

Letter of Responses

Response to Referee #1 (Acpd-10-C1955)

In their manuscript, Wang et al. describe measurements of ambient NMHCs in Beijing during periods when different pollution control measures were being implemented before, during and after the 2008 Olympic games. They provide a detailed overview of NMHCs and their sources in Beijing during these periods and the results nicely show the positive effects of implementing stringent emissions controls. The paper is well written, presents original and unique data that is of interest to the community, and is suitable for publication in ACP after addressing a few comments.

Reply: The authors would like to thank the Referee #1 for the careful review and helpful comments to our manuscript. We have prepared responses to each of the concerns and questions, which are listed below. The referee's comments are in *italics*, followed by the authors' responses.

Comments

(1) *Is it possible to include concentrations of individual NMHC, perhaps as a supplement to the manuscript?*

Reply: Yes, we will provide speciated data for PKU site in the revised manuscript (section 3.2, Table 5).

(2) *Have you considered the potential influence of season on NMHC mixing ratios, as it is likely that at least some of the decrease observed in July and August is due to increased reaction with OH during these months relative to June and September?*

Reply: This is a good point. Very unluckily that the ambient OH levels were not measured in the 2008 campaign, so we are not able to quantify the influence of NMHC losses due to the reaction with OH. However, from the measured ground-level ozone (O_3) and total oxidants ($Ox=O_3+NO_2$), we did not find significantly higher concentrations in July and August than those in June or September. As shown by our measurements, from June to September, the monthly averages of daytime O_3 (8:00-20:00) were 68 ± 30 , 68 ± 27 , 58 ± 31 , and 52 ± 32 ppbv, respectively, while the monthly averages of daytime Ox (8:00-20:00) were 81 ± 28 , 79 ± 27 , 66 ± 31 , and 64 ± 32 ppbv, respectively, hinting that influence of reactions with OH on the seasonal variation of NMHCs was probably a minor factor.

In the following data analysis, we tried very hard to calculate the photochemical consumptions of NMHCs based on first-order reactions with OH by using the ratios of ethylbenzene/m,p-xylene. From this calculation, we might be able to distinguish the contribution of change in emissions and in chemistry, to the variation of ambient NMHC species.

(3) *Along similar lines as the previous comment: Not all of the studies compared to Beijing in Figure 2 were conducted in summer; is it reasonable to make a comparison of NMHC during summer in Beijing to NMHC in winter or spring in other cities? Additionally, as this comparison is only briefly mentioned in the text, it could be removed from the figure/manuscript.*

Reply: Accepted, we have removed this part from the figure/manuscript in the revised manuscript.

(4) *As the non-vehicular source of isoprene was discussed in Section 3.1, I suggest that the*

discussion of isoprene in section 3.2.1 be moved to section 3.1, and that figure 3b be made a separate figure. Additionally, the correlation between isoprene and a tracer associated with vehicular emissions (e.g. ethyne), or rather the lack thereof, would strengthen the argument that isoprene is by and large from biogenic sources. Has this been considered for this dataset?

Reply: It is interesting to argue about isoprene here. Actually the vehicular emission of isoprene was found in previous studies (Barletta et al., 2002; Liu et al., 2008), therefore it was of concern to perform diagnostic analysis for the role of vehicular emission in the variation of ambient isoprene. However, from our evaluation so far, we concluded that the isoprene levels in summer of 2008 in Beijing were dominated by biogenic emissions, which was now a common sense for isoprene. Therefore we prefer to keep the discussion of isoprene unchanged.

Additionally, PKU site was the one characterized for urban area with intensive traffic where the traffic flows were counted, and Figure 3 was used to reflect the variation of several of NMHCs species at this site. It might make sense to plot together the variation of traffic flow, isoprene, and ethyne (tracer for vehicular exhaust emission). As shown in the figure, the variation of ethyne was similar with traffic flows, but almost contradictory to the variation of isoprene, hinting that isoprene might be mainly from non-vehicle sources, e.g. biogenic emissions.

(5) There is no reference given for the maximum incremental reactivities (MIRs) used to determine ozone formation potentials, and I believe a brief description of the technique is warranted.

Reply: Accepted, a description of the technique and the corresponding reference has been added into the revised manuscript (section 3.4, page 15, line 405-407).

(6) Minor/Technical Comments

Figure 2 would benefit from reformatting; placing the data labels at the bottom of the graph(s) would allow the NMHC axes to be rescaled so that the mixing ratios were better represented and easier to view and interpret. Also, should the label for 2(b) read “propene” rather than “propane”?

Reply: Accepted, the figure and the manuscript have been modified according to the suggestions.

p 5567 line 17; p. 5573 line 25; p. 5576 line 4: change NMHCs to NMHC

Reply: Accepted and fixed.

p 5568 line 10: should read “the corresponding control stages are referred to in the temporal”

Reply: Accepted and fixed.

p 5575 line 17: should this read “of propene and toluene”?

Reply: Yes, and fixed accordingly.

p 5575 line 24: please provide a reference for the statement that “Beijing is in an NMHC-sensitive regime” (Zhang and Keding, 2009?).

Reply: This part has been removed from the manuscript, as referring to our response to the general comments (3).

p 5576 line 4: change to “were counted on the 2nd, 3rd and 4th”

Reply: Accepted and fixed.

References:

1 Barletta, B., Meinardi, S., Simpson, I. J., Khwaja, H. A., Blake, D. R., and Rowland, F. S.: Mixing ratios of volatile organic compounds (VOCs) in the atmosphere of Karachi, Pakistan,

Atmos. Environ., 36(21), 3429–3443, 2002.

2 Liu, Y., Shao, M., Fu, L.L., Lu, S. H., Zeng, L.M., and Tang, D.G.: Source profiles of volatile organic compounds (VOCs) measured in China: Part I. Atmos. Environ., 42, 6247-6260, 2008.