

Interactive comment on “Effects of Gas-Wall Interactions on Measurements of Semivolatile Compounds and Small Polar Molecules” by Xiaoxi Liu et al.

Anonymous Referee #2

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Liu et al. present a detailed characterization of the signal delay in detecting organic vapors with saturation vapor concentration (C^*) of $10^0 - 10^4 \mu\text{g m}^{-3}$ through different types of sampling tubes. Different types of CIMS have been used in this study to compare the effect of inlet design on signal delay in detection. RH effect is also probed. Adsorption or absorption of organic vapors by the tube wall under different situations are discussed. The characterization can be very helpful in designing an instrument's inlet for the detection of a fast-changing environment or quantification of gas-phase components. This manuscript is well-written and organized. I suggest for publication after considering the following aspects:

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General comments about experimental suggestions:

Though detailed suggestions have been given in Section 4, I am concerning some other points that the authors have not covered. For example, given the much slower desorption time of low volatile species (Fig. 1 and 4b), are we supposed to use new sampling tubes for every experiment? In Fig. 1, the instrument-only signal decay of the compound $\text{C}_{10}\text{H}_{21}\text{NO}_5$ has not goes back to 0 in 2500 s. Does that mean the IMR has to be cleaned every time after detection of these species? Humidifying IMR shortens the response time based on this study, but will that affect the ionization efficiency of the vapor molecules? The other question is how to use the fact that low volatile species will level off after a while but with a low transmission efficiency, which could be an inverse problem for experiments without prior knowledge. I am sure the authors have the solution, but maybe a step-by-step process helps the readers a lot. The last is how confident the authors are with the relationship between C_w and C^* . As the authors have shown the study of small polar molecules, how about the effect of functional groups of organic species? pH of the water film could play a role, how about the potential hydrolysis reactions?

Specific comments:

1. Page 7 Line 172: Usually in the exponential fitting, the decay rate is $k = \frac{1}{\tau} = \sum \frac{1}{\tau_i}$. Though 10% is defined in this study, I would use the same expression.
2. Page 7 Line 186: About double and triple exponential fitting: what is the τ value reported in this paper?
3. Figure 2: Only several points have error bars. Do all of them have error bars or do other data points simply have small error bars?
4. Figure 4: The red curve (C6HN) higher than 1 is explained by competitive replacement by less volatile compounds, but how to explain the decrease? Though compounds with $C^* < 100 \mu\text{g m}^{-3}$ have lower transmission efficiency, how to explain the

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fast response time (the overlap with species of higher C^* at the beginning)?

5. Figure 5: Looks like Dihydroxycarbonyls are not in the figure.

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