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Interactive comment on “Hygroscopicity of organic compounds from biomass burning and their influence on the water uptake of mixed organic–ammonium sulfate aerosols” by T. Lei et al.

Anonymous Referee #2

Received and published: 26 June 2014

As the authors stated, actual biomass burning aerosols are typically much more complex in terms of composition, and the hygroscopicity of biomass burning aerosols likely depends on the mixing of a diversity of organic compounds with inorganic constituents during different time periods in the field. I am not certain where this paper can appropriately answer this question based on data using internally mixed particles of organic surrogate compounds and ammonium sulfate. Rather than drawing conclusions on the hygroscopicity of biomass burning aerosols, it would be better to focus on hygroscopicity of specific organic –ammonium sulfate mixture with well-mixed mixing structure.

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Discussion on the effect of mixing-structure of mixed particles on hygroscopicity should be included. In this paper, all particles would be well-mixed particles. Is this the typical case for biomass burning aerosols? How about hygroscopicity of core-shell particles having the same mass fraction of the well-mixed particles?

Authors stated that “the residence time of particles before entering into DMA2 is about 2.5 s in the second Nafion tube. This particle residence time may be insufficient for some organic compounds to reach equilibrium at the high RH (Chan, 2005; Sjogren et al., 2007; J. Duplissy et al., 2009) and that to allow the aerosol to equilibrate at the specified RH, we ensure that RH3 is equal to RH2”. How to ensure that all organic compounds tested here reached equilibrium?

Effect of particle size on hygroscopicity should be discussed. Some biomass burning particles observed in the ambient atmosphere are less than 100 nm.

Can the hygroscopic growth factors of 100 nm (dry diameter) particles consisting of mixtures of organic surrogate compounds with ammonium sulfate appropriately represent particles of (a) dry and (b) wet seasonal periods in the Amazon? Chemical compositional data would be obtained from filter samples without information on externally-mixed /internally mixed particles. Each organic species can exist independently (externally-mixed) or mixed with sulfate. How about aging process?

The aerosol generation part should include more information. What are the solvents for the mixed particles? The DI water or other solvents can contain impurity species. Does this affect the mixed particles? It is nice to aerosolize only DI water or other solvent to look at residual particles. The well-mixed state was assumed for their mixed particles. Evidence for this should be needed by microscopic analysis or other compositional analysis.

Did authors use the HTDMA inversion program to derive the HGF?

The change of the DRH based on mixing having different mass fraction should be

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discussed in details.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 11625, 2014.

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14, C4131–C4133, 2014

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