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Effects of relative humidity on aerosol light scattering and its importance for the comparison of remote sensing with in-situ measurements

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In the field, in-situ measurements of aerosol light scattering are often performed under dry conditions (relative humidity RH $<$ 30-40%) which differ from the ambient ones. Since ambient aerosol particles experience a hygroscopic growth at enhanced RH, their micro physical and optical properties - especially the aerosol light scattering - are strongly dependent on RH. The knowledge of this RH effect is of eminent importance for climate forcing calculations or for the comparison of remote sensing with in-situ measurements.

Here, we will present results from the Cabauw Intercomparison Campaign of Nitrogen Dioxide measuring Instruments (CINDI, June-July 2009, Cabauw, The Netherlands). During this campaign different remote sensing and in-situ instruments were used to derive atmospheric parameters mainly NO_2 but also aerosol properties. The aerosol in-situ measurements were performed in the basement of the Cabauw tower (inlet height 60 m). The aerosol scattering coefficient was measured dry and at various, predefined RH conditions between 20 and 95% with a recently developed humidified nephelometer (WetNeph) and with a second nephelometer measuring at dry conditions. In addition, the aerosol absorption coefficient was measured by a multi-angle absorption photometer (MAAP). This combination of measurements allows the determination of the aerosol extinction coefficient at ambient RH.

Three MAX-DOAS (multi-axis differential optical absorption spectroscopy) instruments retrieved vertical profiles of the aerosol extinction coefficient during CINDI. The retrieved aerosol extinction corresponding to the lowest profile layer can now be directly compared to the in-situ value, which is now re-calculated to ambient RH.