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Aerosol estimation by a Ceilometer for comparison with data achieved by unmanned aerial vehicles.

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The project Smart Air Quality Network (SmartAQnet) tries to produce a dataset on aerosol load exemplarily in the city of Augsburg as a basis for short and long term planning for reducing the health risk. Particularly the Focus lies on the combination of existing data with a network of mobile measurements with low-cost sensors, to receive area-wide data. A part of the mobile particulate matter measurements is made with unmanned aerial vehicles (UAV) to assess the plausibility of the low cost measurements in the three-dimensional dynamic of the boundary layer. Also continuous measurements with a Ceilometer (CL51, Vaisala) should extend the three-dimensional measuring data.

Ceilometers have been used quite often for air quality studies. Here in particular the determination of the mixing layer height (MLH) plays a role, because it is a measure for the vertical turbulent exchange within the boundary layer and therefore also for the particulate matter concentration near ground. However additionally particulate matter concentration can be derived by the ceilometer backscatter. In this work, not only ground-based in-situ measurements of the aerosol load should be correlated and compared with the backscatter signal of the Ceilometer, but also vertical particulate matter profiles measured by a Alphasense OPC-N2 and a Light Optical Aerosol Counter (LOAC, Meteomodem) on a UAV. The aim is to validate the accuracy of aerosol profiles determined by the Ceilometer in order to achieve a monitoring of the vertical aerosol distribution continuously over time and later to explain its temporal variability.