



Intercomparison of two Aerosol Mass Spectrometers during the FACE-2004 Campaign

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The Feldberg Aerosol Characterization Experiment (FACE-2004) campaign took place from July – August 2004. The measurements were made at the Taunus Observatory on the Kleiner Feldberg (825 m a.m.s.l.) in Central Germany. The objectives of the experiment were: 1) Physical and chemical characterization of the aerosol in central Europe by state-of-the-art aerosol instrumentation; 2) Test and comparison of new and established aerosol instrumentation; and 3) Investigation of links between aerosol properties in closure and model studies.

The experiment included size-resolved chemical characterization of non-refractory molecular species with the Aerodyne Quadrupole Aerosol Mass Spectrometer (Q-AMS) and a newly developed Time-of-Flight Aerosol Mass Spectrometer (TOF-AMS), as well as analysis of size-resolved chemical composition using impactor and filter samples. Aerosol physical properties were measured with Particle Condensation counters (CPCs), SMPS systems, Optical Particle Counters (OPC) and an Electrical Low Pressure Impactor (ELPI). In addition, size-resolved measurements of cloud condensation nuclei (CCN) concentrations and efficiencies (activated fraction) as a function of supersaturation were conducted, as well as measurements of optical properties: scattering at dry, humidified and ambient conditions using nephelometers and aerosol absorption using a photo acoustic instrument. The total aerosol mass (PM_{10}) was measured with TEOM instruments. During the whole period continuous meteorological observation data of the German Weather Service (DWD) are available.

Here we focus on the datasets obtained by the two aerosol mass spectrometers.

Both instruments detect particles in the size range between approximately 40 nm and 1000 nm and measure quantitatively the mass concentrations and size distributions of various chemical species. The aerosol is sampled and focused through an aerodynamic lens to form a narrow particle beam. In order to obtain aerodynamic size information the particle beam can be chopped by a mechanical chopper. The aerosol particles impact on a heated surface where the non-refractory particle components evaporate before the vapor is ionized by electron impact. In the Q-AMS, the ion current is analyzed by a quadrupole mass spectrometer, whereas the TOF-AMS uses a fast-pulsed time-of-flight mass spectrometer.

Here we present size resolved measurements of sulfate, nitrate, ammonium and total non-refractory organics mass concentrations with high time resolution, measured with the two aerosol mass spectrometers. The size distributions are compared to results from other co-located instruments, whereas the total aerosol mass concentration measured with the aerosol mass spectrometers are compared to TEOM measurements. Correlations of measured species concentrations and size distributions with meteorological data are discussed.