

Interactive comment on “Measurement report: Distinct Emissions and Volatility Distribution of Intermediate Volatility Organic Compounds from on-road Chinese Gasoline Vehicle: Implication of High Secondary Organic Aerosol Formation Potential” by Rongzhi Tang et al.

Anonymous Referee #1

Received and published: 7 December 2020

The manuscript describes a study of IVOC emission factors - determined on a test stand - exploring different driving cycles and habits and two different fuels. The authors classified the group of compounds where speciation was not possible. By using their emissions factors and compound classes they estimate the SOA formation potential and related it to real and potential measures of emission reduction. The study was performed in thorough way, the presentation of the data is very good with few exception (see comments). The paper is written well, language is good and understandable.

C1

However, there are a few typos, missing articles, plural/singular issues and similar, which the author will be able to lift easily. This is also true for the supplement. The obvious weak point of the paper is that the authors tested only one single car. This makes it difficult to judge in how far the results are representative at all and for the Chinese gasoline fleet. However, the authors covered a lot of different and important aspects. They also made comparisons to previous studies for US cars and driving cycle. From this point of view, I see this study as a kind of pilot study, from which a lot can be extracted for structuring future extended studies. I have only a few minor issues, and after the authors address these points, the paper can be published in ACP more or less as it is with minor changes.

Minor comments

Line 156-158, Do you have any idea how accurate that approach is? Finally, you calculate SOA potentials based on those numbers. I suggest that you extend on the potential error of the “Zhao”-method in the supplement and make a short statement here about the potential uncertainty.

Line 181-183, yes, the emission factors are lower, but the gasoline consumption is higher. Isn't it the folding of both which is important for the atmospheric effect?

Line 251 / caption Figure 3, Figure 3 needs a better introduction and captions especially introducing the Chinese E10 trace.

Line 255-265, I suggest always (4x) to refer to the panels in FigureS5 in the supplement in order to relate the statements to the plots. It is easier for the reader.

Line 296-298, these are results from only one vehicle, therefore I suggest to formulate the conclusions a bit more careful.

Line 337-340, I cannot see this in Figure 3. Or should I compare to E10 fuel? However, why E10 fuel then? As mentioned already, Figure 3 needs better explanations.

Line 410-412, I am sorry, but this sentence does not make sense to me. (grammar?)

C2

Please, rephrase.

Line 421/Figure S10, wouldn't it be good to indicate the contribution of the classes to the emission (Figure S4). Or bring Figure S4 and S10 closer together. I guess the aromatics in Figure S4 contain also the single ring aromatics. That would mean here that aromatics are over-effective in SOA formation.

Line 434-436: "...and then keeps constant after~24 h." No, I would say it does not become constant within the first 48h. I could agree with a formulation "levels off after 30h", or "the curves flatten after 24.-30h".

Line 444 and Table 1, could you show the quality of your fits? E.g. plotted into Figure S11?

Line 758 / Figure 5, explain the "balls" in the caption

Errors:

Line 27, B14-B16 compounds, this notation cannot be used here as it is not explained.

Line 30, I suggest to use "did" have instead of "could" have

Lines 35, I would replace "vehicle" by "the tested vehicle", or so. In any case "the" is missing

Line 58 and many more instances: a blank is missing in the reference listings.

Line 104, it was only one vehicle, so please use singular

Line 120/121, either articles or use of plural for "quartz filter(s)" and "TENAX tube(s)"

Line 129, "a" gas chromatograph mass spectrometer or mass spectrometr"y"

Line 135, you can skip "in the literature"

Line 144, please explain the notation SUUMA

Line 209, ... found "that the" NECD cycle. . . , or so

C3

Line 251 ... "show" ... "over" the 11 retention time bins.

Line 296, ... emission "measures" implemented. . . , or so

Line 300, Chinese regulations "may" also appear. . .

Line 305, Figure S8, I guess

Line 322, ..has a similar IVOC volatility distribution "as" the unburned gasoline. . .

Line 366 and more place, typo in the word "Chinese", please double check and correct.

Line 415, I would start a new paragraph here, beginning with "Cold start. . ."

Line 460, Compared with US LEV-2 gasoline vehicle"s", "the" China V vehicle emits three times "more" IVOCs. Three suggested changes in "" "".

Line 463-464, ...IVOCs could act "as" more important SOA precursors. . .

I found typos in the supplement (which has no line numbering and page numbers), which you can find by searching: hot-start; Zhao et al. (ref.) => Zhao et al. (2016); "b-alkane" is double.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-976>, 2020.

C4