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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spatiotemporal Variation, Sources, and Secondary Transformation Potential of VOCs in Xi'an, China" *by* Mengdi Song et al.

Anonymous Referee #3

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General comments:

Understanding the sources of VOCs is vital to the mitigation of O3 pollution. Song et al. performed comprehensive field observations and VOC grid sampling in Xi'an to elucidate the concentration levels, source characteristics, and secondary conversion ability of VOCs. They found that vehicle exhaust was the dominant source of VOC emissions in Xi'an. This paper has important implications for the control of O3 pollution in megacities, so it is well within the scope of ACP. I recommend this paper to be published after addressing the comments below.

Specific comments:

Lines 33-38: The authors only present VOC sources for some specific cities. Can the

authors summarize the results of previous studies for various regions of China, e.g. Beijing-Tianjin-Hebei, Yangtze River Delta, Pearl River Delta?

Lines 78-79: How often were external standards run? Please provide more details.

Lines 88-89: What's the duration for sampling? Did the authors also test blank samples?

Lines 158-159: It is recommended to provide the VOC list in the supporting information.

Lines 172-173: It is not clear to me how good the correlation between O3 and temperature is. What is R2? It seems that the correlation is moderate.

Lines 175-180: The average temperature on polluted days is much higher than that on clean days, which will increase the emission of some VOCs, e.g. isoprene as well as solvent evaporation. As the precursor of MVK and MACR, did the concentrations of isoprene increase on the polluted days?

Based on Figure 3, the increase in the concentration of OVOC on O3 pollution days is largely driven by the increased concentration of acetone. The authors also show in section 3.2.2 that acetone is mainly from vehicle exhaust and industrial sources. Both primary emission and/or secondary transformation may contribute to the increase of OVOC. Can the authors estimate the contribution from primary emissions?

Did the NOx concentration change during the polluted and clean days? Did NOx play a role in increasing the O3 concentration on polluted days?

Line 184: It is recommended to provide the VOC list and the grid sampling data in the supporting information.

Line 190: Did "the overall level" mean "the average concentration"?

Lines 192-194: Are there any specific industrial sources near YT? Again, the contribution of primary emissions to OVOCs should be excluded to draw this conclusion.

Lines 209-210: These numbers are the slopes of the fitting lines, not the correlation coefficients. Please also revise other places accordingly.

Lines 215-217: For the grid sampling, only samples at 7:00 and 15:00 were collected. It is reasonable that vehicle exhaust greatly contributed to the overall VOCs because of the sampling time. The authors should state the weakness of the sampling as a caveat.

Section 3.2.2

MVK is a photochemical product of isoprene. Why are most of the MVK attributed to vehicle exhaust at the CB site?

Figure 1: it is recommended to mark Feiwei plain.

Figures 5 and 7: Linear correlations are shown, not correlation coefficients.

Figure 6: What does the green line represent?

Figure 8: What do the bars and dots represent? Please explain in the caption.

Technical corrections:

Line 10: “a critical precursors”. . .delete “a”.

Line 23: References are missing.

Line 35: “source” should be “sources”

Line 36: “indicates” should be “indicate”

Equation 1, lines 98 and 100: the rate coefficient is typically represented by the lower-case k.

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