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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Water uptake and chemical composition of fresh aerosols generated in open burning of biomass" *by* C. M. Carrico et al.

Anonymous Referee #1

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This paper describes the results of experimental studies on the hygroscopic growth factors (GF) of fresh biomass burning smoke particles. The paper is well written and the results are presented clearly. The most important result is that particles dominated by organics are less hygroscopic than those dominated by inorganic salts.

Since this was a laboratory experiment on fresh biomass burning aerosols, what is the general relevance of the results? Why would they be expected to apply at remote continental or globally-representative locations. Why would highly aged smoke be expected to behave similarly to fresh smoke generated in the laboratory? Dinar et al. (2007, 112, D05211, doi:10.1029/ 2006JD007442) reported a GF (90) of 1.24 for HULIS extracted from samples dominated by aged biomass burning aerosol. How do those results compare with those derived from the laboratory experiments? What would be the kappa

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for HULIS with a GF of 1.24 at 90% RH?

While there appears to be a (log-log) relationship between kappa derived from 100 nm particles and the ratio of total carbon/inorganic ions derived from PM2.5 samples, this implies that chemical composition is invariant with particle size. As the authors note in the introduction, this may not the case. More detailed chemical characterization as a function of particle size could have been obtained with an AMS, which, if I am not mistaken, was deployed during this experiment. If this is the case, why weren't those data used?

Nonetheless, this paper suggests that hygroscopic growth can be estimated well using a simple chemical and thermodynamic parameterization. This has important implications for modeling aerosol optical and hygroscopic properties on local, regional, and global scales.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 3627, 2010.