket data and MF radar data with accuracy.