Interactive comment on "Observation of nitrate dominant $PM_{2.5}$ and particle pH elevation in urban Beijing during the winter of 2017" by Yuning Xie et al.

Anonymous Referee #1

General comments:

Comments: General this paper investigates the pH of nitrate-dominated $PM_{2.5}$. in Beijing in the winter of 2017. The acidity of particles is important in the discussion whether or not a S(IV) might be oxidized through NO_2. The English language of all the manuscript must be thoroughly checked and revised where needed. As the language correction alone is massive, I think the revision of the manuscript corresponds to 'major revision'. Other than this, the manuscript is a solid work with interesting and valuable information and good analysis which should not be missed when Beijing wintertime sulphate formation is discussed.

Response: We thank the referee for his/her kind reply. We have thoroughly checked and revised language. We hope that the current format of the manuscript is good enough in the aspect of language.

Detailed comments

Comments: Title: Maybe better 'nitrate-dominated' instead of 'nitrate dominant'?

Response: Suggestion taken. Please see the title on page 1.

Comments: Abstract, line 18: Better use 'Compared to historical records...' - see above comment, the English language of all of the manuscript has to be thoroughly checked, prefereble by a professional editor or a native speaker.

Response: Suggestion taken. We have asked a professional editor to help us revise the language problem. We modified it with "Compare with …", please see page 1, line 18-19.

Comments Introduction: Needs to be fully language-edited. I cannot do this in my review. Note especially singular/plural use is wrong very often

Response: Suggestion taken, as mentioned above, we have asked a professional editor to help us revise the language problem. We have corrected most of the singular/plural misusing in the text For example, page 2, line 42.

Comments: line 55ff: Maybe the role of non-classical H_2O_2 formation possibly contributing to S(VI) formation should be mentioned here.

Response: Yes, suggestion taken. Non-classical H_2O_2 formation pathways are important in various conditions, especially in the haze episodes of China. We have added some related introduction into the text. Please see page 3, line 50-61.

Comments: line 183ff: How much of the observed pattern is due to weather conditions? Is there a possibility to 'de-weather' these observations?

Response: The referee gave us a very good future direction. The pollution -weather feedback might be more complicated than the chemistry itself only. However, we believe this topic is beyond the scope of this paper. We would have further investigation on the 'de-weather' pattern's link to physiochemical properties of particles in next studies.

Comments: Figures 5 & 6: All together, this is the most interesting finding of the MS. As the nitrate/sulphate ratio increases, pH is expected to increase.

Response: Thanks for the comment, and we have modified the discussion on the cause of it, please refer to page 12-13, line 270-288。

Comments: line 242: Give the correlation coefficient of the straight line plotted in Figure 6 line 308: Please do not start a paragraph like this.

Response: We apologize for the inconvenience by the poor language, and revised the language accordingly. The correlation coefficient was added on the figure.

Comments: Figure 2: Maybe use identical y-axis scaling for (a), (b) and (c) ?

Response: It should be a good idea to use identical axis in data comparison. However, if we use identical y-axis, then the trend might not be significant since the magnitude is quite different among the three situations.