Atmos. Chem. Phys. Discuss., 9, S826–S827, 2009
www.atmos-chem-phys-discuss.net/9/S826/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Increased cloud activation potential of secondary organic aerosol for atmospheric mass loadings" *by* S. M. King et al.

Anonymous Referee #1

Received and published: 16 March 2009

This manuscript discusses the CCN activity of secondary organic aerosol generated via ozonolysis of a-pinene in the presence of an OH scavenger. The experiments were conducted using quasi-monodisperse ammonium sulfate seed aerosol and data are presented for various organic aerosol mass loadings in the chamber. Because the chamber was operated in continuous flow mode the resulting aerosol size distribution and size-dependent mixing state is complicated. A detailed microphysical model is used to fit the resulting complex activation curves. Using this model in conjunction with two-component Kohler theory the authors infer the effective hygroscopicity of the organic component as a function of aerosol mass loading. The observed increase in effective organic aerosol hygroscopicity is then interpreted as a 10% reduction in

solution surface tension. The authors suggest that the surface active compounds have low volatility and thus are more abundant, on a relative basis, at low organic aerosol mass loadings.

The paper is well written and I recommend that this manuscript will be published in Atmospheric Chemistry and Physics.

Minor comments:

In the model used by the authors it is assumed that the effective organic hygroscopicity of the pure compound equals the expressed organic hygroscopicity in the mixture, i.e. there are no organic-inorganic interactions. So far only the work of King et al. (2007) can be used to substantiate this assertion. My question is: the low volatility compounds, which are currently asserted to be surface active, might also behave non-ideally in other respects. For example they might be chemically reactive or interact with the ammonium or sulfate ions in solution. If so, the surface tension lowering is only apparent.

Similarly, increases in organic aerosol acidity or decreases in molecular weight can lead to equivalent increases in apparent organic aerosol hygroscopicity, which might be mistaken for a surface tension effect. Given that carboxylic groups are most effective in lowering the vapor pressure of organic compounds it seems plausible to me that carboxylic acids are more abundant at low mass loadings. This is also consistent with the increase in m/z=44 fraction observed by the AMS.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 1669, 2009.

ACPD

9, S826–S827, 2009

Interactive Comment