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The chemical composition of fine ambient aerosol particles in the Beijing area

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The strong economical growth in China during the last few decades led to heavy air pollution caused by significantly increased particle emissions. The aerosol particles affect not only the regional air quality and visibility, but can also influence cloud formation processes and the radiative balance of the atmosphere by their optical and microphysical properties.

The ability to act as Cloud Condensation Nuclei (CCN) is related to microphysical properties like the hygroscopic growth or the cloud droplet activation. The chemical composition of CCN plays an important role on these properties and varies strongly with the particle size and the time of day. Hygroscopic or surface active substances can increase the hygroscopicity and lower the surface tension of the particle liquid phase, respectively. The presence of such compounds may result in faster cloud droplet activation by faster water uptake.

The DFG project HaChi (Haze in China) aimed at studying physical and chemical parameters of urban aerosol particles in the Beijing area in order to associate the chemical composition of aerosol particles with their ability to act as CCN. To this end, two measurement campaigns were performed at the Wuqing National Ordinary Meteorological Observing Station, which is a background site near Beijing. The winter campaign was realized in March 2009 and the summer campaign took place from mid July 2009 to mid August 2009. Fine particles with an aerodynamic diameter smaller than or equal 1 μm were continuously sampled for 24h over the two campaigns using a DIGITEL high volume sampler (DHA-80).

The present contribution presents and discusses the results of the chemical characterization of the DIGITEL filters samples. The filters were analyzed for the mass concentration, inorganic ions and carbon sum parameters like elemental (EC), organic (OC) and water soluble organic carbon (WSOC). The WSOC fraction was further characterized for hygroscopic substances like low molecular dicarboxylic acids as well as sugars and sugar related compounds. Additionally fatty acids were analyzed to investigate surface active substances.

Usually, the highest PM_1 concentrations were observed during periods with prevailing wind directions from southern areas, while northern wind directions led to significantly lower concentrations. The main components of the fine particles are inorganic ions like the secondary formed ammonium nitrate und ammonium sulphate, as well as carbonaceous material. The organic carbon fraction is mostly dominated by water soluble organic carbon (80% in average). High concentrations of tracers like the anhydrosugar levoglucosan (Iinuma *et al.,* 2007) suggest biomass burning emissions as a dominant source of organic particles in the area. A significant fraction of PM_1 remains unidentified and most likely consists of crust material like dust as well as water.

Iinuma, Y., E. Brüggemann, T. Gnauk, K. Müller, M. O. Andreae, G. Helas, R. Parmar, and H. Herrmann (2007), Source characterization of biomass burning particles: The combustion of selected European conifers, African hardwood, savanna grass, and German and Indonesian peat, *J. Geophys. Res. [Atmos.]*, 112(D8), Doi 10.1029/2006jd007120.