

I thoroughly reviewed this manuscript. I agree that the subject of the review is very essential. This paper presents the characteristic of the particulate I/SVOCs from chassis dynamometer tests of HDDVs complying with multiple emission standards. Interestingly, this paper provides a versatile approach and could be applied into other significant sources prevailing in typical environments. This may have implications for environmental management. I have listed some specific comments (see below) for this paper, and it is recommended to make revision before publication.

We are grateful for the positive tone in suggesting for accepting this manuscript. Below please see our point-by-point response to the reviewer's comments and suggestions. The comments from the reviewers are in black type and our response texts are marked in blue.

EF and OA in Line 30. These abbreviations have to be explained in their first appearance in the text. Check throughout the manuscript. These are readily recognizable only to the more experienced reader.

Thanks, and revised.

In Introduction, from Line 36 to Line 42, so much dated references are cited, such as: Line 38, Lines 39-40, Line 42. A better presentation is needed along with up-to-date references.

Thanks for the comment. We updated the references as suggested and rephrase the content where appropriate. The following references are adopted:

Sun, S. Y., Zheng, N., Wang, S. J., Li, Y. Y., Hou, S. N., An, Q. R., Chen, C. C., Li, X. Q., Ji, Y. N., and Li, P. Y.: Inhalation Bioaccessibility and Risk Assessment of Metals in PM_{2.5} Based on a Multiple-Path Particle Dosimetry Model in the Smelting District of Northeast China, *Int. J. Env. Res. Public Health*, 19, 10.3390/ijerph19158915, 2022b.

Faridi, S., Bayat, R., Cohen, A. J., Sharafkhani, E., Brook, J. R., Niazi, S., Shamsipour, M., Amini, H., Naddafi, K., and Hassanvand, M. S.: Health burden and economic loss attributable to ambient PM_{2.5} in Iran based on the ground and satellite data, *Sci Rep-Uk*, 12, 14386, 10.1038/s41598-022-18613-x, 2022.

Nguyen, G. T. H., Nguyen, T. T. T., Shimadera, H., Uranishi, K., Matsuo, T., and Kondo, A.: Estimating Mortality Related to O₃ and PM_{2.5} under Changing Climate and Emission in Continental Southeast Asia, *Aerosol and Air Quality Research*, 22, 10.4209/aaqr.220105, 2022.

Li, Y. J., Zhu, Y., Liu, W. J., Yu, S. Y., Tao, S., and Liu, W. X.: Modeling multimedia fate and health risk assessment of polycyclic aromatic hydrocarbons (PAHs) in the coastal regions of the Bohai and Yellow Seas, *Sci. Total Environ.*, 818, 10.1016/j.scitotenv.2021.151789, 2022.

Sun, J., Shen, Z. X., Zhang, T., Kong, S. F., Zhang, H. A., Zhang, Q., Niu, X. Y., Huang, S. S., Xu, H. M., Ho, K. F., and Cao, J. J.: A comprehensive evaluation of PM_{2.5}-bound PAHs and their derivative in winter from six megacities in China: Insight the source-dependent health risk and secondary reactions, *Environ. Int.*, 165, 10.1016/j.envint.2022.107344, 2022a.

Lines 77-78. You expressed "a comprehensive characterization of speciated g-p partition of vehicle emission is yet

to achieve”. However, there is no reference, please give some to confirm it.

Thanks, and revised as suggested. The following references are inserted here to support the statement.

Alam, M. S., Zeraati-Rezaei, S., Stark, C. P., Liang, Z. R., Xu, H. M., and Harrison, R. M.: The characterisation of diesel exhaust particles - composition, size distribution and partitioning, *Faraday Discuss.*, 189, 69-84, 10.1039/c5fd00185d, 2016.

Zhao, Y. L., Kreisberg, N. M., Worton, D. R., Isaacman, G., Weber, R. J., Liu, S., Day, D. A., Russell, L. M., Markovic, M. Z., VandenBoer, T. C., Murphy, J. G., Hering, S. V., and Goldstein, A. H.: Insights into Secondary Organic Aerosol Formation Mechanisms from Measured Gas/Particle Partitioning of Specific Organic Tracer Compounds, *Environ. Sci. Technol.*, 47, 3781-3787, 10.1021/es304587x, 2013.

Liu, Y., Gao, Y., Yu, N., Zhang, C., Wang, S., Ma, L., Zhao, J., and Lohmann, R.: Particulate matter, gaseous and particulate polycyclic aromatic hydrocarbons (PAHs) in an urban traffic tunnel of China: Emission from on-road vehicles and gas-particle partitioning, *Chemosphere*, 134, 52-59, 10.1016/j.chemosphere.2015.03.065, 2015.

