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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Changes in chemical components of aerosol particles in different haze regions in China from 2006 to 2013 and contribution of meteorological factors" *by* X. Y. Zhang et al.

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Dear Anonymous Referee,

Thanks for your careful review of the manuscript. We read the reviewer's comments carefully, and have responded and taken all of reviewer's comments into consideration and revised the manuscript accordingly. All the changes have be highlighted and tracked changes in the revised manuscript. My detailed responses, including a point-by-point response to the review and a list of all relevant changes, is as follows:

“Interactive comment on “Changes in chemical components of aerosol particles in different haze regions in China from 2006 to 2013 and contribution of meteorological factors” by X. Y. Zhang et al. Anonymous Referee #1 Received and published: 23 September 2015 General Comment: Based on chemical composition of aerosol in different haze regions in China from 2006 and 2013 with 24h filter samples collected at 13 CAWNET stations, the authors discuss the sources of PM10 and contribution of meteorological factors especially during haze episodes in key regions of China. As this dataset is obtained from a well-organized and continuously running network and filter samples have gone through the same analytical protocol and quality control, results from different sites and years are comparable, which provides valuable spatial and temporal trend information of PM10 composition and sources in China. To understand sources of China is very much needed in China now in order to improve air quality and visibility. It provides a more complete picture of aerosol in China and valuable dataset for future study. The authors carry out detailed analysis of data and provide important and interesting results. Therefore, I would recommend to publish this manuscript. Some comments and suggestions are provided below to improve the quality of the manuscript.”

Responds: Thanks for the positive comments.

“Specific Comments: “1) One of the key conclusion of this work is that dust is important source in PM10 in China. Dust is probably calculated by the oxides of Al, Si, Fe etc. As these “crustal” elements are also found in coal fly ash, I would recommend the authors to show the equation for calculating dust and try to differentiate the contribution from dust and coal fly ash. If not possible, at least coal combustion during winter cold season in the northern China should be emphasized. ”

Responds: As mentioned by reviewer, mineral aerosol observed in China indeed contains coal-ash from incomplete combustion in most area of China. This is also the major point of us in our previous work (Zhang et al., AE, 2002) and in this manuscript (P10, L2-10). The original text in last version of the manuscript is “In general, a high

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mineral concentration was observed in northwest China, thereby indicating the influence of dust from natural Asian dust sources. However, in the southern margin of the Loess Plateau in XiAn, the mineral level exceeded those in stations closer to natural dust sources (Dunhuang, Galanshan etc). Thus, urban fly coal ash and fugitive dust sources were also observed to affect the mineral levels in these areas. Based on the measurement results of non-crustal Ca in coarse particle fractions, especially during non-spring seasons (with fewer occurrences of Asian sand and dust storm (SDS)), part of the mineral dust is hypothesized to originate from construction activities and coal ash (Zhang et al., 2002)."

Actually mineral dust is estimated by using the surrogate concentration of element (Fe) in this manuscript, which is around 4% in the Chinese mineral dust mass (see in P10, L10-13). This approach has been used in our previous works in various ambient conditions and areas in China, and has been proved to be able to estimate mineral dust content properly (Zhang et al., AE, 1993; Zhang et al., AE, 2002; Zhang et al., JGR, 2003; Zhang et al., ACP, 2012), although the uncertainties are still there. We didn't use the oxides of Al, Si, Fe, Ca, Mg, Ti to estimate mineral dust concentration, mainly because we found, in our previous work, that we can get similar concentration of mineral aerosol by using the simple method (just on the basis of Fe, like this manuscript) and by using oxides of various element, which will probably bring the extra uncertainties due to limitation of elemental analysis; another reason is that we can not obtain Si, Al in relative higher accuracy by using Whatman quartz microfibre filters as the filtration media that we used to measure water-soluble constituents, carbonaceous species and mineral aerosol simultaneously.

Of course, we found we don't want to distinguish the relative contributions of coal-ash and other sources to mineral mass by only using Fe (no one can do this). But we added some more descriptions about the approach how to estimate the mineral mass, and some text to emphasis the existence of coal ash in mineral aerosol concentration (P10, L12-25), which also reinforce the major conclusion of this manuscript that "coal-

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combustion was still the largest anthropogenic source of aerosol pollution in various areas in China"

"2) Page 19219: the last paragraph in section 3, the authors suggest the contribution from biomass burning and motor vehicle simply based on EC/OC ratio. This ratio is not very specific to sources. Even for the same source type, e.g., biomass burning, this ratio can have a range under different fuel types and combustion conditions. Therefore, it should be careful in such discussion if it is only based on EC/OC ratio. "

Responds: As reviewer's comment, it is not very precise to pinpoint the contributions from biomass burning and motor vehicle by simply using EC/OC ratio, but it still can provide some insights into it, because the large differences do existed in OC/EC ratios for biomass burning (5.9-8.9) and motor vehicle (1.4-3.0) emission.

We added some sentences to mention the uncertainties and weaken this speculation according to reviewer's suggestion in P17, L6-7.

"3) The discussion and description in this manuscript contain many numbers and details. It would be easier to read if it is better organized and more clear after revision. "

Responds: Some revisions have been made. We provide less number as possible as we can to increase the readability of this manuscript. We also added a "Table 3" in summary section to put all numbers on to make a comparison between the normal regional background and winter concentration of major chemical components in major haze regions of China. That makes text more clear (P34, Table 3).

4) The summary is too detailed and long. It should contain key points and conclusions from this work."

Responds: Revised. We simplified many text, and place lots of number on the table 3.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 19197, 2015.