

Review of “Characteristics of wintertime VOCs in suburban and urban Beijing: concentrations, emission ratios, and festival effects” by Li et al.

This manuscript performed VOCs measurements at an urban site and a suburban site in Beijing in winter. The spatial distribution of VOCs is discussed and used to infer the primary and secondary sources of VOCs. The emission ratios are also estimated and contrasted between two sites. It is also shown that the population migration during Chinese new year leads to a 60% decrease in VOCs concentrations. Overall, the conclusions are well supported by the results, though the conclusions are not very exciting. I recommend publication after major revision.

I have some major concerns regarding the discussions on isoprene emission. Firstly, the reported isoprene concentration is about 1ppb at urban site in winter. This concentration is surprisingly high, given the low biogenic isoprene emission in winter. From table 1, isoprene concentration in this study is higher than other studies. Figure 7 also shows that the estimated isoprene emission ratio in this study is higher than other studies. I think it is important to justify the accuracy of isoprene measurement. For example, the authors should better quantify the interference from furan. Secondly, the observation that the daytime reduction of urban isoprene is much lower than other VOCs is intriguing. This phenomenon is most prominent between 12:00 and 16:00. The authors provide three possible explanations on Page 5, but the first two reasons can not explain this observation. It is possible that there is some anthropogenic source of isoprene (after ruling out the interference of furan). If so, this additional unknown source of isoprene would be an important finding. I suggest to look into the sources of isoprene. I want to bring some recent studies on volatile chemical products¹⁻² to the authors’ attention. Thirdly, in Table 2, the correlation coefficient between isoprene and CO is fairly high, compared to other studies. This also points to a potential anthropogenic source of isoprene. Alternatively, there is substantial interference from furan.

Other comments

1. The VOC vs. CO scatter plot should be shown in the SI for all VOCs.
2. Page 8 Line 16. This conclusion is only applicable to VOC that has very slow reaction rate with oxidants.

Reference

1. McDonald, B. C.; de Gouw, J. A.; Gilman, J. B.; Jathar, S. H.; Akherati, A.; Cappa, C. D.; Jimenez, J. L.; Lee-Taylor, J.; Hayes, P. L.; McKeen, S. A., et al. Volatile Chemical Products Emerging as Largest Petrochemical Source of Urban Organic Emissions. *Science* **2018**, 359, 760-764.
2. Coggon, M. M.; McDonald, B. C.; Vlasenko, A.; Veres, P. R.; Bernard, F.; Koss, A. R.; Yuan, B.; Gilman, J. B.; Peischl, J.; Aikin, K. C., et al. Diurnal Variability and Emission Pattern of Decamethylcyclopentasiloxane (D5) from the Application of Personal Care Products in Two North American Cities. *Environ Sci Technol* **2018**, 52, 5610-5618.