Effects of high RH on α-pinene SOA phase partitioning

Abstract, Noenne Prisle

Hygroscopic growth with increasing relative humidity thermodynamically affects SOA gas-particle phase partitioning by increasing the absorbing organic aerosol phase mass concentration and by altering the mean molecular weight and likely also activity coefficients of the partitioning aerosol phase components. Some recent theoretical calculations predict a significant increase in organic aerosol mass concentration at high relative humidity from these thermodynamic effects [1].

We have undertaken to experimentally investigate the smog chamber generated α-pinene SOA growth driven by changes in the particle phase internal mixing state at high relative humidity. This was done by generating SOA from α-pinene ozonolysis under dark, low-NO_x conditions in a dry smog chamber and increasing the relative humidity in the chamber rapidly after SOA formation is complete. Throughout the experiment we track the aerodynamic size distribution of the particle phase composition using an Aerodyne aerosol mass spectrometer. Preliminary experimental results indicate a humidity driven SOA growth of 20 ± 20% at about 80% relative humidity and 23 °C.

We compare experimental results to humidity driven SOA growth modelled from partitioning theory [2] employing different sets of the α-pinene SOA product volatility distribution and different effective humidity induced shifts in such distributions.

References:

[1] E. I. Chang and J. F. Pankow, *Organic particulate matter formation at varying relative humidity using surrogate secondary and primary organic compounds with activity corrections in the condensed phase obtained using a method based on the Wilson equation*, Atmos. Chem. Phys. Discuss. **8**, 2008.

[2] N. M. Donahue, et al., *Coupled Partitioning, Dilution, and Chemical Aging of Semivolatile Organics,* Environ. Sci. Technol. **40**, 2006.