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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of air pollution control measures and regional transport on carbonaceous aerosols in fine particulate matter in urban Beijing, China: Insights gained from long-term measurement" *by* Dongsheng Ji et al.

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Comment 1 Carbonaceous aerosols are of great importance for air quality and climate. This manuscript presents long periods measurements of EC and OC in Beijing between 2013 and 2017. The results are informative under the background of China's Clean Air Act. Although the manuscript is well written generally, some conclusions are a little bit speculative, which could be improved in the revision. SpeciïňĄcally, Concentrations

of atmospheric compositions are inïňĆuenced by both meteorology and emissions. The observed decreasing trend of OC and EC could be also attributed to changes in meteorological conditions, which was not discussed.

Response: We thank the reviewer for the constructive comments and suggestions. According to the reviewer's suggestions, we have added some meteorological information in Table S1, which is referred to in line 220 of the revised manuscript, and it is now explained in lines 219-232 why the annual average OC and EC have decreased over the years. The revised part is as below: Benefiting from the Air Pollution Prevention and Control Action Plan and increasing atmospheric self-purification capacity (ASC, shown in Table S1), a decline in annual average concentrations is on the whole recorded. In detail, the annual average concentrations of OC peaked in 2014 and then declined from 14.5 to 7.7 μg/m3, whereas those of EC also peaked in 2014 and then declined from 4.3 to 2.6 μg/m3 during the study period. The decline in OC and EC concentrations is closely associated with decreasing coal consumption, increasing usage of natural gases and the implementation of a strict vehicular emission standard and increasing atmospheric self-purification capacity (Tables S1- S3).

Comment 2 The strong correlation between OC and EC are not necessarily meaning they are from same source. Primary pollutants could correlate well with each other under same meteorology. Please prove these statements with more detailed analysis.

Response: Thank you for pointing this out. For better clarity, a more detailed discussion has been added in the revised manuscript. Primary OC and EC share a variety of common sources including vehicular emissions, coal combustion, biomass burning, etc. (Bond et al., 2013). Besides, primary OC and EC can correlate well with each other under the same meteorological conditions, as these would have similar effects on the carbonaceous aerosols in terms of atmospheric advection and convection. However, it should be noted that EC is more stable than OC (Bond et al., 2013); the correlation between OC and EC would become gradually less significant with the enhancement of secondary OC formation when the meteorology is more favorable for

complex chemical conversion of volatile organic compounds (VOCs) and secondary VOCs via gas-to-particle partitioning or heterogeneous reactions. Hence, the OC/EC ratios/correlations can indicate the impact from source types and meteorological influences to some extent (Blando and Turpin, 2000). The above modifications can be seen in lines 472-478 of the revised manuscript.

References: Blando, J. and Turpin, B.: Secondary organic aerosol formation in cloud and fog droplets: a literature evaluation of plausibility, Atmos. Environ., 34 (10), 1623–1632, 2000. Bond, T. C., Doherty, S. J. Fahey, D. W., Forster, P. M., Berntsen, T., DeAngelo, B. J., Flanner, M. G., Ghan, S., Kärcher, B., Koch, D., Kinne, S., Kondo, Y., Quinn, P. K., Sarofim, M. C., Schultz, M. G., Schulz, M., Venkataraman, C., Zhang, H., Zhang, S., Bellouin, N., Guttikunda, S. K., Hopke, P. K., Jacobson, M. Z., Kaiser, J. W., Klimont, Z., Lohmann, U., Schwarz, J. P., Shindell, D., Storelvmo, T., Warren, S. G., and Zender, C. S.: Bounding the role of black carbon in the climate system: A scientific assessment, J. Geophys. Res-Atmos., 118(11), 5380–5552, 2013.

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