

## ***Interactive comment on “Comprehensive organic emission profiles for gasoline, diesel, and gas-turbine engines including intermediate and semi-volatile organic compound emissions” by Quanyang Lu et al.***

**Anonymous Referee #2**

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This is a very useful paper that synthesizes motor vehicle emission data and comes up with recommendations for the molecular composition of these emissions to be used in photochemical models and for the volatility distributions to be used in models for secondary organic aerosol (SOA) formation. The results for SOA formation are discussed in terms of existing mechanisms. I recommend that the paper be published after incorporation of the following comments:

The results for the VOC molecular composition obtained in this work are getting short thrift in the presentation. Table S3b gives the lumped composition for use in SAPRC,

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but it is not discussed or presented in much detail. I recommend the Authors consider the following changes:

1. Including the detailed VOC composition that went into these lumped compositions would be very helpful in many other analyses and I suggest adding it to Table S3.
2. To draw attention to these results, I suggest the authors include a graph representing the results in Table S3b in the main body of the paper.
3. The Authors would expand the audience for this paper even more, if they included VOC compositions for use in other mechanisms as well, e.g. Carbon-Bond, RACM, GEOS-CHEM.
4. Finally, some discussion of the recommended VOC compositions would be very useful, for example: how do they compare with previous papers, and to what extent does the lumping affect total OH reactivity?

Detailed comments:

Page 5, lines 29-30: Remove “falls”

Page 5, lines 30-31: Remove “falls in”

Page 6, lines 10-11: “estimated” instead of “estimates”

Section 2.3: Equation (2) does not account for the reaction rate coefficients of different compounds. A brief discussion of how this affects the analysis is warranted.

Page 7, line 7: “group” instead of “groups”

Page 11, lines 17-18: But wouldn't this suggest that the enhancement of IVOCs in gasoline exhaust is not the same for different source categories (Pre-LEV vs. ULEV etc.)? That would be in contrast with one of the main messages from this paper.

Figure 3: “cyclic” is consistently misspelled in the legend.

Figure 5, panel a: It is not entirely clear to me what is being plotted here. From the

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caption I understand that 1 stands for total NMOG emissions. Is it the mass fraction of NMOGs that is considered an SOA precursor, regardless of the yield? It seems like a very high number.

References: The typesetting made it difficult to distinguish one reference from another.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-752>, 2018.