A new aerosol conditioning system - Characterisation and first application

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Aerosol particles are known to have the capability of taking up water. As a result, their optical properties (and especially their ability to scatter light) are altered and with it their direct impact on the Earth's radiative balance. Predicting the contribution of condensed water to light scattering remains however a challenge due to the fact that this highly depends on the particle dry size and chemical composition (i.e. the particles hygroscopicity). The relative humidity (RH) dependence of the particle light scattering coefficient $\sigma_{sp}\sigma_{sp}$) is therefore an important measure for climate forcing calculations but also needed for comparing in-situ with remote sensing measurements

This dependence is usually reported as *f(RH)* and is defined as in Eq. 1:

$$f(RH)_i = \frac{\sigma_{sp}(RH)_i}{\sigma_{sp}(RH)_{dry}}$$

Equation 1. Light scattering enhancement factor at a relative humidity

Several studies have successfully measured and modelled the ability of aerosol particles to take up water in various locations (Zieger et al., 2010) using a custom-built humidified nephelometer (WetNeph; Fierz-Schmidhauser et al., 2010). We present here the first results obtained with a newly commercially available aerosol conditioning system. A detailed characterization of this new instrument will soon be performed, including a comparison to the above mentioned custom built WetNeph. A first application in the field in Hyatiäla, Finland is also foreseen and will be presented.

The aerosol conditioning system used in this study (ACS 1000, Ecotech) allows for the humidity to be controlled within ±0.8% (Fig. 1) from ~40% to 90% RH. It is composed of a gore-tex humidifier, a nafion dryer and two integrating, polar nephelometers (Ecotech, Aurora 4000).

Figure 1: RH control of aerosol conditioning system ACS

The aerosol light scattering enhancement at 90% RH was measured (Fig. 2) for over a month in Melbourne, Australia. The figure shows the importance of the particles water uptake on their light scattering.

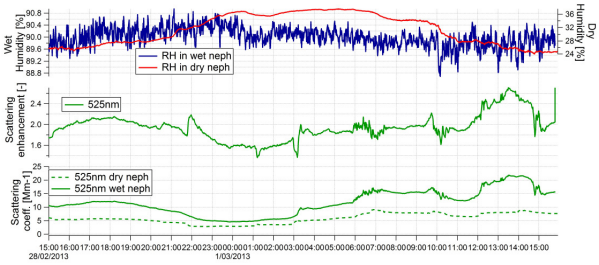

Figure 2: First application of the new humidified nephelometer

Zieger, P. et al. (2010), *Atmos. Chem. Phys.,* **10**, 3875-3890.

Fierz-Schmidhauser, R., et al. (2010) *Atmos. Meas. Tech.,* **3**, 39-50.