



Seasonal variation of middle atmosphere temperatures at 69N above ALOMAR in Northern Norway

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The ALOMAR Rayleigh/Mie/Raman lidar, located at 69° N in Northern Norway, measures relative density profiles and aerosol particles and derives temperatures in the stratosphere and mesosphere. It is operated year-round whenever permitted by the weather. Since there are two months of midnight sun around summer solstice at the lidar site, the instrument was designed to operate even during daytime when the atmosphere is illuminated by the sun. The useful signal consisting of backscattered laser light is separated during daytime from scattered sunlight by using spectral filters optimised to the highly stabilised lasers and a small field of view of the receiving telescopes. This technical design together with a dedicated crew of operators allow us to collect 500 h–1100 h of lidar observations per year, on average one profile every fourth day. Assuming hydrostatic equilibrium, the measured relative density profiles are converted to temperature profiles in the aerosol-free part of the middle atmosphere above 30 km through integration of the density profile. We will present the seasonal variation of the daily-mean temperatures in the upper stratosphere and mesosphere above the ALOMAR observatory. The temperature field will also be compared to the MSISE90 and Lübken1999 reference atmospheres. Combining temperature data from the RMR lidar in the middle atmosphere with Lübken1999 temperatures in the summer upper mesosphere and ECMWF temperatures below 30 km, a temperature climatology for the ALOMAR site is presented that spans the entire lower and middle atmosphere. Stratopause heights and temperatures are calculated from RMR lidar temperature profiles as well. The variability of temperature and stratopause parameters is investigated to find suitable times for the detection of solar-cycle influences.