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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Contribution of organic carbon to wood smoke particulate matter absorption of solar radiation" *by* T. W. Kirchstetter and T. L. Thatcher

Anonymous Referee #2

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This is a well-written, interesting, and relevant manuscript that should be published in ACP after the following comments have been addressed:

1) The manuscript discusses the UV light absorption of OC from residential wood burning and then generalizes in section 4 "Significance" to biomass burning aerosols in the global atmosphere. While the authors present some evidence that their results on the UV absorption in residential wood burning are similar to results obtained for ambient measurements of biomass burning emissions in southern Africa and in the Amazon, this matter needs further discussion. There are significant differences in emissions from residential and open (e.g., wildland fires and agricultural burning) burning; see for

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example Zielinska and Samburova (2011), Conny and Slater (2002), and Mazzoleni et al., (2007). In particular PM emissions from open biomass burning generally have a much larger OC/BC PM mass ratio which could indicate more UV absorption if the brown carbon fraction of OC is comparable. Other differences that need to be pointed out include the lack of atmospheric processing in this study compared to biomass burning aerosols in the global atmosphere and the fact that wood is only a minor fuel type in global biomass burning emission inventories.

2) The discussion of literature values of AAE for biomass burning smoke needs to be expanded beyond Kirchstetter et al., (2004) and Bergstrom et al., (2007). More recent references that come to mind are Rizzo et al. (2011) and Gyawali et al. (2012).

3) The discussion of artifacts of filter-based light absorption measurements needs to include the effect of particle morphology changes for liquid OC particles (Subramanian et al., 2007). In addition, the authors refer to "The so-called filter-loading or shadowing artifact" (p. 5806, line 23). The term "shadowing should be deleted because it refers to a geometric optics concept and has no application for submicron combustion particles and near-visible wavelengths.

References:

Conny, J. M., and J. F. Slater (2002). Black Carbon and Organic Carbon in Aerosol Particles from Crown Fires in the Canadian Boreal Forest. J. Geophys. Res., 107, DOI:10.1029/2001JD001528.

Gyawali, M. et al. (2012). Photoacoustic Optical Properties at UV, VIS, and Near IR Wavelengths for Laboratory Generated and Winter Time Ambient Urban Aerosols. Atmos. Chem. Phys., 12, 2587-2601.

Mazzoleni, L. R. et al. (2007). Emissions of Levoglucosan, Methoxy Phenols, and Organic Acids from Prescribed Burns, Laboratory Combustion of Wildland Fuels, and Residential Wood Combustion. Environ. Sci. Technol., 41, 2115-2122.

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Rizzo, L. V. et al. (2011). Spectral Dependence of Aerosol Light Absorption over the Amazon Basin. Atmos. Chem. Phys., 11, 8899-8912.

Subramanian, R. et al. (2007). Yellow Beads and Missing Particles: Trouble Ahead for Filter-Based Absorption Measurements. Aerosol Sci. Tech., 41, 630-637.

Zielinska B. and Samburova V. (2011). Residential and non-residential biomass combustion: impacts on air quality. In: Nriagu J.O. (ed.) Encyclopedia of Environmental Health, volume 4, pp. 819–827 Burlington: Elsevier.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 5803, 2012.