Responds to the comments from Anonymous Referee #4

Overall
"This paper presents a two-year data set that describes chemical composition of PM10 from 16 monitoring stations in China. Quantified components include water-soluble inorganic constituents, mineral dusts, and OC/EC. This data set is valuable for evaluating spatial and temporal variations of atmospheric particles in China.

However, this manuscript is not well prepared. 1) The manuscript is poorly written with a lot of grammar mistakes. Many grammar mistakes such as "long-rang transport" (on page 7, line 10) can be avoided by careful proofreading. Some grammar corrections are listed in the "Technical corrections" section below. "

A: Thank you for the thorough review of the manuscript. We have carefully revised and polished the paper by careful proofreading in addition to the ones suggested by the reviewer.

"2) The contents of the manuscript are not well organized, making it very difficult to follow. For example, there is only one sub-section (3.3.1) in section 3.3. This sub-section is not necessary if it is the only one. Breaking section 3.3 into two or more subsections is suggested. In sections 3.1 and 3.2, each component (sulfate, nitrate, etc.) is discussed individually. This seems redundant. It is better to group them into "primary" and "secondary" components, and discuss each group separately. It is more clear this way and easier to follow. Another example is that the urban/rural difference of ammonium is discussed in again in the "Aerosol acidities" section. This part should go with section 3.1, where the urban/rural differences are discussed. "

A: These are really good suggestions. We have followed the suggestions and break section 3.3 into two subsections. We also group the aerosol species into "primary" and "secondary" components for our discussion in sections 3.1 and 3.2.

"3) Many arguments are presented without sufficient explanation or evidence. For example, high OC is found in rural China, urban S. Asia and High Asian Area (on page 8, the last paragraph), the reason is ascribed to open biomass burning, but no evidence or references are shown to prove it. More examples are given in the "Specific comments" section below. A lot more work needs to be done in order to meet the high standards of ACP."

A: We have noticed these and put more explanations associated with more references in the sections.

Specific comments
"1.Page 2, line 17: what is "surface visibility"? This term is not defined in this paper. Is it the visibility measured on the ground? If yes, what is the height of the measurements?"

A: Surface visibility (meteorology) is normal observational term used at meteorology station, indicating the visibility determined from a point on the ground, as opposed to control-tower visibility

"2.Introduction part: previous studies on the haze events in China should be summarized here, since this is one of the focuses of this paper as indicated by the title."

A: Agree.

"3.Page 4, line 24: "on a one day in every three day basis" – it is not clear how the samples were collected."

A: Change the wording to "24-hr filter sample was taken every three days"

"4.Page 5, line 18: "with certain concentration", what is the concentration? Please specify. Is there a reference?"

A: We add a reference to specify this.

"5.Page 6, line 18: it says the high concentration of mineral particles in China is because of "Asian desert sources". This is too broad. Use back trajectories analysis to identify specifically which desert source is most important."

A: We change the wording from "Asian desert sources" to "Asian desert sources, mainly the deserts in Mongolia and in western and northern China (like the Taklimakan and Badain Juran, respectively) ." Actually, the distributions of main desert sources were described in details in the next two references in our original text.

"6.Page 6, line 19-23: it says some high mineral concentrations are "evidently" caused by urban emissions. However, the no evidence is shown in the analysis. How are the "urban mineral" and the "desert mineral" separated?"

A: Actually in our text, exactly followed "evidently" caused by urban emission, we give the analysis and provide a reference, like "For example, Ca is mainly associated with mineral aerosol in the PM10 samples; but non-crustal Ca is found in the coarse particle fraction, most of which is expected to be from construction activities and coal-ash (Zhang et al., 2002)."

"7.Page 7, line 10: it says "long-range transport of Asian dust" affects the comparison of urban/rural mineral aerosol concentration, how does this work?"

A: Because the long-rang transport of Asian dust have an equal impact to urban and rural mineral dust level, the urban to rural ratio for mineral aerosol will be less than other aerosol species if the long-rang transport of Asian dust have a big influence on the mineral dust in

China.

"8.Page 8: need to explain the OC concentration difference between China and S. Asia."

A: Agree. We add sentences to explain the difference between China and S. Asia.

"9.Page 9, the second paragraph: comparison of NOx inventory in China to the global NOx inventory does not help explain the high nitrate concentration in HBP, SCB in China."

A: The purpose of comparison of NOx inventory in China to the global NOx inventory is try to explain why the high nitrate concentration found in HBP, SCB in China relative to other places in the world.

"10.Page 9: It says ammonium is from coal combustion. This is not correct. Ammonium is formed secondarily by reaction of ammonia and sulfate/ nitrate."

A: The ammonium mentioned here is gas-phase ammonium, not ammonium product that is formed secondarily by reaction of ammonia and sulfate/ nitrate. From the emission inventory (Cao et al., 2010), we do found some ammonium from coal-combustion, especially in urban area. This is a new finding.

"11.Page 10, line 1: I don't think EC can also be called LAC, because "brown carbon" can also absorb light but it is not EC."

A: Agree. But because no EC measured in major US Network (IMPROVED) where they only provide LAC data that can be used to compare with EC, we have mention LAC here to clarify the reader what kind of data we used for comparision.

"12.Page 13, "deltaC" and "S" are not discussed in the paper. So equations (3) and (4) are not necessary."

A: Agree. We deleted equations (3) and (4).

"13.Page 14, line 17: "depleting K by SO4" is not clear. This phenomenon is not discussed earlier in the text."

A: We add some sentences to make this clear.

"14.Page 15, the last paragraph: OC/EC is lower in urban areas is explained by the dominance of primary emission in urban. This lower ratio in urban areas can also be explained by the lower biomass burning emissions in urban areas, which is discussed in the next paragraph."

A: Agree, we add this point in the revised manuscript.

Technical corrections
"1.Page 2, line 5: change "with global aerosol" to "with global aerosol measurements.""

A: Done.

"2.Page 2, line 9: grammar mistake of this sentence."

A: Revised.

"3.Page 2, line 13: delete "also".""

A: Done.

"4.Page 2, line 17: delete "somewhat".""

A: Okay.

"5.Page 2, line 18: delete "also".""

A: Okay.

"6.Page 2, line 19: change "plus" to "and".""

A: Done.

"7.Page 5, line 2: "raised above the surrounding ground level", reword."

A: Reworded.

"8.Page 5, line 1: delete "by".""

A: Okay.

"9.Page 5, line 5: define "BST", is it Beijing time?"

A: Yes.

"10.Page 5, line 9: change "using" to "being used".""

A: Changed.

"11.Page 5, line 23: change "the details protocol" to "the detailed protocol".""

A: Changed.

"12.Page 6, line 12: change "accounting _35%" to "accounting for _35%"."

A: Revised.

"13.Page 6, line 19: change "hands" to "hand"."

A: Changed.

"14.Page 7, line 17: delete "(ug/m3)". The unit should be specified in the figures or figure captions."

A: Okay.

"15.Page 9, line 22: reword this sentence."

A: Reworded.

"16.Page 13, line 16: change "with a few urban and rural difference" to "with a few urban and rural differences".

A: Changed.

"17.Page 14, line 15: "showing somewhat degree combination", reword."

A: Reworded.

"18.Page 14, line 21: change "significant different" to "significantly different"."

A: Changed.

"19.Figure 2: specify number of points for each species. "

A: Okay.

"20.Figure 4: replace the numbers on the x-axis with the components "Mineral", "SO4", etc."

A: Okay.

"21.Figure 7: It seems that there are two figures and the one on the right is cut."
A: No, it is just one figure.