

## Development and preliminary evaluation of an aerodynamic lens for focusing nanoparticles

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Aerosols have significant impacts on the radiation budget of the Earth's atmosphere by direct and indirect effects. Chemical composition of aerosol particles with diameters smaller than 100 nm (nanoparticles) is an important factor for understanding the formation process of aerosols. However, measuring chemical composition of nanoparticles is challenging because of their extremely low mass loadings in ambient air. Aerosol mass spectrometry coupled with an aerodynamic lens (ADL; Liu et al., *AST*, 22, 293, 1995), which can efficiently deliver aerosol particles into vacuum, is a useful tool for online measurements of aerosol composition. Although the concept of an aerodynamic lens for nanoparticles (nano-ADL) has been reported by previous studies (e.g., Wang et al., *IJMS*, 258, 30, 2006), the application of nano-ADL to ambient measurements has not been established. We have developed an improved nano-ADL based on the design of ADL for submicron particles (submicron-ADL) that has been used for aerosol mass spectrometry.

Laboratory experiments were performed using a custom-made particle generation system consisting of saturation and condensation tubes for oleic acid vapor. Monodisperse particles generated by a differential mobility analyzer were introduced into the submicron or nano ADL.

The detection of particles was performed using a Faraday cup. The transmission efficiency and particle beam width were measured using a movable knife-edge.

The submicron-ADL showed nearly 100% transmission efficiency for particles larger than 100 nm. On the other hand, the nano-ADL showed nearly 100% transmission efficiency at around 50 nm and decreased with increasing particle diameters, suggesting that the current design is favorable for the sampling of nanoparticles. The application of the nano-ADL to an aerosol mass spectrometry system will be discussed in the presentation.

Keywords: Aerosol, Nano particle, Aerodynamic lens, Mass spectrometry