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Characteristics of wave structures derived from lidar measurements

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A daylight capable Rayleigh-Mie-Raman (RMR) lidar is in operation since summer 2010 at the mid-latitude station at Kühlungsborn (54° N, 12° E). The RMR lidar system is used for measuring wave structures at day and night to investigate short and long periodic atmospheric waves, like gravity waves (GW) and thermal tides (with diurnal, semidiurnal and terdiurnal components). About 6150 h of data have been acquired so far, with each sounding lasting for at least 6 h. For such long lasting data sets the general problem is the separation of the different wave contributions from the observed superposition of GW, tides or even longer periodic waves in the time series of temperature profiles. For extracting wave induced temperature deviations the most common method is to calculate these from the daily mean. Using this method the daylight capability allows the characterization of tides for a long lasting measurement. We will present the variability of tidal amplitudes on scales of days that are not represented in monthly averages. Because short periodic GW can at least partly hide behind those temperature deviations induced by tides, we use spectral filter methods for extracting GW induced temperature deviations. We will show a comparison of different methods with regard to gravity waves. GW activity and characteristics are derived in an altitude range between ∼30 and ∼70 km. The results demonstrate that the gravity wave potential energy density (GWPED) strongly depends on the used filter method. The contribution of different spectral ranges to the total GWPED will be presented.