#106 Received 01/20/2015

Zabotin, Nikolay[1]; Bullett, Terence[1]; Rietveld, Michael[2]; Godin, Oleg[1]; Negrea, Catalin[1]; Zabotina, Liudmila[1]
1. University of Colorado Boulder
2. EISCAT Scientific Association

**A Study of Thermospheric Gravity Wave Activity Based on the Analysis of Tromsø and Wallops Island Dynasonde Data**

Abstract:
Propagation conditions for thermospheric gravity waves are much dependent on geographic location. In the Polar Regions, these are characterized by combination of several unique factors including interactions with the auroral activity and the polar vortex. Tropospheric sources of the gravity waves, such as wind disturbances caused by mountain relief, are likely to be complemented by energy and momentum depositions associated with fluxes of energetic particles from above.

We apply recently developed Dynasonde techniques to study peculiarities of the gravity wave characteristics over Northern Scandinavia and compare them to those at mid latitudes. A week-long (adjacent to the summer 2014 Solstice) data series for this study has been obtained with the Dynasonde system at the EISCAT's Tromsø Observatory operating continuously with sounding session periodicity equal to 2 min. A component of Dynasonde data analysis software, the inversion procedure NeXtYZ, has been used to attribute plasma density, plasma contour tilts, and line-of-sight Doppler values to the altitudes in real space with 1 km resolution. The temporal and spatial resolution allows visualization of the phase fronts of the traveling ionospheric disturbances (TIDs) and measuring the full set of parameters (both vertical and horizontal) of TID activity in the upper atmosphere between the base of the E layer and the maximum of F layer, where the radar's signal can be reflected by the ionospheric plasma.

We verify the nature of the activity by substituting the TID parameters into the dispersion relation describing acoustic-gravity waves. In addition, our analysis yields statistics of the directions of propagation of the prevailing TIDs over the Tromsø location, and application of the Lomb-Scargle periodogram technique to the tilt data provides useful insight into the dynamics of spectral composition of the TIDs, which we compare to results of a similar analysis obtained for mid-latitude (Wallops Island, VA) Dynasonde location. With background atmospheric parameters taken from the Whole Atmosphere Model developed at SWPC select waves are backtracked to their apparent source locations using a ray tracing technique.