The format of the paper still needs to be improved. Such as, Line 80: “integrate” and Line 145: “Nest”. Please modify it.

Thanks very much for the comment. We corrected the sentences where appropriate and improve the format of the overall manuscript.

Line 164. You said “we is the mass fraction of carbon (0.86) in the diesel fuel”. How do you get this value 0.86? There is not any analysis about the reason or any reference to support it.

Thanks for the suggestion. According to the national standard: Fuel consumption test methods for heavy-duty commercial vehicles (<http://www.catarc.org.cn/upload/201908/20/201908201530245058.pdf>), the average molecule formula of diesel fuel is CH_{1.86}. Mass fraction of carbon is $12/13.86 = 0.865$. This fraction widely is adopted in previous studies and one of the references is given below: Close T.R. Dallmann, T.W. Kirchstetter, S.J. DeMartini, R.A. Harley Quantifying on-road emissions from gasoline-powered motor vehicles: accounting for the presence of medium- and heavy-duty diesel trucks, *Environ. Sci. Technol.*, 47 (2013), pp. 13873-13881.

Line 173. The sentence “alkane is the most abundant species” is not smooth. Please confirm words “is” and “species” are conflict whether or not?

Thanks for the comments. We checked and confirmed no confliction.

Line 173-175. The two sentences expressed similar idea. It is recommended that they can be combined into one part. The second sentence is deleted as suggested.

Lines 190-198. This chapter you gave the results about EF. Lines 173-189, the average HDDV-emitted particulate I/SVOCs EFs of cold-start and hot-start driving cycles are expressed, respectively. However, you do not distinguish

the results about cold-start and hot-start in Lines 190-198. Please give an explanation.

When comparing the EFs from cold-start and hot-start, as we did in line 173-189, the EFs from different driving conditions are reported separately. A substantial decrease of EFs from cold-start to cold-start are observed. Further on, we would like to investigate the impacts of aftertreatment devices on the EFs, regardless of the driving conditions. In this regard, for certain vehicle type, i.e., (DOC + DPF) vehicles or non-(DOC + DPF) vehicles, we average the EFs from all the driving conditions and compare the results for different vehicle types.

Line 225. What is the meaning of O-I/SVOCs? You analyzed volatility distribution of I/SVOCs before. What is the difference between O-I/SVOCs and I/SVOCs?

O-I/SVOCs is short for oxygenated intermediate-volatility and semi-volatile organic compounds (I/SVOCs). I/SVOCs are defined on the volatility distribution of organic aerosol and those in the effective saturation concentration (C^*) range of 10^{-1} to $10^6 \mu\text{g m}^{-3}$. O-I/SVOCs, in particular, refer to the oxygenated fraction of total I/SVOCs. O-I/SVOCs resolved in the particulate I/SVOCs emitted by heavy-duty diesel vehicles (HDDVs) include phenols, benzylic alcohols, aliphatic alcohols, benzylic ketones, acids, and aliphatic ketones, and their respective mass fractions are reported in the manuscript. We missed the full name of O-I/SVOCs in its first appearance in the text and revised in the updated manuscript (line xx).

Lines 266-269. There is some confusion regarding what you refer as the respective fractions. You gave three ratio change results under W_cold condition and W_hot condition. However, what do the three ratio change results correspond to, P1, P2, P3 or may be P3, P2, P1...? Please write it clearly.

Thanks for the suggestion. The CHTC-HT driving cycle (1800 s) is divided into three segments: low-speed (phase one (P1), 342 s), middle-speed 99 (phase two (P2), 988 s), and high-speed (phase three (P3), 470 s) and PM samples are collected separately. Besides, samples are also collected during the whole time (1800 s). 1800s samples collected under cold-start and hot-start conditions are named W_cold and W_hot, where W is short for whole sampling. We add supplementary description of the sampling schedule in the revised manuscript (line xx-xx):

“... (phase three (P3), 470 s) and samples were collected separately. Besides, samples were also collected during the whole sampling time (W, 1800 s) under cold-start and hot-start driving conditions and named W_cold and W_hot for short. Prior...”

Line 309. The same as Q5. The sentence “The particle fraction decreases to less than 1% between $\log_{10}C^* = -1$ to $2 \mu\text{g m}^{-3}$ ” is not smooth. Please modify it.

Thanks for the comments. The sentence is rephrased.

Updated text (lines xx-xx):

“...particle fraction decreases to less than 1% between the volatility range of $\log_{10}C^* = -1$ to $2 \mu\text{g m}^{-3}$. It is highly likely...”