Atmos. Meas. Tech. Discuss., 3, C1015–C1020, 2010
www.atmos-meas-tech-discuss.net/3/C1015/2010/

Atmospheric Measurement Techniques Discussions

Interactive comment on "A new aerosol collector for on-line analysis of particulate organic matter: the Aerosol Collection Module (ACM)" *by* T. Hohaus et al.

T. Hohaus et al.

t.hohaus@fz-juelich.de

Received and published: 23 July 2010

Reply to the comments of Anonymous Referee #3

The authors would like to thank the referee for her/his careful reading and positive feedback/helpful remarks that helped to improve the quality of the manuscript. In the following we respond to the individual comments and describe their realization. We have repeated the comments here in italics and added comment numbers for easy reference between points in the responses. Our replies follow each excerpt. Changes

to the manuscript text are presented in bold.

Specific Comments:

1. This manuscript evaluates the performance and, in particular, the mass transfer efficiency of the ACM-GC-MS was under a variety of both laboratory and ambient conditions. The ACM-GC-MS was also used to analyze the composition of secondary organic aerosol (SOA) from the ozonolysis of beta-pinene in parallel with analysis of filter samples and also ambient OA in conjunction with parallel sampling by an AMS. The mass transfer effiency of the ACM-GC-MS was determined to be 100% in the case of laboratory-generated octadecane particles and the response was found to be linear over a wide mass range. However, in the case of beta-pinene SOA, the mass transer efficiency was found to be 6-11%, which was attributed to known compound detection limitations of the GC-MS system for higher oxigenated products which are produced in the reaction. In the case of ambient measurements, ACM-GC-MS sampling was conducted at the Aerodyne labs in Massachusetts and the resulting measurements were compared to total OA measurements by an AMS. ACM-GC-MS and AMS measurements were compared with each set of measurements being highly correlated. The authors extend these results to assert that the ACM-GC-MS is capable of quantitative measurements of ambient aerosol mass loadings. Based on the information provided, this assertion may be an overreach. For example, Figure 9 compares ACM-GC-MS measurements in arbitrary units (presumably units of peak area) against AMS organic mass in micrograms. Making the claim of quantitative ACM-GC-MS measurements of ambient mass loadings would require the conversion of peak area to mass which is inherently very difficult as possibly indicated by the fact that the authors in this case declined to do so. Additionally, it is likely that at least a small fraction of OA in the vicinity of the Aerodyne labs is SOA. While the body of AMS literature shows that it is not biased in the detection of SOA, the same cannot be said of the ACM-GC-MS as indicated by <100% mass transfer efficiency in the case of beta-pinene. Therefore, it

is likely that the ACM-GC-MS measurements of ambient aerosol mass are lower than those of the AMS and are not quantitative as a result. If the authors continue to insist on quantitative ACM-GC-MS measurements, this contention needs to be strengthened.

[Response]: We agree that the ACM GC-MS data only represent a part of the organic aerosol composition. However both measurements show a high linear correlation. This indicates that the overall ACM-GC-MS measurements are representative of the ambient organic aerosol mass loading measured in Bilerica, USA. For a detailed response and the corresponding changes to the manuscript it is referred to the authors response to the comments of Anonymous Referee #1 for item 26 and item 30.

Technical Corrections:

2. p. 1362, l. 13: "places" should be "place".

[Response]: Corrected.

3. p. 1363, l. 8-9: The sentences here are unclear. "After sampling the filter content is analyzed in the laboratory using standard analytical procedures. These include solvent extraction, supercritical fluid extraction or thermal desorption of these filter samples." The listed techniques, however, are not specifically speciation techniques but are essentially extraction techniques. These sentences should be clarified.

[Response]: The term “analytical procedures” should be seen in combination with the following sentences in the introduction describing the possibility of combining different extractions methods with subsequent different analytical mehtods such as GC-MS or LC-MS. For clarity we changed the sentences as follows: **These include a combination of solvent extraction, supercritical fluid extraction or thermal desorption of the filter samples with subsequent analysis with analytical techniques, such as gas chromatography coupled to mass spectrometry (GC-MS, most widely used) and liquid chromatography coupled to MS (LC-MS) (especially for polar com-**

pounds) to characterize the molecular composition of the OA.

4. p. 1364, l. 14: Either remove "techniques" after "similar" or "instrument" after "TAG".

[Response]: “instrument” was deleted.

5. p. 1365, l. 5,6: Pluralize "pump".

[Response]: Done.

6. p. 1365, l. 9,10: "chamber" should be pluralized and verbs in the sentence should be changed accordingly.

[Response]: Corrected.

7. p. 1367, l. 6,7: The following sentence is not clear and should be corrected: "The carrier gas flushes the evaporated particles..." This should be changed to reflect the fact that it is not the particles that are flushed from the collection surface, but instead volatile, non-labile molecules are transported to the detector. This same expression of particles being transported to the detector is also a problem in the Conclusions section

[Response]: These statements have been adjusted. For details it is referred to the authors response to the comments of Anonymous Referee #1 for item 2.

8. (p. 1379, l. 24) and should be corrected there as well.

[Response]: It is referred to the authors response under the previous item 7.

9. p. 1369, l. 10: I would recommend using "maximum desorption temperature" in this context as the collection surface temperature is dynamic during sample desorption.

[Response]: We agree and changed the expression accordingly.

10. p. 1371, l. 8: Please add "response" following "ACM-GC-MS" as that is what is being discussed in this sentence.

[Response]: Done.

11. p. 1372, l. 5: Although this sentence ("This is provided by a floor heating system which temperature...") is unrelated to the main focus of this paper, it is unclear and should be corrected for easier readability.

[Response]: The sentence was rephrased for a better understanding of the effect of the floor heating system. For a detail response it is referred to the authors responses to the comments of Anonymous Referee #2 for item 34.

12. p. 1373, l. 6: Add "do" following "experiment".

[Response]: Done.

13. p. 1373, l. 8: Change "extend" to "extent".

[Response]: Corrected.

14. p. 1378, l. 14: change "drop" to "drops".

[Response]: Done.

15. p. 1379, l. 7: change "in" to "is".

[Response]: Done.

16. p. 1380, l. 1: Change "allows to study" to "allows the study of".

[Response]: Corrected.

17. p. 1380, l. 11: Please add "response" following "ACM-GC-MS" as that is what is being discussed in this sentence.

[Response]: Added.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 1361, 2010.