



## **Long term lidar observations of temperatures and waves in the polar atmosphere at the ESRANGE**

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Atmospheric gravity waves have been subject of intense research for several decades due to their enormous impact on the atmospheric circulation and on the temperature structure. Excitation and penetration of gravity waves crucially depends on the background wind field. In particular different wind directions in the troposphere and the stratosphere can cause critical levels which prevent gravity waves from further penetration. While commonly the winter polar atmosphere is transparent for gravity waves, the polar atmosphere during summer prevents wave propagation. Thus the gravity wave activity varies with season in polar latitudes. Gravity waves can easily be seen in atmospheric temperature profiles measured e.g. by lidar. The U. Bonn lidar at the ESRANGE is located close to the Scandinavian mountain ridge which is a major source of orographically induced gravity waves. Since January 1997 we performed measurements regularly during polar winter and summer. During the last eight years there were 15 measurement campaigns leading to a large data base of atmospheric temperature profiles. The analysis of this comprehensive data set shows clearly large differences in the gravity wave activity by about one order of magnitude - measured by the gravity wave potential energy density - between summer and winter. The larger gravity wave activity during winter can also be seen in the larger variability of stratopause altitude and temperature which is in contrast very small during summer. Finally the wave activity shows an exponential decrease during the last eight years with a half-life period of about four years.