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Atmospheric Chemistry and Physics Discussions

Interactive comment on “Temperature-induced volatility of molecular markers in ambient airborne particulate matter” *by* C. R. Ruehl et al.

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1) Is the rural site at Angiola?

R: No, the site was near Coalinga, at the University of California WestSide Research and Extension Center (WSREC) outside Five Points.

2) The sampling program length was only 5 days. The variations in ambient temperature and probably source mix may not have been seasonally representative. What does this imply about the general representativeness of the volatility results?

R: For each of the four campaigns (two sites for two seasons), samples were collected for a total of ten days (two five-day samples were composited to ensure enough material was available for quantification). We will clarify this in the text. None of these periods included “high-PM” events (e.g., as seen during CRPAQS) or had particularly high concentrations of biomass burning markers such as levoglucosan, so we feel safe in saying that these results are more typical of the SJV. Still, we have added text expressing the caveat that longer-term sampling is needed before the effect of the volatility documented in this study can be more fully determined.

3) I’m confused on the issue of the backup filter subtraction and the implication this has for inferences on absorbent-mediated volatility. The front filter absorbs ambient VOC and absorbents in the aerosol on the front filter influence volatility. Since there are no absorbents on the backup filter (except the filter itself), it seems there is an inconsistency in using the backup for correcting for ambient VOC absorption while at the same time speculating about the nature of absorbents on the front filter.

R: We assume that our backup filter subtraction corrects for any gas-phase adsorption (not absorption) onto the quartz filter. As the reviewer points out, this will not correct for any semi-volatile compounds which are either adsorbed onto or absorbed into the particulate phase on the filter. However, this is simply equivalent to assuming that the PM sampled is already in equilibrium with the vapor phase (in which case, exposure to additional vapor while on the filter will not increase the concentration of the semi-volatile compounds in/on the PM phase). We will modify the text to include this assumption.

4) Receptor modeling assumes conservation of composition. Since source sampling is done under different, probably not ideal conditions, relative to ambient sampling, how do we relate these ambient results to [fresh] source emissions?

R: We do not attempt to do this in the current manuscript. The implication of the results presented here is that certain molecular markers should not be considered conservative; however, more results would be required before firm conclusions can be reached.

5) What are the relative importance of volatility and reactivity for these compound classes?

R: It is hard to separate these two issues. They are most likely linked, as gas-phase oxidation is expected to proceed more rapidly than heterogeneous oxidation, and therefore a compound's atmospheric lifetime might be expected to vary inversely with its volatility. Having said that, we would expect n-alkanes and hopane/steranes to be the most volatile/least reactive; cholesterol/levoglucosan to be the least volatile/most reactive, and PAHs to be intermediate, based on their vapor pressures and rate constants for reactions with oxidants such as the OH radical.

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