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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measured and modeled humidification factors of fresh smoke particles from biomass burning: role of inorganic constituents" *by* J. L. Hand et al.

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Comment: The manuscript describes measurements of humidification factors measured during the FLAME study. Aerosols produced by controlled burns of different biomass fuels were tested. The humidification factors were measured with humidity controlled nephelometry. These measurements were supplemented by measurements of particle size distributions, bulk PM2.5 chemical composition and SEM analysis. The chemical composition was used to predict aerosol water content at different RH using E-AIM model, which in turn allowed estimation of humidification factors. A comparison of the predicted and measured humidification factors showed that hygroscopic proper-

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ties of the tested biomass smoke aerosols can be predicted using only the inorganic fraction. The manuscript is well written, the methods are well described and the data interpretation is solid. I have only a few minor comments and suggestions:

Response: We thank the reviewer for their helpful comments regarding the manuscript.

Comment: While I do not think this would affect the results significantly, I wonder how the substitution of K with Na would affect model predictions at low RH in the metastable case. Since the solutions at low RH are strongly non-ideal, ions of different sizes such as Na and K would probably have different activities.

Response: We agree that it would be interesting to investigate the metastable curves using potassium versus sodium. We did perform these model estimates using the thermodynamic model ISORROPIA that does include potassium salts. Unfortunately the model produced unrealistic water activities in some cases and therefore we chose not to use it.

Comment: I am not convinced that the data shown in Fig.6 provides an evidence of a deliquescence point. The jump in the measured f(RH) is quite small in comparison to the experimental uncertainty.

Response: We have restated the discussion of deliquescence with respect to Figure 6. We have changed the statement to read “Although within experimental uncertainty, measurements suggest possible deliquescence around 75% RH while the modeled deliquescence was shifted lower by about 5% (70%).” [Page 4243, line 15-16]

Comment: I would suggest changing the scale of the y-axis of Figures 2-4. I understand that the authors wanted to demonstrate relative hygroscopicity of different biomass burning aerosols by using the same scale on all figures. This, however, makes it very difficult to compare the observations with the model.

Response: We have changed the scale on the suggested figures.

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Interactive Comment