Nanoparticles in fine dust – development of modern measuring methods
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Airborne particulate matter (PM), its health and environmental impact are strongly associated with aerosol size distributions and concentrations next to the chemical composition of particles in question. There is a large number of studies, which established links between concentration of ambient aerosols, levels of air pollution and adverse health and environmental effects. For the description of air quality the term particulate matter (PM) has been coined. PM10 particle size fraction represents mass concentration of particles with aerodynamic diameters below 10 micrometers. Similarly, the PM2.5 rule was established in the United States, however formally not yet in the European Union. It is a broad understanding now that the PM10 and PM2.5 measurement provide very important steps towards air quality assessment but there is also no doubt that more accurate descriptors of the actual environmental burden are still needed. However, there is broad consensus that PM1.0 and PM0.1 would be more suitable size than PM 2.5 for health related aerosol sampling. Though, there is still relatively limited amount of data for the PM1.0 and PM0.1 fraction available. Very recently an increasing volume of scientific contributions mirrors the enormous importance and very likely, health hazard due to nanoparticles.

For that reason we develop a sampling/sizing system – allowing a combined aerosol mass, surface and number size distribution measurement: cascade virtual impactor (LCVI) allowing time-integrated, size-resolved measurements: PM10, PM2.5, PM1 and PM0.1. Those measurements will be carried out as a function of key environmental parameters along with chemical post-sampling characterization of the collected particulate matter focussing particularly on carbon (total, organic, elemental). The sampling and characterization of PM0.1, PM1, PM2.5 and PM10 will be conducted concurrently with the time- and size-resolved measurement of particle number and surface distributions in these size fractions. The mass information (PM) will then be linked with two additional descriptors of airborne particles, which are meant to be of decisive importance in determining the health and environmental impact - number and surface - covering the airborne particle size range starting from 10nm. This approach provides a better understanding of the relationship and interaction between nanoparticles and larger PM constituents. First results obtained with this hybrid measuring system will be presented and discussed.
