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# Calibration of the Met Office Ceilometer Network using the Cloud Method

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Ceilometers are single wavelength, low-power lidars. Several hundred ceilometers are currently deployed across Europe; their main application has been to record a diagnosed cloud base height determined by the manufacturer-specific algorithm. Recent studies have shown that the full vertical profile of attenuated backscatter observed using ceilometers might be used in a more quantitative way. Observations of the boundary layer and the presence of clouds and aerosols are key in furthering the understanding of air pollution and its health impacts, cloud and aerosol interactions, aerosol mixing and transport, and in reducing the error and uncertainty in numerical weather prediction. Ceilometer networks provide a cheap, reliable and continuous data source which many national meteorological services already have in place. These new potential applications of ceilometers have highlighted the need to ensure they are accurately calibrated.

A simple and robust method has been devised to calibrate ceilometers based on the cloud calibration technique originally developed by O'Connor et al. (2004) which relies on the fact that the lidar ratio of liquid water clouds is a known constant. This new method can be run operationally, removing unsuitable profiles where the cloud does not fully attenuate the ceilometer beam. Examples will be shown using data from the Met Office network. This UK network comprises 42 ceilometers from two manufacturers, Vaisala and Jenoptik (now manufactured by Lufft). By taking into consideration possible issues such as instrument saturation (in the Jenoptik instruments), the window transmission and by accounting for the attenuation of the ceilometer beam by water vapour (in the Vaisala instruments), we show that ceilometers from different manufacturers can be successfully calibrated using this method.

The Met Office ceilometer network has been calibrated using this new technique with typical calibration coefficients estimated to be accurate to within 8-10%. For example, the Middle Wallop Vaisala ceilometer has a calibration coefficient of $1.5 \pm 0.13$. The calibration is shown to be stable over periods of more than a year. As a result, we have a reliable, quantitative and continuous data source of vertical backscatter profiles covering the UK.