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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Considering the future of anthropogenic gas-phase organic compound emissions and the increasing influence of non-combustion sources on urban air quality" *by* Peeyush Khare and Drew R. Gentner

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We thank the reviewer for supporting our manuscript and their insightful comments which have helped us further improve our work. After having gone through the comments in detail, we present our revisions/replies below:

Reviewer 2:

Following on from the detailed reviewer comments added on the 15th of February, I have only a few things to add. I think this paper is a valuable contribution to the

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literature and nicely complements the paper by McDonald et al. recently published in Science (I was surprised there was no reference to this paper here).

-Line 124: Should furnishings be added to your list? There are emissions of VOCs from e.g carpets that I'm not entirely clear are included in your list. Is it also worth somewhere making the distinction between primary and secondary emissions from surface sources, as these will vary over time – so primary emissions from furnishings/building materials are high in the first instance and then decrease over time, whilst secondary emissions are ozone dependent and may even increase over time if outdoor ozone concentrations (and hence indoor concentrations) increase.

Response: We agree with the reviewer that furnishings are a major potential source of emissions that belong as part of this work. We had broadly included these things with building materials but acknowledge that greater detail could be provided. To address this concern, we have modified the bullet points in lines 131-132 to "Building materials (e.g. carpeting, flooring, insulation, wood, gypsum)" and "Furnishings (e.g. furniture)". Secondly we also agree that primary versus secondary emissions are an important differentiation. We include them both in our three emission pathways described in section 2, lines 144-149. To address the reviewer's concern, we have changed emission pathway #3 in lines 148-149 to also include emissions via degradation of "a solid product/material". We also refer the author to lines 156-159 where we specifically discuss emissions via ozone oxidation, and have now added a comment about emission timescales for these emissions.

-Line 261: The products you investigated have 'hidden' ingredients (varying from 30-60% of the total). Is it similar for similar types of products, so you could potentially estimate the amount that is missing from your inventory, or is it manufacturer rather than product dependent or random?

Response: Our survey of MSDSs demonstrated very wide ranges of reported product composition for proprietary reasons. The reported ranges tended to vary at random,

and could not be reliably constrained by product type.

-Line 498: There is some literature that suggests siloxanes may have health impacts - see review of such by Tran and Kannan in Science of the Total Environment 511 (2015) 138–144.

Response: We thank the reviewer for pointing out the Tran and Kannan (2015) paper. We acknowledge potential health effects from a wide range of compound classes that might not be fully understood. We intended “low” to include things that are not part of well-established hazardous compounds such as those on the air toxics list. We have now edited the sentence in lines 514-516 of the (revised) manuscript for clarity, and removed “siloxanes” to resolve the reviewer’s concern.

-Section 4.2: I agree with the first reviewer that this section is too long. I wasn’t clear from your response whether you had shortened this section significantly, but if not, would urge you to make it shorter and more focused.

Response: We have revisited the last 2 sub-sections of section 4.2 again, and based on the comments from the two reviewers, we have significantly shortened the “Contributions from off-road combustion-related sources” sub-section to a single, more concise paragraph. We have also incorporated the sub-section on modifying factors into the introduction (as suggested by Reviewer #1).

-Table 1: I was a bit confused by some of the footnotes. You need to tie them more specifically to the information in the table so we know which fraction the footnotes refer to (e.g. footnote f refers to the emitted fraction presumably?).

Response: We agree with the reviewer and have rephrased the “Note” at the bottom of Table 1 footnotes to prevent confusion. The “Note” now reads, “All fractions given in the footnotes refer to the emittable fraction of a product. Emittable fraction is confirmed with MSDS where possible.”

-The authors might also want to consider the increasing use of so-called ‘green’ mate-

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rials indoors that typically have lower emission rates than more traditional materials. If such materials become more widely adopted, it may be that indoor sources of VOCs decrease over the considered period of time as well (or at least those from some of the sources considered).

Response: We agree with the reviewer that this is a very interesting area of development within the market and research field, but it is unclear if a holistic consideration of emissions across all three described pathways will yield significantly different emissions/conclusions, since modifications have primarily targeted more direct emissions historically. For example, a study by Toftum et al. 2008 (cited in the manuscript in line 161) reports SOA formation from ozonation of a green paint. We agree that this is a very interesting area of research and have acknowledged it in the conclusions section with future research needs.

Edits

Line 322: Sentence too long and grammar needs improving.

Response: Done. The sentence is split into two sentence and rephrased for clarity.

Line 703: grammar needs improving.

Response: Done

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