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Atmospheric Measurement Techniques Discussions

Interactive comment on "Predicting ambient aerosol thermal-optical reflectance (TOR) measurements from infrared spectra: extending the predictions to different years and different sites" *by* M. Reggente et al.

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1 Response to Referee 1 (Ref. amtd-8-C4509-2015)

The authors thank the anonymous referee for her/his constructive and useful comments. We have worked on the comments carefully and made all requested changes to the manuscript. Below, the comments from referee 1 are put in italic font, and our answers are in roman font. We have uploaded a revised version of the manuscript (as

supplementary material with the answers to the referee 2) with the suggested changes marked in yellow (the changes marked in red refer to the changes suggested by the referee 2).

1.1 General Comments

The authors present results of a comparison of FTIR and TOR analysis of OC/EC for filter samples collected for the IMPROVE network. Previous work by this group has indicated that FTIR analysis provides similar results as TOR for OC/EC analysis, but that it is also cheaper and easier and can provide additional composition information on OC through functional group analysis. Here the authors expand on their earlier studies by analyzing a larger set of ~2500 samples from 17 sites across the US (and one in Korea) and two different years (2011 and 213). They conduct a very thorough and comprehensive statistical analysis to compare the methods and to evaluate the best approaches for FTIR calibration. The results are impressive and indicate that FTIR can be used instead of TOR for routine OC/EC analysis and that it has a number of advantages. This represents a major advance in the aerosol composition data that will be available in the future from this network. The paper is concise, very well organized, and clearly written, and I think is certainly suitable for publication in AMT. I have only a few very minor Specific and Technical Comments.

Response: We are glad the referee found the article to be concise, very well organized, clearly written and suitable for publication in AMT.

1.2 Specific Comments

1. In practice how will you make sure that if the composition of the aerosol changes at a site over time that the calibration is still valid? It seems that you might be able

to tell this from changes in functional group composition. Is this part of the long-term plan? Would you then conduct periodic comparisons of FTIR and TOC to verify that the calibration is still valid? It might be worth mentioning this.

Response: We agree with the referee that duration for which the calibration model works correctly is an open question. Indeed, one possible solution to test the goodness of the model is to perform periodic evaluations with collocated TOR measurements. However, we expect that changes in aerosol composition lead to changes in sample spectra; and an increase in Mahalanobis distance indicates significant changes relevant for prediction of TOR OC or EC. As discussed in Section 2.4 (in the revised manuscript page 7 lines 20-24), the method that we propose aims to anticipate the prediction error in OC or EC concentrations before applying the calibration model. The purpose of such an approach is to determine whether a particular calibration model is suitable for a new set of samples without requiring an assessment of prediction accuracy using TOR OC and EC measurements a posteriori.

1.3 Technical Comments

1. P. 12434, line 8: I suggest deleting the "or" between PTFE and Teflon. PTFE is a type of Teflon, but there are others such as FEP that is used for most smog chambers.

Response: We have deleted the "or" (in the revised manuscript page 2 line 7).

2. P. 12434, line 11: I suggest inserting "functional group" before "composition".

Response: We have inserted "functional group" (in the revised manuscript page 2 line 11).

3. P. 12438, line 14: Should be "calibration".

Response: We have deleted the "s"(in the revised manuscript page 6 line 6).

4. P. 12438, line 20 and P. 12447, line 8, and elsewhere: Should be consistent, "pls" or "PLS".

Response: In the manuscript, we have changed all the "pls" in "PLS" (in the revised manuscript page 6 line 11 and 12) except for the title of the article in the References (in the revised manuscript page 22 line 14).

5. P. 12439, line 26: Should delete "the" after "measure".

Response: We have deleted the "the" after "measure"(in the revised manuscript page 7 line 16).

6. P. 12442, line 21: It seems like this is a "Results and Discussion" section. There is no separate "Discussion" section.

Response: We have renamed the section as "Results and Discussion" (in the revised manuscript page 10 line 6).

7. P. 12446, line 4 and P. 12450, line 4: Should be "two-thirds".

Response: In the manuscript we have changed all the "two third" in "two-thirds" (in the revised manuscript page 4 line 6; page 11 line 14; page 13 line 14; page 17 line 5; page 35 caption of Figure 7; page 41 caption of Figure 13).

8. P 12447, line 1: Should be "other".

Response: We have deleted the "s" (in the revised manuscript page 14 line 10).

This concludes our response to the referee. We would like to thank her/him again to

have driven us to significantly improve this manuscript.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 12433, 2015.