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Performance Statistics of the DWD Ceilometer Network

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The DWD ceilometer network was created in 2008. In the following years more and more ceilometers of type CHM15k (manufacturer Jenoptik) were installed with the aim of observing atmospheric aerosol particles. Now, 58 ceilometers are in continuous operation.

The presentation aims on the one side on the statistical behavior of a several instrumental parameters which are related to the measurement performance. Some problems are addressed and conclusions or recommendations which parameters should be monitored for unattended automated operation. On the other side, the presentation aims on a statistical analysis of several measured quantities. Differences between geographic locations (e.g. north versus south, mountainous versus flat terrain) are investigated. For instance the occurrence of fog in lowlands is associated with the overall meteorological situation whereas mountain stations such as Hohenpeissenberg are often within a cumulus cloud which appears as fog in the measurements.

The longest time series of data were acquired at Lindenberg. The ceilometer was installed in 2008. Until the end of 2008 the number of installed ceilometers increased to 28 and in the end of 2009 already 42 instruments were measuring. In 2011 the ceilometers were upgraded to the so-called Nimbus instruments. The nimbus instruments have enhanced capabilities of coping and correcting short-term instrumental fluctuations (e.g. detector sensitivity).

About 30% of all ceilometer measurements were done under clear skies and hence can be used without limitations for aerosol particle observations. Multiple cloud layers could only be detected in about 23% of all cases with clouds. This is caused either by the presence of only 1 cloud layer or that the ceilometer laser beam could not see through the lowest cloud and hence was blind for the detection of several cloud layers. 3 cloud layers could only be detected in 5% of all cases with clouds.

Considering only cases without clouds the diurnal cycle for the occurrence of clear skies can be assessed. Most clear skies occur during night time and the minimum occurrence is about 14:30 UTC. This is can be explained by typical daily meteorological cycle where the strongest convection appears in the afternoon and that clouds are dissolving during night-time.

Furthermore a statistical investigation of reasons for measurement gaps will be presented. Such reasons could be measurement errors, technical problems or just gaps due to regular maintenance of the instruments.