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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 #2

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This manuscript describes laboratory experiments measuring and parametrizing the hygroscopicity of aerosols generated from burning various biomass. These hygroscopicity measurements are related to the measured composition of the aerosols. This manuscript provides new information that is helpful in elucidating the water uptake of aerosols. I recommend that this manuscript be accepted with very minor changes; most of the changes are in regards to expanding existing sections to provide more context.

Page 3634, lines 11-13, please explain briefly what the three fitted parameters mean rather than just listing what they are so that the reader can fully understand the fitting.

When the different types of biomass are introduced in Section 4.1 the authors discuss how different types of biomass burn differently, in general the smoldering flames pro-

duced particles with smaller GFs than those with a strong flaming phase. This paper goes on to show that composition is also important component that impacts GF. How do these two variables fit together? Does biomass that generally produces a smoldering flame also produce large amounts of organic matter when burned with a strong flaming phase? Which is more important to GF, the particles' composition or how the biomass burns? As this manuscript does a great job in detailing the impact of composition on GF it would be helpful to the readers to understand how that relationship may change with different types of burning. Perhaps it would be helpful if the data shown from different types of fires were shown on a graph in different colors; that would make it easier for the reader to understand how these different variables fit together.

Figures 4-6 are very hard to read as-is. Will they be a full-sized page in final manuscript? That might be helpful, but still, these are very busy graphs. In Figure 5, what is the line that connects some of the dots (e.g., sagebrush, ponderosa pine)? In the caption to Figure 5 it would be helpful to explain what the different sizes of dots represents.

Section 4.3, page 3637, starting line 21. The explanation of heading vs. backing is a little confusing in this section as how it relates to the actual experimental set-up (difficult to understand what uphill and downhill means in a controlled burning chamber). Does it relate to where the sampling was in relation to the fire? A better explanation here would be helpful.

Section 4.4 and Figure 8 show a relationship on a log-log scale. There is still quite a bit of scatter around the line even on this log-log scale. Thus, I would not agree with the statement on page 3640 that the measured and predicted K were in reasonable agreement. The trend was definitely in agreement, but only from Figure 8 it looks like there is still plenty of scatter. This "reasonable agreement" should be quantified (e.g., all measured vs predicted were within XX% of each other). Additionally, error bars on Figure 8 would be helpful.

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Section 4.5. In this section it seems as if the authors put a piece of biomass in water, atomized that and then tested its GF and the GF of this solution was similar to when it was combusted. To me, this seems incredible and seems as if combustion thus is not important, only the composition that is water-soluble. Or is it that combustion does not change the composition of those that are water soluble? This section needs to be expanded more to put these findings into context and answer the above questions.

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