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Atmospheric Measurement Techniques Discussions

Interactive comment on "Measurements of Delays of Gas-Phase Compounds in a Wide Variety of Tubing Materials due to Gas-Wall Interactions" *by* Benjamin Deming et al.

Anonymous Referee #1

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Reviewer comments on amt-2019-25.

The authors present a very useful comparison between many widely used tubing types. They report equilibration times of each tubing material when switching between sampling representative atmospheric compounds and clean air. In particular, polymeric tubing (i.e. Teflon) is reported to generally have substantially faster equilibration times than metal tubing (in most cases even when coated). While relatively technical in nature, this work tackles an important issue in designing new instrumentation for the analysis of difficult-to-measure atmospheric components. I have relatively few comments and recommend publication with only minor revisions.

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Major comments: 1) It is not clear to me how well adsorbent and absorbent tubing can be compared by their approach, which is concerning given that a major conclusion of this work is the advantage of absorbing tubing over adsorbing tubing for sampling gases. One specific issue on this topic is that adsorbing times are on a 50% benchmark and the absorbing times on a 90% benchmark. Are these quantitatively comparable, which is to say, do they have the same mathematical meaning to allow direct comparison across modes? In Eq. (3), it seems odd to subtract the time it takes to get to 90% in the instrument from the time it takes to get to 50% in the complete setup. Couldn't the sigmoidal fit of the adsorbing data be used to similarly estimate time it takes to get to 90% and provide a uniform comparison? On a similar note, why where timescales measured during depassivation for absorbent and passivation for adsorbent?

The authors explicitly discuss that these metrics are different, so different equations are used and when they are included on the same plots a note is made. However, the authors nevertheless compare these cases, for instance stating in the abstract that "glass and uncoated and coated metals ... always caused longer delays than Teflon." I think it is important to compare across these materials, so my suggestion is not to stop comparing (e.g. removing the offending sentence in the abstract), but to put a little more care into figuring out how best to compare across categories (e.g. unify benchmarks).

2) A lot of time is spent rationalizing and discussing the fact that the steel tubing was previously used. I'm not sure how best to handle this; in short my issue is that large sections of pages 13 and 15 discuss the potential impact of this issue on the observed results but fundamentally it is just an N of 1. If the authors truly believe that the results of steel are strongly influenced by the history of the tubing, it seems best to just leave that data out and focus on 13 instead of 14 types of tubing. Otherwise, given the amount of time these seem to need to talk about it, it is apparently a bit of an apples to oranges comparison. Maybe they could have another small paragraph if which they discuss the possibility that tubing history has an impact and present their evidence for

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that specific issue there.

Technical comments: I actually have very few minor technical comments. I noticed no typos or specific issues in language, and believe the figures are clear and to the point.

I notice that the manufacturers of C-PFA also makes C-FEP, and it seems to be significantly cheaper (a little more than half the price). Given the relatively similar results between FEP and PFA, is there a reason the authors chose to test C-PFA but not C-FEP? Convincing the community to switch to conductive Teflon would be easier if cheaper, so it is a little bit unfortunate that C-FEP was not tested or discussed.

I think Figure S3 actually adds a lot of insight, and should maybe be added to the main body of the manuscript. If this change were made, the figure would need some cleanup to bring it up to the clarity standards of the current main figures.

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