

NEI experiment on-board S310-35 rocket during the DELTA campaign

Makoto Wakabayashi[1]; Takayuki Ono[1]

[1] Department of Astronomy and Geophysics, Tohoku Univ.

The rocket campaign DELTA (Dynamics and Energetics of the Lower Thermosphere in Aurora) was carried out on 13 December 2004 in Norway. The sounding rocket S310-35 was launched at 0:33 (UT) to measure the ionospheric plasma and neutral gasses during the diffuse aurora. Ground-based observations were simultaneously carried out by using EISCAT radar and Fabry-Perot interferometer during the rocket flight. This campaign aimed to clarify the driving factor of strong neutral wind, in particular, horizontal wind. The new experiment of this campaign is the measurement of neutral (N₂) temperature which is planned to measure the neutral atmospheric heating due to the auroral precipitation or joule heating. It is possible to discuss the physical process of atmospheric heating and effect on the driving wind system. Because the neutral temperature measurement (NTV) uses an electron beam, the rocket payload is designed to be separated during the flight to avoid any interference to other passive instruments.

Electron number density measurement was carried out by using the NEI instrument on-board the S310-35. NEI is the impedance probe which is developed by Oya [1966]. The NEI instrument was improved for this campaign with regard to an interference from the NTV experiment. The NEI sensor was BeCu ribbon antenna, and extended at X+65 sec (65 sec after launch). During the ascending period, electron density enhancements were observed in the altitude ranges from 100 to 110 km and from 125 to 130 km with the electron densities of about $1 \times 10^6/\text{cc}$ and $6 \times 10^5/\text{cc}$, respectively. In the descending phase, electron density enhancement is in the altitude range from 108 to 115 km, and there are many periodic density fluctuations due to the rocket wake.

These electron density enhancements seems to be associated with the enhancement of neutral temperature or auroral altitude. It is interesting to compare with the other observation results during the DELTA campaign not only the on-board instruments but also ground-based instruments as the EISCAT radar.