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Atmospheric Measurement Techniques Discussions

Interactive comment on "An unheated permeation device for calibrating atmospheric VOC measurements" *by* J. Brito and A. Zahn

Anonymous Referee #2

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This paper describes a new unheated and unpowered permeation device used as a calibration source for volatile organic compounds (VOCs). The device consists of a PTFE membrane, a large water bath housed in vacuum insulation used as a heat buffer. The advantages of this system are a very fast equilibration time of the permeation rate and a large thermal mass to suppress temperature drifts of the system.

Calibrations of instruments measuring VOCs, such as GC-MS or PTR-MS, are essential to guarantee high data quality, but this is often not a simple task especially for oxygenated compounds like acetone as is described in this paper. Simple calibration devices as described here will clearly improve the quality and simplicity of VOC measurements and this topic is certainly very fitting and useful for readers of AMT. The

paper is well written and I enjoyed reading it, but I still have some comments that I like to see addressed before publishing this paper.

Major Comments: 1) The introduction is very detailed, almost too detailed in places, and so the main conclusion of the paper is somewhat diluted. Since this is an instrumental journal I find this acceptable, but would still suggest to significantly shortening chapters 2.1 and 3.1 and the discussion about the static and dynamic calibration methods on page 2933.

2) Even though the introduction is very detailed there is one important topic not discussed and I would like to see that added. To my opinion the main advantage of permeation tubes compared to gas cylinders is not discussed in the paper. Many VOCs, such as oxygenated compounds like aldehydes, alcohols and especially acids, are not stable in cylinders and degrade over time or can never be quantitatively recovered from cylinders. Permeation or diffusion sources are the only means for calibrating for those compounds. On the other hand, compounds that are in the gas phase at room temperature such as alkane or alkenes cannot be filled well into a permeation device. I would like to see a section added that discusses which compounds are not suitable for gas cylinders and have to be calibrated using permeation sources and what type of compounds cannot be done with the device as described here.

3) In here also lies the main problem of the device described here. The permeation rate from the source can be calculated, if all the parameters of the PTFE Teflon film are known, but it seems to me that ultimately the mixing ratio in the output of the permeation device was determined using a calibration gas cylinder of acetone. If this is the case, how do you calibrate for compounds, where no gas standard is available. Usually permeation tubes are weighed very carefully every few months to determine the weight loss and therefore the permeation rate. Can you weigh the permeation device or calibrate as described for example in Veres et al 2010? I would like to see that explained in the text.

4) How do you monitor the temperature? In the description no temperature measurement is indicated, but this is the most important parameter for the permeation rate. For example, small unpowered USB thermometers are available that record the temperature for days, which could be used to monitor the temperature change and therefore the thermal stability of the system while not powered.

5) I would like to see a graph of how the temperature in the fully insolated system changes with time. The temperature drift is only calculated, but this is a very easy measurement and should be added to the manuscript.

Minor comments: Page 2943 line 28: once every 100 min Page 2949 line 23: typo: small

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 2931, 2011.