Atmos. Chem. Phys. Discuss., 15, C11179–C11181, 2016
www.atmos-chem-phys-discuss.net/15/C11179/2016/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source apportionment and dynamic changes of carbonaceous aerosols during the haze bloom–decay process in China based on radiocarbon and organic molecular tracers" *by* J. Liu et al.

Anonymous Referee #1

Received and published: 6 January 2016

This study presents 14C level in carbonaceous aerosols, and inorganic ions and anhydrosugars in PM2.5 during the spring period of 2013 in Beijing and Guangzhou. The study concludes that both primary and secondary matter from fossil sources played a key role in the blooming phase of the pollution episode. In my opinion, several critical issues need to be addressed in this study as detailed below.

1. The chemical components of PM2.5 in both Guangzhou and Beijing have evidently seasonal variations. The sources of major aerosol chemical components are expected to be highly variable with seasons, and the causes for haze formation could also be

different from season to season. For example, secondary inorganic aerosols were the dominant sources in summer while biomass burning sources were in autumn/winter in Beijing (Zhang et al., 2013; Cheng et al., 2013; Du et al., 2014). Heavy haze mostly occurred in winter instead of in spring in Beijing. Why this study picked a spring period? Will the results be applicable to other seasons? Moreover, only a few data samples are presented in this study to illustrate one aerosol pollution episode during the spring period in Guangzhou and Beijing. How is the representative of the episode case in spring for these two cities?

2. While haze is mainly caused by aerosol pollution, they are two different definitions and should not be used interchangeably. Besides PM level, relative humidity is another key factor for haze formation. This work does not provide any information on aerosol optical properties and meteorological parameters. It only presents aerosol pollution episodes in Beijing and Guangzhou, rather than haze processes. Moreover, inorganic and organic particulate matters have different mass scattering efficiencies, it is inappropriate to conclude haze is predominantly driven by organic matter and nitrate only based on mass concentrations. The focus of the study may need to be modified based on available data and analysis conducted in the study.

3. Page 34959, line 20. The OM is the biggest contributor to PM2.5 in Beijing and Guangzhou. However, 41∼49% fraction of PM2.5 were unidentified. Such a large percentage of unknown mass fractions of PM2.5 make people wonder if the conclusions are valid. The authors are suggested to reconstruct the PM2.5 mass based on daily data. The OM conversion factors are 2.1 and 1.3 to WSOC and WSIC, respectively. However, these conversion factors are obtained from a rural site in Hungary from January to September 2000 (Kiss et al., 2002). These factors may not be suitable for application in the urban area of Beijing and Guangzhou.

4. Page 34959, the authors are suggested to provide direct evidences that the higher calcium concentration in Beijing is related with dust storm during the sampling period, as it could also come from road or/and construction fugitive dust.

5. Page 34964-34965. The growth of carbonaceous aerosols and nitrate also related to the combined influence of boundary layer height, humidity, chemical reaction and their thermodynamic properties. It would be better to provide more convincing evidence to show the growth is more related to the sources rather than the meteorological factors.

References:

Zhang, R., Jing, J., Tao, J., Hsu, S.C., Wang, G., Cao, J., Lee, C.S.L., Zhu, L., Chen, Z., Zhao, Y., Shen, Z., 2013. Chemical characterization and source apportionment of PM2.5 in Beijing: seasonal perspective. Atmospheric Chemistry and Physics, 13, 7053-7074.

Cheng, Y., Engling, G., He, K.B., Duan, F.K., Ma, Y.L., Du, Z.Y., Liu, J.M., Zheng, M., Weber, R.J., 2013. Biomass burning contribution to Beijing aerosol. Atmospheric Chemistry and Physics, 13, 7765-7781.

Du, Z., He, K., Cheng, Y., Duan, F., Ma, Y., Liu, J., Zhang, X., Zheng, M., Weber, R., 2014. A yearlong study of water-soluble organic carbon in Beijing I: Sources and its primary vs. secondary nature. Atmospheric Environment, 92, 514-521.

Kiss, G., Varga, B., Galambos, I., Ganszky, I., 2002. Characterization of waterâĂŘ-soluble organic matter isolated from atmospheric fine aerosol. Journal of Geophysical Research, 107(D21).

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 34949, 2015.