Mesoscale variability of the aerosol distribution as determined from ceilometer measurements

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The spatial distribution of aerosol particles is relevant for studies on the radiation budget, for the verification of chemistry transport models, or for air quality studies just to name a few. As the distribution is highly variable the requirements to measurements are very demanding. As a consequence it is often assumed that the aerosol distribution is "relatively homogeneous", i.e., measurements at one site are representative for a larger area.

By exploiting 2 years of measurements from 12 ceilometers located in the area of Munich and Berlin, Germany, we have investigated the spatial differences between locations separated between 3–km and 50–km. For this purpose we have used the mixing layer height (MLH), a quantity often used when the vertical aerosol distribution should be described by a single parameter. The MLH was determined by the COBOLT-algorithm (Geiß et al., 2017). It was found that the MLHs at different locations inside the two cities are highly correlated and agree within a few tens of meters. However, the maximum extension of the mixing layer from April to September was found to be significantly larger in Berlin compared to Munich.