Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 9, 7243-7256, 2009
www.atmos-chem-phys.net/9/7243/2009/

Positive sampling artifact of carbonaceous aerosols and its influence on the thermal-optical split of OC/EC

Y. Cheng[1], K. B. He[1], F. K. Duan[1], M. Zheng[2], Y. L. Ma[1], and J. H. Tan[1]
[1]Department of Environmental Science and Engineering, Tsinghua University, Beijing, China
[2]School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, Georgia, USA

Abstract. Accurate measurement of carbonaceous aerosols is challenging, due to the sampling artifact and the problems of the split of OC/EC. Two approaches have been used to account for the positive artifact: backup quartz approach in which a backup quartz filter is placed either behind a front quartz filter (QBQ) or in a parallel port behind a Teflon filter (QBT), and organic denuder approach in which an organic denuder is placed upstream of the quartz filter. Both approaches were evaluated in Beijing, China, from January to February 2009. 10% of the OC captured by the bare quartz filter was from the positive artifact. The origin of backup OC was quantitatively evaluated by the denuder-based method. All of the QBQ OC was from gaseous organics passing through the front filter, but the QBQ had not reached equilibrium with gas phase due to the relative small sampling volume resulting in an undercorrection of the positive artifact by 3.7%. QBT OC was from both gaseous organics passing through the front filter (82%) and the evaporated organic carbon (18%), thus overcorrecting the positive artifact by 6.3%. Even the positive artifact-contributed QBT OC was found to overestimate the positive artifact, perhaps due to the difference in the adsorption properties of the loaded filter and the filter without particle loading. Re-partitioning of PC and EC was performed by the multiple linear regression approach. The attenuation coefficient of PC was twofold higher than that of EC, indicating PC was darker than EC, resulting in the underestimation of native EC by TOT-split-EC. It was also found that PC formed on the bare quartz filter (45.56 m^2/g) was darker than that formed on the denuded filter (38.64 m^2/g), indicating that the underestimation for the bare quartz filter was more significant.

Final Revised Paper (PDF, 1208 KB) Discussion Paper (ACPD)

Citation: Cheng, Y., He, K. B., Duan, F. K., Zheng, M., Ma, Y. L., and Tan, J. H.: Positive sampling artifact of carbonaceous aerosols and its influence on the thermal-optical split of OC/EC, Atmos. Chem. Phys., 9, 7243-7256, 2009. Bibtex EndNote Reference Manager