Atmos. Chem. Phys. Discuss., 13, C9868–C9870, 2013
www.atmos-chem-phys-discuss.net/13/C9868/2013/
© Author(s) 2013. This work is distributed under
the Creative Commons Attribute 3.0 License.

Atmospheric Chemistry and Physics Discussions
Open Access

Interactive comment on "Hygroscopicity, CCN and volatility properties of submicron atmospheric aerosol in a boreal forest environment during the summer of 2010" *by* J. Hong et al.

Anonymous Referee #2

Received and published: 10 December 2013

In the study the hygroscopicity and volatility of aerosol measured in Hyytiälä, Finland, were investigated. The measurements were conducted during the summer 2010 as a part of a bigger measurement campaign. The main findings are that aerosol hygroscopicity is a function of particle size and that even the most nonvolatile components were at least partly hygroscopic. Although already numerous articles have been published related to aerosol measurements in Hyytiälä, I found the manuscript interesting and containing some new results. I recommend the manuscript for publication after the following suggestions has been considered and some revisions are made.

There are some parts in the manuscript that could be improved considerably. In Page

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

29110 the correlations between GF and different concentrations is not done as well as it should be. In Figure 3 linear fit is presented, although it is obvious that there is no linear correlation between the GF and organics to sulphate ratio. I would prefer presenting correlations so that the mass fraction of different particulate phase compounds could be shown in x-axis. Also if it is stated that correlations between other variables are tested then those could be presented. If there is correlation between GF and ozone it would be nice to see how good the correlation is.

It would be interesting to see how particle volatility is affected by biomass burning. Similarly it would be nice to see if the HTDMA and CCNc derived hygroscopicity has similar difference with different air masses. Plotting for example time series of CCNc derived hygroscopicities in a similar way as growth factors would make this possible.

The discussion about the possible composition of nonvolatile aerosol remaining after heating is weak. There is no discussion about the role of sodium chloride or potassium salts for example. The aethelometer measurement for black carbon concentration has high uncertainty and thus the hygroscopicity of unknown nonvolatile component must be quite uncertain.

In page 29114 I do not completely agree with the authors in the analysis of small particle composition. If the composition is more homogeneous, why the VFR is decreasing almost linearly as function of temperature? What do you actually mean by homogeneous here? What does it actually mean for chemical composition if smaller particles have higher hygroscopic growth factor after volatilization than the bigger particles but the VFR is smaller?

For small particles hygroscopicities from sub- and supersaturations are closer to each other than for large particles, although the mass fraction of organics is probably largest for small particles. At the same time the difference between hygroscopicities is said to be caused by dissolution of organics. How do you explain this? It would be interesting to see time series instead of mean values. Also it should be stated if only the temporally overlapping data is presented in Figure 5 or is it mean of all data available from the campaign.

Minor comments:

Page 29099, line 11-12: I would not say it is a fact that particulate organics have a different degree of dissolution in sub- and supersaturated conditions. Not at least all of them, so please rewrite the sentence.

Page 29100, line 12-14: Hygroscopicity affects the CCN number concentration but it will not determine it alone as aerosol particle number concentration is quite important factor also. More than that, it will not determine the lifetime of cloud, but might in some cases affect it. Please rewrite.

Page 29113, lines 3-5: How important Kelvin effect is when volatility is measured? I think it is quite minor compared to composition.

Page 29113, lines 23-25: What about sodium chloride and potassium salts, or other inorganic components that have high temperature for volatilization?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 29097, 2013.