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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characteristics of $PM_{2.5}$ speciation in representative megacities and across China" *by* F. Yang et al.

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Authors thank the two anonymous reviewers very much for their comments on our manuscript. Their general and specific comments for revision are valuable for the improvement of the paper. We respond the points one-by-one as below.

Referee #1 (specific comments)

1.Section 3.1, the comparison is very confused. The authors should clearly state the importance to compare chemical species of PM2.5 in four Chinese cities with those outside China.

Response: We remove the data measured outside China from Table 1. We used the comparison based on long-term surface observations to indicate the high levels of

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PM2.5 mass and chemical species in the four Chinese Megacities.

2.Page 1033, lines 20-22, “This comparison implies that mobile sources were likely more important than stationary sources (including ship emissions in the Pearl River) in Guangzhou.” This is too speculated, more solid evidence, e.g., emission data, is needed.

Response: To avoid the speculation, we reword the sentence as “This comparison implies that mobile sources (including ship emissions in the Pearl River) were likely more important in Guangzhou than in three other Chinese megacities”. We also add a comparison of annual mean of ambient NO2 concentrations in the four megacities.

3.Page 1033, lines 27-30 and Page 1034, lines 10-11, these analyses are contradictory to each other.

Response: We delete the latter sentence (on P1034 L10-11) to avoid the paradox.

4.Section 3.2 does not match the manuscript title well; please consider revising one of them.

Response: Suggestion taken. We reword the title of Section 3.2 as “PM2.5 speciation across China”.

5.Page 1037, lines 6-13, it is very difficult to understand and this reviewer can not follow the logic.

Response: Thanks for the comment. We reword the sentences to make them understood.

6.Page 1037, Lines 20-21, “This probably indicates there was significantly larger regional contribution of SNA at this rural site.” How about less primary OC emission?

Response: Thanks for the comment. We reword the sentence as “This probably indicates there was significantly larger fraction of transported secondary aerosols and/or aged aerosols in rural Beijing”. We revise the whole paragraph according to the next

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comment.

7.Page 1037, the last paragraph, page 1038, the top two paragraphs, this reviewer cannot understand what the authors were trying to say.

Response: Thanks for the comment. We reword these paragraphs, and add a new paragraph, so as to make them understood and better expressed.

8.Page 1039, the top paragraph, the logic is not clear to this reviewer.

Response: Thanks for the comment. We adjust the order of the sentences in this paragraph to make the logic clear.

Referee #2 (specific comments)

1.IMPORTANT. You should describe the levels of PM2.5 according the type of environment: Regional background, urban background, traffic, industrial,... Giving single ranges (ie. 34 to 193) for all sites do not gives relevant information. Modify this in abstract, text and conclusions.

Response: Suggestion taken. We also add a table (Table 2) to give a brief introduction about PM2.5 sampling sites, sampling and analyses, and mass concentrations at all the selected locations (diagrammed in Fig. 3) across China.

2.IMPORTANT, describe inter-annual trends in PM2.5 where long time series are available.

Response: Suggestion taken. In the fourth paragraph in section 3.3 (revised version), we add description about the inter-annual trends in PM2.5 and the fractions of some major species.

3.IMPORTANT, distinguish between sulfate and nitrate instead of using SNA for descriptions. Sources, seasonal and interannual trends may differ considerably.

Response: Thanks for the suggestion. As stated in section 2.2, we take sum of sulfate,

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nitrate, and ammonium in PM2.5 as secondary inorganic aerosols. We describe them as a whole and separately where necessary. We also add discussion about their separate seasonal and inter-annual trends in section 3.3 according to the last comment.

4.Use OM instead of POM, since it makes confusion with Primary Organic Mater possible.

Response: Suggestion taken.

5.In the methodology section you should describe for every site the type of instrument used for measuring PM2.5 levels and compare filter-gravimetry results with the other methods used.

Response: In section 2.1, we describe the type of PM2.5 sampler used in Guangzhou in the third paragraph, and those used in Beijing and Chongqing in the forth paragraph. All the PM2.5 levels were measured based on filter-gravimetry, thus there is no comparison with the other methods. For all the sites in which PM2.5 speciation balances are compared in Fig. 3, we add a brief introduction about the PM samplers in Table 2, including that used in the megacity in PDR, Shanghai.

6.Spell out YDR.

Response: YDR is spell out when it appears at first time (P1028 L18).

7.IMPORTANT. The data you used for comparison is arising from measurements in Los Angeles 1995. There are a lot of more recent data compilations available in science journals for PM levels and speciation in Europe and USA. Have a look in Journals such as ACP and Atmospheric Environment. See specially crustal load in PM2.5 in southern Europe.

Response: Thanks for the suggestion. We remove the data measured outside China from Table 1 according to referee #1's specific comment 1. We used the data measured in Los Angles during 1995-1996 for comparison since it was a long-term (more than one-year) observation and the chemical species data were available. For com-

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parison of crustal load in PM2.5, in section 3.3 we add the data based on recent long-term measurement in the Canadian National Air Pollution Surveillance (NAPS) network (Dabek-Zlotorzynska et al., 2011).

8.Vehicle population replace by Vehicle fleet at several parts of text.

Response: There are two 'vehicle population' terms in the text. We replace the one on P1038 L11 with 'vehicle fleet'.

9.End of page 1038. In summer high sulfate, and not high SNA are usually recorded. Ammonium nitrate may volatilize due to high temperatures during summer?

Response: We fully agree with the point and replace 'SNA' with 'sulfate'.

10.Row 21 page 1039: PM2.5 mass seasonally, by PM2.5 mass.

Response: Suggestion taken.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 1025, 2011.