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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Volatile organic compound emissions from solvent- and water-borne coatings: compositional differences and tracer compound identifications" *by* Chelsea E. Stockwell et al.

Anonymous Referee #1

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The authors present a compelling overview of Texanol and PCBTF emissions from coatings making the case for these compounds as specific tracers for water based and solvent based coatings. The authors accomplish this with an impressive synthesis of laboratory, ambient, and reported data. This paper makes a significant contribution to the study of VCPs, and I recommend it be published with minor revisions.

Mobile platform measurements show "hotspot" behavior for PCBTC, and perhaps Texanol, indicative of emission from manufacturing or construction sites. Neither compound correlates with transportation (CO) or PCP usage (Siloxane D5, population density). Taking advantage of stagnant meteorological conditions, the authors also estimate emissions for the two proposed tracer compounds.

Furthermore, using ingredient and sale data for coatings (at least in California), they show these compounds are both commonly and specifically used in coatings. This establishes a good basis for a tracer: the compound is measurable and specific to the category.

Laboratory experiments are used to qualitatively examine the headspace emissions of 19 products. I believe that this information is useful, however I have some concerns about the experimental design. Are you concerned that the water trap could systematically remove water soluble compounds? How sensitive were recoveries for water soluble compounds to the water trap temperature? I understand that this is designed to be quantitative and not qualitative, but the fact that Texanol cannot be detected by this method suggests the data in Figure 4 should be interpreted with some caution. I am fine with the presentation of what was detected, but would like to see more of a disclaimer of what may not be detected.

Evaporation experiments show that among the category of "coatings", g VOC per kg product emissions can vary tremendously. It would be nice to have more than one example of a product within each subcategory (ie more than one "Latex paint"), however that may be outside the scope of this study. The authors show that the majority of VOC emissions occur shortly after application, and again the amount emitted and the time frame of emission vary within the category of coatings. The emissions presented in Figure 4 are great!

Before giving more specific notes, I would like encourage the authors to eventually add their PTR-ToF-MS findings to the PTR Library (Pagonis, D., Sekimoto, K. and de Gouw, J. A.: A library of proton-transfer reactions of H3O+ ions used for trace gas detection, J. Am. Soc. Mass Spectrom., 2019.) The application of GC before PTR should give rich fragmentation information for compounds that would help further research in this field.

Some specific notes to follow:

Experimental methods: please list the exact masses on which you measure Texanol and PCBTC. Please list the temperature at which you conduct the laboratory experiments. One would suspect evaporation rates are highly temperature dependent. So much so that this may be worth mentioning in the discussion section as well!

Lines 33-35: VCPs as petrochemical organics: I would like a little clarification in the writing here. VCPs are defined as: VOCs that are ingredients of, and directly emitted from, coatings, adhesives, inks, personal care products, and cleaning agents (also pesticides if you would like to add). However, this sentence may leave the reader with the impression that they are necessarily petrochemical in origin, which is not true (Just as an example, McDonald 2018a include ethanol and monoterpenes as VCPs. I don't think either of these chemicals have a significant petrochemical source.) This sentence is technically correct, as many VCPs are of petrochemical origin, but I think it is especially important that while this term is somewhat young we really hammer down its strict definition.

Lines 42-43, ibid.

73 delete “a” 99 “was” to “were”

Line 212: “while emissions from VCPs scale linearly with the number of people” This is contradicted by the previous evidence showing that these two VCPs do not correlate strongly with population density. Do you mean PCPs rather than VCPs?

Lines 223-226 I see you are detecting Texanol on the dehydrated fragment, certainly expected for an alcohol. I would add that an isomer on this mass would be menthyl acetate, a terpenoid and flavor/odor additive. Seeing as you have calibrations of texanol, is there a fragmentation pattern that could be used to determine if there is interference in the ambient data?

Line 337, and figure 7a: should values these be normalized to the initial mass of the product used?

Figure 1b shows clearly shows PCBTF's “hotspot” behavior. Texanol, on the other hand does not show much use in the winter, which is helpful in showing that it does not follow CO or PCP patterns. However, in the summer the two largest spikes seem to align with large spikes of D5. Is this correct? If so, see my note regarding a possible interference from menthyl acetate.

Figure 2a: Legend is in units of people per square kilogram. Should be per square kilometer.

Figure 3: I think you could remove this figure. At the very least, remove the fits in 3a. The lines trick the eye into finding patterns that the R-squared says are not present.

Figure 5: Significant figures on the ppb/mg labels. 2? 3?

Figure 6: Consider using a left and right y axis rather than a VOC multiplier. I'm not certain, but it may read better.

Figure 10b: this figure is confusing to read. Consider another representation. Maybe a (grouped?) bar chart.

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