



LExNo - Hygroscopic growth and activation of laboratory-generated aerosol particles imitating combustion aerosols

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In November 2005, the measurement campaign LExNo (LACIS Experiment in November) was conducted at the ACCENT infrastructure site LACIS (Leipzig Aerosol Cloud Interaction Simulator). The goal of this campaign was to study the hygroscopic growth and activation of laboratory-generated model aerosol particles that imitate an aged biomass burning aerosol.

The aerosol particles were produced by a spark generator (Palas, GfG 1000) and subsequently coated with ammonium sulphate and/or levoglucosan (a tracer for the combustion of cellulose) by means of two furnaces. The mobility diameters of the generated particles were determined by means of two DMAs, i.e. before and after coating.

During LExNo, the following measurements were carried out: Two aerosol mass spectrometers were used to measure the particle composition, i.e. the amount of soot, ammonium sulphate and/or levoglucosan in the particles. Hygroscopic growth factors were determined by means of a high humidity HTDMA that measured up to relative humidities of 98% (Hennig et al. (2005)). The critical super-saturations needed for the activation of the particles into cloud droplets were measured with LACIS running under super-saturated conditions (Stratmann et al. (2004)), with two Wyoming type CCN counters (Snider et al. (2003)) and with a DMT continuous flow CCN counter (Roberts and Nenes (2005)). For all experiments the mobility diameter of the particles was selected with a DMA. Vacuum aerodynamic diameters of the particles were determined with the Low Pressure Impactor (LPI) and with two Aerodyne mass spectrometers (e.g. Schneider et al. (2005) and references therein).

The AMS measurements indicate a clear relation between composition and both hygroscopic growth factor and critical super-saturations needed for the activation. A first comparison of the critical super-saturation derived for 21 different particle compositions showed a good comparison between the 4 different instruments and measurement methods that were used to determine the critical super-saturation. Combined measurements of mobility diameter in the continuum regime and vacuum aerodynamic diameter as measured by the LPI and the AMSs allowed the determination of the effective density of the particles, thus giving additional information about the phase composition of the coated soot.

References:

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