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Calibration of LACIS as a CCN detector and its use in measuring activation and hygroscopic growth of atmospheric aerosol particles

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Abstract. A calibration for LACIS (Leipzig Aerosol Cloud Interaction Simulator) for its use as a CCN (cloud condensation nuclei) detector has been developed. For this purpose, sodium chloride and ammonium sulfate particles of known sizes were generated and their grown sizes were detected at the LACIS outlet. From these signals, the effective critical super-saturation was derived as a function of the LACIS wall temperature. With this, LACIS is calibrated for its use as a CCN detector. The applicability of LACIS for measurements of the droplet activation, and also of the hygroscopic growth of atmospheric aerosol particles was tested. The activation of the urban aerosol particles used in the measurements was found to occur at a critical super-saturation of 0.46% for particles with a dry diameter of 75 nm, and at 0.42% for 85 nm, respectively. Hygroscopic growth was measured for atmospheric aerosol particles with dry diameters of 150, 300 and 350 nm at relative humidities of 98 and 99%, and it was found that the larger dry particles contained a larger soluble volume fraction of about 0.85, compared to about 0.6 for the 150 nm particles.

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