

## ***Interactive comment on “Size-resolved aerosol water-soluble ionic compositions in the summer of Beijing: implication of regional secondary formation” by S. Guo et al.***

**Anonymous Referee #1**

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The present paper describes observations and data analysis on the Beijing aerosols during summer of 2006. The paper brings, with a novel approach of the PMF analysis, decomposition of the summer Beijing aerosols into a few aerosol modes, which could be a substantial contribution. Thus the scope of the paper and the authors' interests match with those of the ACP journal, I favor the publication of the manuscript. Although the quality of the science of the present paper is good, I feel some reorganization may be favorable for some parts. It is a pity that the final section (3.4) of the manuscript sounds for me less significant and less relevance with earlier sections. As the authors admit that "the estimation does not need to be very accurate", I feel that the section could be more concise at any rate.

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General comments (not in the order of the importance)

-Although the authors have obtained 3 or 4 modes of the aerosol sources, which the discussion, I feel, in the later section of 3.3 does not well make use of. This may be due to some confusion of general terminologies of "coarse", "fine", etc. and those defined originally in the present study.

-In the section 3.2.2 the authors concluded that "these particles may from in-cloud process of long range transport". I am confused by the terminology of "in-cloud". I am sure that the authors consider "the bigger size droplet mode" aerosol is produced by the cloud activity. However, where did the aerosol meet the cloud? Maybe not fog? Considering that the air mass was advected from Yufa to PKU over the ground surface (probably within a few hundred meter above the ground), it could not meet the cloud. Although I know that Beijing is located inland, I wonder if you often have afternoon/evening shower in summer time in Beijing?? A recent work by Chen et al. (J. Geophys. Res. 114 (2009) D08306) may give a hint for this question. They suggested the existence and explanation for the polluted layer a few km above Beijing during summer. The convection during daytime may bring aged? aerosol in the lower free troposphere back to the surface.

-Description for measurements by a steam jet aerosol collector should be incorporated to the experimental section, in order to give the understanding that the authors have carried out not only the MOUDI observation.

-Figure 1 maybe better redraw. I am confused with the "polluted episodes" and "clean episodes" at a first glance because the time series were not perfectly match with PKU and Yufa samples. Please identify the episodes evidently. The criteria may include some ambiguity. For instance, the authors states that "the SORs during the clean episodes were lower than 0.2", which is not always true. The aerosol concentration at Yufa on August 29th was very low. Also, why was not September 5th included as the clean episode 2? The aerosol concentration at Yufa on the day was low as well.

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Relating to this, please add the definition of the samples in the caption, for instance; the samples are given the id as yymmdd-X, where X denotes sampling core time of morning (A), afternoon (P) and night (N).

-I do not understand the final conclusion of the section 3.1 in page 23960 stating that "by scavenging and dispersions". No real information on the precipitation is given thus its role is unclear. This is a drawback of the present paper.

-In the PMF analysis you can obtain better fit by increasing the number of the factors. Therefore, it should be stated why the authors chosen 3 or 4 factors to resolve the present data.

-English is fluent in general, but some ambiguity and lengthy expressions remained in the present text. I recommend having native speaker's check in case.

The following lists the technical suggestions.

-Many sentences omit 'that'. This may be better to add.

-In page 23956 at 7th line: PMF model was ...-> PMF model analysis was ...

-In the same page at 11th line: indicating it must be taken into account in summer. -> that secondary components are important especially in summer.

-In page 23957 at 2nd line: Beijing EPB -> Beijing Environmental Protection Bureau?? (EPB)

-In the same page at 16th and 18th lines: It's ... -> It is ...

-In page 23958 at 3rd line: two more stages -> two more fine stages ?

-In the same page at 20th line: in a refrigerator -> Please add how much temperature was in a refrigerator.

-In the same page at 24th line: formate, acetate, oxalate -> formate, acetate, and oxalate

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-In the same page at 25th line: Please mention not only "the same as Hu et al. (2005b)." but about 'ion chromatographic methodology' in brief.

-In the same page at 26th line: Please add the rough figure for the detection limits.

-In page 23959 2nd paragraph starting from 14th line: The explanation for Fig. 1 seems to be needed here.

-Equation 1 in page 23961: Definitions of gik and fkj should be given.

-In page 23961 at 25th line: showed -> shown

-In page 23963 at 15th and 16th lines: 0.4

-In the same page at the next line: measured -> determined

-In page 23963 at 26th and 27th lines: "due to more resuspended dust by traffic and more construction works before Olympics." sounds simply as a speculation.

-In page 23965 between 6th and 8th lines: I cannot follow well "The absence of the nighttime correlation between sulfate and SO<sub>2</sub> suggests the deposition of sulfate was of greater importance than aqueous-phase production during the nighttime."

-In page 23965 at 23th and 24th lines: "mass concentrations of K<sup>+</sup> to sulfate ... biomass burning particles." This needs reference.

-In page 23966 between 14th and 18th lines: "the contributions of different formation pathways have not been quantified yet due to lack of suitable analysis technique." I can not follow the logical flow of this sentence and the next conclusive sentence.

-Table 1: Compare -> Comparison, reference -> Reference, 2001-7 -> 2001-Jul, and the present results should be at the top of the table.

-Table 2: condensation, droplet, etc. should be typed as Condensation, Droplet, etc. Some data accompany more than 4 digits, which seem less reliable as the effective figure.

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-Table 3: The number of the samples should be given.

-Fig. 3: The line drawn by yellow cannot be seen clearly. Also, legends should be easily readable (make larger).

-Fig. 5 may be omitted.

-References should follow the format of the present journal. Please check them again.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 23955, 2009.