



## Wintertime gravity waves over northern Sweden from 18 years of Esrange Lidar data

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The structure of the polar winter stratosphere is strongly affected by gravity waves. Gravity waves have been linked to the formation of the polar winter stratopause and drive the inter-hemispheric circulation in the mesosphere.

The Esrange lidar has been operated regularly at Esrange Space Center ( $68^{\circ}\text{N}$ ,  $21^{\circ}\text{E}$ ) in northern Sweden since January 1997. For this study we analyzed more than 200 measurement nights that were conducted between November and March. The resulting statistics cover a time period of 18 years.

We calculated temperature profiles at heights from 30 up to 80  $\text{km}$  height by means of the integration technique and determined deviations from the background temperature. From these temperature deviations, we can obtain wave properties like the vertical wavelength of the observed gravity waves. Additionally, we determined the height of the stratopause and the gravity wave potential energy density (GWPED). These parameters are analyzed to gain insight into their seasonal variation as well as their correlation to the meteorological background situation. The relationship between GWPED and stratospheric warmings is examined more closely as well as how the GWPED changes in the presence of the polar vortex. We also compare our results to other published lidar observations in order to determine geographically induced differences.