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Atmospheric Measurement Techniques Discussions

Interactive comment on "Dynamic Solution Injection: a new method for preparing pptv-ppbv standard atmospheres of volatile organic compounds" *by* K. J. Jardine et al.

Anonymous Referee #1

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Review of "Dynamic Solution Injection: a new method for preparing pptv-ppbv standard atmospheres of volatile organic compounds", submitted by Jardine et al., for publication in Atmospheric Measurement Techniques Discussions.

This article describes a method for producing dynamic gas phase standards of volatile organic compounds (VOCs) with mixing ratios of 10s of parts per billion down to parts per trillion by volume. The method is termed dynamic solution injection (DSI). DSI makes use of simple off the shelf parts and a computer controlled liquid handling pump. The accuracy of the pump was evaluated by measuring the amount of liquid

delivered over time gravimetrically. The accuracy of the DSI method was evaluated by comparison with standards generated using both compressed gas (CG) standards and permeation tubes (PT). Good agreement was achieved between DSI and the CG standards. Agreement with the PT generated standards was not as good. The authors claim that DSI is an improvement over traditional methods due to its high accuracy and precision, low cost, simplicity, and portability.

Based on the description and data presented in the article, DSI definitely seems to be a valid method for producing dynamic gas phase standards of VOCs at mixing ratios relevant to ambient atmospheric studies. Especially in the category of cost and simplicity, this calibration method seems attractive (depending on the cost of the liquid pump). Issues regarding the stated accuracy of the method and the portability of the method need to be addressed by the authors and are described in the following paragraphs. I recommend accepting the manuscript with moderate revisions.

The claims of accuracy made in the manuscript, and in particular the claim that the DSI method is more accurate than using CG standards and PTs is not conclusively supported by the data presented. The observed discrepancy when calibration curves are compared between standards prepared using DSI versus CG standards and PTs cannot necessarily be attributed to the latter methods. The fact that responses for the CG and PT methods are lower than those for DSI suggests VOC losses in the calibration system; however, there are other possibilities. Accuracy issues associated with making dilute solutions of the VOCs listed in table 1 could lead to the observed discrepancies. Especially when these solutions were produced by delivering volumes as small as 5 μL. If this was accomplished using a GC syringe, the error could be large. Poorly calibrated or misused mechanical action micropipets can also lead to large volume errors. Another possible issue could be with the permeation tubes. The manuscript does not state how the permeation rates were determined, which can have a large effect on the calculated mixing ratio of the final standard gas.

In several places, the manuscript states that the DSI method is field portable relative to

other calibration generation methods such as CG and PT methods. The DSI method, as with the other methods, requires a dilution gas. In the field, the dilution gas is usually a tank of compressed zero air or UHP nitrogen. The authors should be more explicit in what they intend when they say 'field portable'.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 3047, 2010.