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Periodic variations for several hours of neutral temperature observed with the sodium LIDAR at Tromsø

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We have been studying atmospheric dynamics of the polar Mesosphere and Lower Thermosphere (MLT) with EISCAT (European Incoherent SCATter) radar, MF radar, and meteor radar located at the EISCAT Tromsø site (69.6 deg. N, 19.2 deg. E). For the further improvement of our knowledge regarding mesospheric/lower thermospheric dynamics at high latitudes, we installed a new sodium LIDAR at the same site. The new sodium LIDAR is available for obtaining height-resolved temperature as well as wind velocity in the upper mesosphere and lower thermosphere. The neutral temperature of the upper atmosphere is one of the important parameters to understand contributions of the atmospheric waves such as gravity and tidal waves to the MLT coupling process.

Since 1 October 2010, the sodium LIDAR observations have been conducted for about 8 weeks. In total, we succeeded in obtaining the temperature data for about 180 hours. One of the notable advantages of this LIDAR is high time resolution of 10-20 minutes, which enable us to study oscillations like gravity waves and tides in the upper mesosphere and the lower thermosphere. Of particular interest in the temperature variations is clear downward phase propagation appeared on 29 October 2010. The oscillation period is about 4-hours, and its vertical wavelength is about 10 km. The amplitude at 90 km is about 15 K. Several events with downward phase propagation are observed in January 2011.

The presentation will show the observational results of these oscillations. Comparisons with periodic variations of wind velocity observed with the MF radar will be also shown.

Keywords: sodium LIDAR, Atmospheric gravity wave, Tromsø, Mesopause and Lower Thermosphere, EISCAT, variation of temperature