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Interactive comment on “An intercomparison study of analytical methods used for quantification of levoglucosan in ambient aerosol filter samples” by K. E. Yttri et al.

K. E. Yttri et al.

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We would like to thank the referees for their valuable comments and corrections made to the paper, contributing to improve its content and appearance.

Reply to comments made by referee #3:

Major comment: Page 7420, Line 15 to Page 7421, Line 5 – I feel the one thing missing from the conclusions is a mention of the bounds that could be put on the current measurements based on the intercomparison results. Basically from these results can we better constrain all the data we have out there already for levoglucosan. This would be

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especially useful to modelers that often use a variety of levoglucosan measurements to create biomass burning emission inventories.

Answer: We very much agree with referee #3 in his comment and we have included the following sentence in the conclusion to account for this: The accuracy for levoglucosan, presented as the mean percentage error (PE) for each participating laboratory, varied from -63% to 20%; however, for 62% of the laboratories the mean PE was within \pm 10%, and for 85% the mean PE was within \pm 20%. The variability of the various analytical methods, as defined by their minimum and maximum PE value, ranged from 3.2% to 41% for levoglucosan.

Minor comments: All minor changes pointed out by referee #3 is accounted for in the revised paper.

Figures:

For Figures 2 through 8 commas are used in the place of decimal points. Although this is fine, decimal points are used throughout the text. It would probably be better to stay consistent and use the same format throughout the entire paper. Also in the list of analytical methods used to the right of each figure, the 2 in H₂O is not subscripted.

Answer: Commas have been replaced by decimal points in Figures 2 – 8. Concerning “H₂O” vs. H₂O: The program (Microsoft Excel) in which the figures were made, does not allow for subscript in legends.

Reply to comments made by referee #4:

As indicated by the referee, a listing of all references that can be of relevance to the topic of the actual paper is impossible, and hence a selection must be made. Four of the five “specific” comments by the referee relates to papers that could be added to the introduction part of the actual paper. We have added a selection of the suggested papers.

Ref. comment 1: Even prior to the work by Simoneit et al., levoglucosan was proposed

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as biomass burning tracer by Hornig et al. (1985) and Locker (1988), which could be cited in the introduction (page 7400).

Answer: We included the paper by Hornig et al. (1985).

Hornig, J.F., Soderberg, R.H., Barefoot, A.C., Galasyn, J.F., 1985. Wood smoke analysis: vaporization losses of PAH from filters and levoglucosan as a distinctive marker for wood smoke. In: Cooke, M., Dennis, A.J. (Eds.), *Polynuclear Aromatic Hydrocarbons: Mechanisms, Methods, and Metabolism*. Batelle Press, pp. 561-568.

Ref. comment 2: Agricultural waste burning is an important source of anhydrosugars especially in Asia, which has been reported for several ambient and source emission studies, such as Fu et al. (2008), Oanh et al., (2011) or Wang et al. (2011). This can be mentioned on page 7400 as well. In another recent study (Engling et al, 2014) anhydrosugars were measured down-wind of peat fires in Indonesia (first paragraph, page 7401).

Answer: We have included the paper by Wang et al. (2011)

Wang, G.H., Chen, C.L., Li, J.J., Zhou, B.H., Xie, M.J., Hu, S.Y., Kawamura, K., Chen, Y.: Molecular composition and size distribution of sugars, sugar-alcohols and carboxylic acids in airborne particles during a severe urban haze event caused by wheat straw burning. *Atmos. Environ.*, 45, 2473-2479, 2011.

Ref. comment 3: The stability of levoglucosan was also investigated for ambient aerosol following long-range transport to a remote island by Mochida et al. (2010), which can be mentioned in the discussion on page 7402.

Answer: We find that the references given in the paper covers the topic of degradation of levoglucosan and that adding another paper on this topic would be redundant.

Ref. comment 4: It is not clear what "clean up" refers to (in line 19, page 7409) – does it perhaps include the entire sample preparation process, including extraction and filtration, rather than just the purification of the extract solution? This should be

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specified here.

Answer: We have replaced the actual sentence with the following one: "Nine (lab. 1, 2, 4, 5, 6, 9, 11, 12, 13) out of the thirteen laboratories used an internal standard, but only eight (lab. 1, 2, 4, 5, 6, 9, 11, 12) of them used it to account for potential loss of analytic compounds during the sample preparation process."

Ref. comment 5: When discussing the levoglucosan/mannosan ratio (in lines 22-26, page 7418), the authors may also want to mention that besides the distinction between hard wood and softwood, additional attempts have been made to qualitatively classify other types of biomass by using this ratio as well, such as described by Engling et al. (2009, 2013).

Answer: We agree that the levoglucosan/mannosan ratio has been attempted used to classify other types of biomass as well. However, it is the differentiation between hardwood and softwood which is most commonly addressed by this ratio, and the main purpose of this part of the study is to show how much variability there can be in this ratio and how it can affect the conclusion on fraction of softwood versus fraction of hardwood. Hence, we have not included any further references covering the use of the levoglucosan/mannosan ratio

Additional changes: 1. Schnelle-Kreiss to Schnelle-Kreis in the author list. 2. A. Gülcin to G. Abbaszade in the author list. 3. Nicolas Bonnier included to the author list.

Interactive comment on *Atmos. Meas. Tech. Discuss.*, 7, 7397, 2014.

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