Amt-2019-376 review anonymous author

Many thanks to the authors for the consideration of the comments provided and for delivering the revised manuscript. I would like to kindly bring their attention to some of the suggestions that where partially handled and require additional clarifications or elaboration. Namely:

1) As mentioned in the abstract of the paper "*The concentration of particulate organic carbon (OC) is determined by subtracting black carbon concentration, concurrently measured optically by an Aethalometer®, from the total carbon concentration measured by the TCA08*". This is also described in detail in the first two paragraphs of the method and instrument description section (section 2.1). The method described, as also mentioned by the authors at the third paragraph of section 2.1, has been earlier introduced in Bauer et al. (2009) and elsewhere, e.g. Arhami et al. (2006). No doubt that the current method application and the new instrumentation described in the paper introduces novelties and convenience for the user as listed in detail by the authors. Nevertheless, I would advise modifying the title and related text from "new TC-BC method" to either "new application of the TC-BC method" or "new instrument introduction for the TC-BC method" or similar.
2) In line 24 of the abstract as well as in section 3 it is mentioned that the *equivalence* of the newly introduced instrument and off-line thermo-optical OCEC reference method has been evaluated. The authors attempted to follow the EN16450:2017 but as mentioned in the text the norm procedure was not properly applied. Since an equivalence procedure can return two outcomes, pass or fail, it would be fair for the reader to clearly state which of the two was the case for this attempt. I suggest to either modify the text accordingly in order to include this information or remove the equivalence term.
3) In deviation from EN16450:2017 only one candidate instrument application was included in the campaign. The authors mention in-house tests as an alternative. This is not a valid argument for a number of reasons: non-compliant with EN16450:2017, different aerosol type sampled, different conditions between in-house and field campaign, to name a few. The in-house tests and data obtained are of course welcome and can be presented in detail but in any case, cannot serve as an alternative. The text should be modified accordingly.
4) The uncertainty limit value of 2.00 $\mu g/m^3$ mentioned in page 11 line 12 originates from calculations of PM reference methods where limit values of 30 $\mu g/m^3$ or more apply. This value is not directly applicable for TC measurements which is a fraction of PM. Additionally one would expect a more stringent limit value for ambient TC concentrations compared to PM. Both the above will result in a significantly lower uncertainty limit value in the future. There is clearly the need of introducing a method specific uncertainty limit value but unfortunately this is not there yet. It would be best if the above are clarified more in the text. The uncertainty limit value of 2.00 $\mu g/m^3$ should serve as an indication and not as a direct criterion for compliance. Finally, the calculation of the method uncertainty of 0.43 $\mu g/m^3$ is not valid since less than 40 data points were used for its calculation, which does not meet the requirements of EN16450:2017.
5) It is common practice in comparison exercises, e.g. as organized by ACTRIS, for laboratories to receive simultaneously parts of the filter and perform triplicate analysis. Further, standard solutions are also included in order to investigate the analyzer calibration of each participant. It seems that in the comparison organized by the authors, the first laboratory performed single

analysis and then forwarded the whole filter to the second laboratory for another single analysis. Further no standard solution was included. EN16909:2017 includes the following in 7.2 NOTE: *"OC concentration may change depending on handling…"*. The above might have added to the observed differences between the results of the two laboratories and itwould provide the whole picture to the reader if they were mentioned clearly in the text.

6) Section 3.3, last sentence, item 3,mentions that "*Sampling artefacts and denuder efficiency: positive/negative artefact phenomenon is recognized by standards EN 12341:2014 and EN 16909:2017, but, as the magnitude of these effects cannot be quantified precisely, they are not considered in the uncertainty budget."* Indeed, that is the case for low volume samplers without the application of a denuder for a 24-hour sampling period. As stated elsewhere in the manuscript, e.g. page 13 last paragraph, the TCA method faces a pronounced VOC adsorption positive artifact due to reduced sampling times. Considering the above, a more appropriate budget uncertainty calculation would include the uncertainty due to the positive artifact which in any case is not negligible.
7) In section 3.5 an offset of 1.33 µg/m^3 is found for the comparison between eOC and OC. When considering that the average measurements of the laboratories where applied as the reference method this will probably result at a +/- 0.4 µg/m^3 offsets for each laboratory from the their average results, which as mentioned earlier might originate from handling variation of filters or analyzer calibration deviation. The observed offset of 1.33 µg/m^3 is more than 3 times greater than 0.4 µg/m^3. Further when comparing the Pearson correlations for OC measurements including and excluding the intercept this remains 0.99 for the laboratories while it drops from 0.98 to 0.94 for the eOC to OC comparison. Finally, there is a clear systematic bias which the authors attribute to a dominant positive artefact related to VOCs and denuder efficiency. Despite the above clear indications of a significant limitation of the application the authors conclude that the observed offset can be neglected. I recommend revision of the current section accordingly. For your consideration EN16450:2017 includes a section where describes the calculations for determining the requirement of an intercept correction or not and also lists the following criterion: Calibration needs not to be performed when the value of the intercept is 1,0 µg/m^3 ≤ a ≤ 1,0 µg/m^3
8) Correction in references: ARSO laboratory participated in 2016-2 ACTRIS comparison exercise and not in 2018-1.

References

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Mohammad Arhami, Thomas Kuhn, Philip M. Fine, Ralph J. Delfino and Constantinos Sioutas (2006) Effects of Sampling Artifacts and Operating Parameters on the Performance of a Semicontinuous Particulate Elemental Carbon/Organic Carbon Monitor, Environ. Sci. Technol. 2006, 40, 3, 945-954