

FINDING A VOLATILITY BASIS SET TO DESCRIBE THE MEASURED SECONDARY ORGANIC AEROSOL EVAPORATION IN A CHAMBER EXPERIMENT

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Secondary organic aerosol (SOA) particles are formed from the oxidation products of volatile organic compounds and can account for a large fraction of the atmospheric organic aerosol matter [1]. When modelling SOA, it is often assumed that the particles are liquid which can in turn lead to a too fast of an evaporation when compared to laboratory measurements [2]. These results hint that the phase of the particles does not stay liquid throughout their lifetime. However, such conclusion is sensitive to the knowledge of the volatilities of the chemical species in SOA - property which still has uncertainty.

Here we measured and simulated the evaporation of atmospherically relevant SOA particles produced in an α -pinene ozonolysis. We investigated what kind of a SOA particle composition can produce evaporation similar to the chamber measurements, if the particles are still assumed to be liquid. We represented the numerous organic components with a volatility basis set [3] of eight compounds and used the genetic algorithm to find the optimal composition which would produce the best fit between a detailed evaporation model simulation and the measured SOA particle evaporation.

Our findings show that the SOA particles need to consist of at least one (extremely) low volatile compound but there needs to be also a semi volatile and volatile compounds to produce the measured evaporation. The compositions derived in this study differ significantly from the previously determined and generally used mass fraction distribution [4].

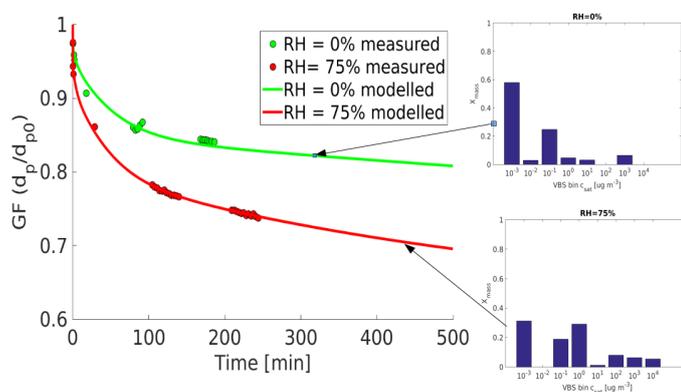


Figure 1. An example of the best volatility basis sets found to describe the measured evaporation.

[1] Q. Zhang *et. al*, Geophysical research letters **34** (13), (2007).

[2] T.D. Vaden *et. al*, PNAS **108** (6), (2011).

[3] N.M. Donahue *et. al*, Environ. Sci. Technol., **40** (8), (2006).

[4] R.K. Pathak *et. al*, Atmospheric Chemistry and Physics, **7** (14), (2007).