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Size-segregated elemental composition of aerosol particles: A laser ablation ICP-MS mapping approach

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Aerosol particles are ubiquitous in the troposphere and exert an important influence on the global climate and environment. Increasing our understanding of the physical and chemical properties of aerosols is essential for properly assessing their effects on various issues such as human health, air quality and global climate and ultimately establishing effective control strategies. The effects of atmospheric aerosol particles on the environment and on human health are strongly dependent on their particle size and chemical composition.

Laser ablation is one of the most attractive sample introduction techniques in inductively coupled plasma - mass spectrometry (ICP-MS) due to the microbeam characteristics of the laser enabling microanalysis for spatial resolution purposes in the low μg g^{-1} range for most elements of the periodic table. However, accurate analysis can be difficult if matrix-matched standards (i.e. of similar composition and morphology as the samples) are lacking.

In this study laser ablation ICP-MS was used for direct multi-element analysis of aerosol particles collected by cascade impaction. This is a first attempt to analyse both micro- and nanoparticles by whole-spot analysis using a so-called multi-elemental mapping approach by rastering with the laser beam over the surface of the impaction foils. This approach combined with image analysis circumvents problems associated with elemental heterogeneity of the collected aerosols in the impaction spots. The sen-

sitivity and spatial resolution of the method are high enough to even record elemental distribution profiles in nanoparticles.

Urban and industry-influenced aerosols collected by a four- and ten-stage impactor have been analyzed using this approach and results obtained will be presented.