

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.

Anonymous Referee #5

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General Comments

This manuscript describes a new device for sampling aerosol particles for chemical analysis and presents results of an evaluation of its performance using an alkane aerosol standard, SOA formed in a chamber, and ambient aerosol. The device employs a standard design of an aerodynamic lens to sample particles into a tube collector, which can be cooled to reduce evaporation. When the sample is collected some valves are switched and the sample is evaporated by resistive heating and flushed into a detector with helium. Transfer lines are coated and heated to reduce sticking of compounds to the walls. In this evaluation, the detector was a GC-MS-FID, although

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other gas analyzers could be used. The evaluation with the standard alkane aerosol indicates good aerosol and gas sampling and transport efficiencies and linearity of response for nonpolar compounds like alkanes. Results for the more polar, less volatile SOA are poor and indicate that highly oxidized compounds and oligomers are lost in the transfer lines and/or GC-MS. The GC-MS result for ambient aerosol indicates a good linear correlation with mass measured by ACM-GC-MS and AMS. The manuscript is clearly written and all necessary information is included. Although there may be serious problems in transferring highly oxidized compounds, the device is relatively simple and could potentially see use by other researchers with a variety of gas analyzers, so the work is a useful contribution to the field. I think it is worthy of publication in AMT.

Specific Comments

1. Section 4.2: Why was only octadecane used as the standard test aerosol? This seems to provide the least rigorous test possible, since the particles are liquid and so focus well, they are quite volatile and so don't have to be heated much (in fact from my experience I am surprised they did not at least partially evaporate between the DMA and collector), and they are not sticky. Something like a monoacid or diacid, which are known to be more sticky, should be tried.
2. It seems like the evaluations performed here cannot distinguish between losses of compounds between the collector and detector, and losses in the GC-MS-FID. The authors attribute their losses in the SOA experiment to the GC-MS-FID, but this is not necessarily the case.
3. Section 5.5: It seems a little odd to assume that the sampling efficiency of particles in the aerodynamic lens drops from 100% to 0% at 500 nm. Isn't the real efficiency vs. size relationship known?
4. Section 5.6: The observation of a linear correlation between GC-MS signal and AMS mass does not mean the ACM-GC-MS-FID system is quantitative. It only means the ACM-GC-MS-FID analyzes a constant fraction of the organic aerosol measured by the

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AMS. It is obvious the system is not quantitative from the SOA experiments. Can the authors evaluate the ability to quantify ambient aerosol by comparing the total ion signals of the AMS and ACM-GC-MS-FID after adjusting the MS ion detector calibrations using a standard, or by using the FID signal?

5. Isn't a major disadvantage of this collection method compared to that used by the TAG or by the TD-CIMS (Smith and McMurry) that the flow rate here is much lower and so reduces sensitivity? This should be noted.

Technical Corrections

None.

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