

Reviewer comments on “Contribution of organic carbon to wood smoke particulate matter absorption of solar radiation”

Journal: *ACP*

Manuscript ID: 10.5194/acpd-12-5803-2012

Submitted by: T.W. Kirchstetter and T.L. Thatcher

General comments:

This study derives the contribution of organic and black carbon to the total wood smoke absorption in the atmosphere from spectral attenuation measurements of smoke particles collected on filters. The key finding of the manuscript is that organic carbon and black carbon account for roughly 14 and 86% of solar radiation absorbed by wood smoke.

Overall, the manuscript is well written and provides interesting and valuable information, but needs minor refinements in structure and content before publication.

The introduction needs a more in-depth discussion of biomass PM optical properties. It would be helpful to provide a discussion of more recent literature and how the filter based absorption spectra presented qualitatively relate to *in situ* spectra (if such data are available).

The methods section is missing the amount of detail needed to reproduce the results. It should provide more information on the measurements and data analysis methods; i.e. it is unclear if the AAE values were determined by regression of $\ln(\text{ATN})$ and $\ln(\lambda)$ and how exactly the ATN of BC was subtracted. Even though this information might seem obvious for the authors and is mostly covered in Kirchstetter et al. (2004), it would strengthen the manuscript and make it easier to read and understand.

The results and significance sections are well presented and the graphical information is easily readable. Also, a good discussion of the significance of the results is presented.

Specific comments:

Introduction pg.5804, ln.24; missing word “of” before atmospheric particulate matter

Introduction pg.5805, ln.9; careful wording is required, wavelength selectivity alone does not explain brown appearance but wavelength selectivity in UV/blue does

Introduction pg.5805, ln.20; support abundance statement with a reference

Methods pg.5805, ln.26; correct “radiate” to “radiata” and use italics for *Pinus radiata*

Methods pg.5806, ln.25; it would be beneficial to expand this section with a couple of brief sentences about the sampling, i.e. location in relation to sources/ equipment/ typical filter loadings, handling if available to support these significant results.

Methods, pg.5806, ln.6 to 13; This section is key for the understanding of the results and needs to be further elaborated as stated in the general comments above. It would also be beneficial to separate formulae from the text for better clarity. The determination of F_{OC} could also be added here in a new paragraph (see comment below) for better structure and readability of the manuscript.

Methods, pg.5806, ln.19; rephrase/check the sentence of the collapsing coating.

Results, pg.5807, ln.6; explain briefly why this sample is representative (e.g. all samples show same trend)

Results, pg.5807, ln.18; explain the determination of OC attenuation in the methods section and just refer to it here.

Results, pg.5807, ln.20; replace “current” with a better word.

Results, pg.5807, ln.28; Do you mean the publication Chen and Bond (2010) instead of Sun (2007) for AAE values of filter extracts at various combustion conditions?

Results, pg.5808, ln. 2 - 22; It would be useful to describe the method for determining F_{OC} in the methods section and just show/ discuss the results here. It is not entirely clear to me why a 5th order polynomial fit had to be used; is it because of different wavelength increments in the solar data in comparison to the measurements? Please also cite the source of the solar spectrum data and to what condition it refers (standard atmosphere?)

Significance, pg.5809, ln.15 ~ 24; You discuss similarities to other OC field data. Would you expect that atmospheric processing does not have a significant or limited effect on biomass OC absorption spectra?

Significance, pg.5810, ln.4; “appreciably” is perhaps not the right word in this context.

Table 1; please check caption (missing and unclear wording)

Fig 3; please check caption (remove “to” in ln.3)