# Electron density fluctuations induced by atmospheric gravity waves in the MLT region

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In this study, we investigate the relationship between electron density fluctuations and atmospheric gravity waves in the MLT region, which is corresponding to the ionospheric D region. The main source of the ionization in this region is NO, and the major ion above the ~80 km altitude is NO+. It is known that chemical reactions are important below 80 km altitude and that hydrated ions are major species at the bottom of the D region. Because the dissociative recombination rate between electrons and hydrated ions is much faster than the ionization of NO, the electron density is depressed below ~80 km altitude.

Sugiyama [1988] suggested that the ion-chemical reaction involving ion hydrates is very sensitive to temperature fluctuations in this region (at about 80 km altitude), and that the electron density fluctuations which are much larger than those expected from NO variations can be caused by gravity wave-induced small temperature variations. In the Poke Flat MF radar observation in 18-22 UT on February 28, 1999, electron density fluctuations can be seen with phase propagating upward at about 80 km altitude. Simultaneously, a gravity wave whose period is about 5 hours and the vertical wave length is about 14 km is found from the wind velocity data. The electron density fluctuation (Ne'/Ne) is about 59%, and this value is quantitatively agreed with the estimated one based on Sugiyama model.

In this presentation, we calculate the correlation coefficients between the electron density and the wind velocity (zonal and meridional components), and investigate where, when, and how often the electron density variations caused by the gravity waves are observed. High correlation coefficients are often derived at around 80km altitude, especially in the region where high correlation between zonal and meridional winds can be seen. We can determine the propagating directions of gravity waves from the relation between electron density and wind velocity variations. It might be possible to study the statistical feature of gravity wave propagation using MF radars.