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Seasonal cycle of Gravity Wave Potential Energy Density from Lidar and satellite observations at 54^{o}N and 69^{o}N

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Gravity waves (GW) play an important role in transporting energy and momentum and in influencing the general circulation and the thermal structure of the atmosphere. Ground-based observations of gravity waves are used as benchmark in the theoretical and modeling concepts under the framework of Transregio project (TRR181). In this study, we present new experimental results.

We compare the climatology of the Gravity Wave Potential Energy Density (GWPED) retrieved from temperature fluctuations, observed by two lidar systems, located in Kühlungsborn, Germany (54^{o}N, 11^{o}E) and in Andenes, Norway (69^{o}N, 16^{o}E). Both lidars have the unique capability of measuring during both day and night covering an altitude range from 30 to 80 km. We applied three methods to calculate the GWPED for the years 2012-2016, namely: by subtracting a constant mean background, temporal and vertical filtering with a 5^{th} order high-pass Butterworth filter.

From latitudinal comparison, we found that GWPEDs are similar at both locations. While a seasonal behavior is clear in the vertically filtered data with a winter to summer ratio of 3, such behavior is not pronounced in the temporally filtered data obtained at either of the locations. Comparisons of our data to SABER observations reveal good qualitative and quantitative agreement.