

Interactive comment on “The levels, variation characteristics and sources of atmospheric non-methane hydrocarbon compounds during wintertime in Beijing, China” by Chengtang Liu et al.

Anonymous Referee #3

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This manuscript describes NMHCs measurements at an urban site in Beijing city in winter in order to identify their levels, variation characteristics, and their sources. Therefore, the authors applied a widely-used receptor model, PMF, to investigate sources of NMHCs in winter at this site. The concentrations and their temporal variation were analyzed according to different meteorological situations (clear days and haze days). The overall analysis shows the important contribution of coal combustion emissions to the NMHCs in winter especially in haze days. The paper is well written and organized. I would however, like to see some revisions before it is accepted for publication in ACP.

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Major revisions

1-Page 4, line 1: specify how the detection limit is determined.

2-Add a table with all the measured NMHCs (average, median, standard deviation, and detection limit) and indicate which compounds were selected for PMF analysis. The table can be added to supplementary material.

3-Page 4, line 5-6: the authors cited 4 PMF studies in China but there are earlier and more authoritative studies, as the PMF is widely-used and not limited to a specific place. It would be good to integrate some of these as well.

4-I suggest to add wind direction and ozone concentrations in figure 1 and to add analysis accordingly in section 3.1. In addition, pollution roses of some specific compounds can be shown.

5-Page 6, section 3.2.2: Please explain more, in the beginning of the paragraph, why you selected these compounds (propene and propane) because referring to table 4, we can see that the correlation between combustion related species such as benzene/toluene ($r^2=0.96$) and between ethylene/acetylene ($r^2=0.91$) is better than between propane/propene ($r^2=0.8$). Knowing that toluene is more reactive than benzene, and ethylene is more reactive than acetylene.

6-Page 7, line 7: add O₂ to the reaction (8) : $O_3 + NO_2 \rightarrow NO_3 + O_2$

7-Page 8, section 3.3.1: why did you select the cis-2-butene/trans-2-butene ratio? These species weren't even included in PMF analysis. It seems that these two compounds don't have the same behavior in clear/haze days (figure 4).

8-Page 8, line 10: do you mean gasoline vehicle exhaust or gasoline evaporation related to vehicles?

9-Page 8, the first paragraph (line 10 – 29): It will be better if the ratios from literature are shown in figure 4 as it is the case of figure 5.

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10-Page 9, section 3.3.2: the source attribution must be consolidated and more detailed. It will be nice to see diurnal variation of the different factors as well as the time series in different conditions (clear sky, haze days). The PMF results should be also consolidated by using the air quality indicators (like ozone and PM2.5). Adding to that, an analysis of all the factors with wind direction can add more information about the sources and can reveal some point sources such as industries.

11-Page 9, line 15: It is not true that highly reactive NMHCs were excluded because xylenes, ethylene, etc. were included in the PMF analysis so please put other arguments.

12-Page 10, line 1 - 5: how can you explain the correlation of aromatic > C7 with benzene which is a combustion tracer as it correlates also with ethylene and acetylene.

13-Page 10, section 4: please make a brief introduction about the work at the beginning of the paragraph.

Minor revisions:

1-Page 6, line 10 – 12: please rephrase. I think the word “concentration” is lacking.

2-Page 6, line 16-17: rephrase: “...indicated that vehicle exhaust was an important source of NMHCs...”

3-Page 6, line 24: “...which favors accumulation...” remove “the”

4-Keep the same name of compounds in all the manuscript like (propene or propylene; ethane or ethylene...)

5-Page 7, line 27-28: Put this sentence as an explanation before the equations, at line 14.

6-Page 8, line 3: “which is close to...”

7-Page 8, line 23: “... in winter of Beijing are close to those...” and not “closed to”

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8-Page 8, line 27: "...could also be confirmed..." not "been"

9-Page 9, line 15: "with highly reactive", remove "with".

10-Page 9, line 23: "which was in consistent..." please clarify, do you mean "inconsistent"?

11-Page 10, line 11: "it is clear..." not "clearly"

12-Page 11, line 1: "significant fluctuation..." not "significantly"

13-Page 15 and 21, table 1 title: "status" not "statues"

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