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Atmospheric Chemistry and Physics Discussions

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Interactive comment

Interactive comment on "Tracking Separate Contributions of Diesel and Gasoline Vehicles to Roadside $PM_{2.5}$ Through Online Monitoring of Volatile Organic Compounds, $PM_{2.5}$ Organic and Elemental Carbon: A Six-Year Study in Hong Kong" *by* Yee Ka Wong et al.

Anonymous Referee #1

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General comments:

This manuscript presented source apportionment of carbonaceous aerosols based on six-year in situ measurements of different types of gas- and particle-phase chemical species at a near road-side site in Hongkong. Specially, the data sets of organic and elemental carbon coupled with VOCs were applied in PMF analysis to apportion the source contributions of gasoline and diesel combustion emissions. Meanwhile, an EC-

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Discussion paper

tracer was also applied here for the comparison with the PMF results. Both methods have confirmed a significant contribution of traffic emissions to ambient aerosols in such an urban environment. A decreasing trend in diesel-related emissions was observed, which was attributed to local emission control policies. Overall, this paper is well written and easy to follow, as well as it fits well this journal scope. I believe that this work could make significant implication for understanding the relationship between emission control and air quality improvement, as a good example in China. I would suggest this paper could be accepted for publication before addressing the comments below.

Comments in detail:

Line 128: More description/discussion on PMF analysis should be given. For example, did the authors performed seasonal PMF runs, or only yearly PMF runs, or only a single PMF run (six-year data all together)? Did the authors test more factors? Why not selecting more factors? How were those Q value variations?

Line 160, section 2.4: the author defined that the vehicle PM is the sum of total ambient EC and vehicle OC. Was there contribution of any solid-fuel burning (and cooking to OC) to EC and OC? If yes, how did the authors isolate these fractions using this vehicle OC/EC method, and assuming that total ambient EC was only from vehicle emissions? In addition, the authors simply considered the minimum OC/EC ratio as the vehicle OC/EC method. This part should be more clearly described, for example what this ratio is, how many selected samples associated with such minimum ratio, did the authors filter the potential influence of biomass burning and/or cooking (if applicable), etc.? These points should be discussed here.

Line 180, section 3.1: For trend analysis/discussion in the manuscript, they could be further performed with statistical approach, for instance, the Mann-Kendall trend test. By using that, the magnitude of change rate for the trend can be quantified, along with the significance levels. Overall, it seems there were increasing trends during the beginning years, while the decreasing trends have been observed since around 2013? In addition, it seems that there was a rapid decrease in those trends during around 2013-2015 (?), while a slowdown decrease in those trends were observed during recent years. Therefore, those points might be further discussed and explain possible reasons.

Lines 186 – 190: I think air mass back-trajectory analysis could be applied here to support those statements. By this method, the authors will be able to investigate the different concentration levels and/or sources of OC and EC associated with different air mass origins/clusters.

Lines 190 – 192: Did the authors have any evidence to prove these reasons?

Lines 192 – 193: It could help to further support the OC trend driven by wintertime OC when you separately show the six-year trends of monthly data for winter (DJF), spring (MAM), summer (JJA), and fall (SON). Did the authors find seasonal characterization for those OC and EC trends over the six-year period? Those new plots can be presented in supplement.

Lines 202-203: Based on these discussions above, it seems not fully convinced to conclude the less regional source influence on EC loadings rather than local traffic emissions. I guess, the similar EC diurnal cycles between work days and holidays/Sundays might reflect similar rush hours between the two types of days during a week. This could not sufficiently prove that the EC was more coming from local emissions. The different concentration levels of EC between the two types of days were also observed, however they weren't discussed. These similar diurnal patterns, along with different concentration levels, would be due to reduction in the total amount of traffic emissions over local and/or small-regional scales, however rush hours were overall not changed. In addition, as the NOx data was available in this work, it would be interesting to show correlations of EC versus NOx during work days and holidays, respectively. As commented above, air mass back trajectory analysis could also help to understand if there would have significant influence of regional sources on EC observed at the receptor site. Therefore, further discussions to support your statements should be extended.

Line 241: It's not easy to justify the seasonality only based on time series of monthly data. It would be better if the authors could show monthly cycles and/or perform a seasonality significance test.

Lines 257-259: It would be also good to show diurnal variations of the OC/EC ratio to support the lowest ratios associated with the rush hours. As shown in Fig. S3, EC presents high concentration starting from around 7 AM – 6 PM. Could this suggest rush hours for EC spanning this time period? It might be also useful to check and discuss diurnal variations of OC concentrations, NOx and OC/EC ratios.

Line 278: As commented above, did the authors perform only a single PMF run? Did you have any other PMF run tests, e.g., using seasonal runs? Based on these runs, did the authors have the same solution? And were the results from seasonal PMF runs consistent with the present results? Did the authors try to increase the number of PMF factors? How were those PMF solutions based these tests?

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