Response to the comments from **Anonymous Referee #1**

The paper presents the result of oxalate, inorganic ions, and some metal elements of PM2.5 and TSP aerosols collected during one year in Shanghai, China. The authors analyzed the data, focusing on oxalate, in terms of season variations and correlation with some tracers of aerosol sources, and discussed the contribution of water-soluble organic cabon (WSOC) to visibility degradation.

The data set is quite extensive (with a total of 238 sets of samples), and the paper is well written and easy to follow. Unfortunately, the data analysis and interpretation lack depth, as such the paper gives neither new insights in science nor an advance in methodology. Significant revisions are needed to unravel the scientific value of the data before its publication.

We would like to thank the referee for a thorough comment on this manuscript. In the revised manuscript, we have corrected the paper according to the comments point by point. Below are the responses to all the comments.
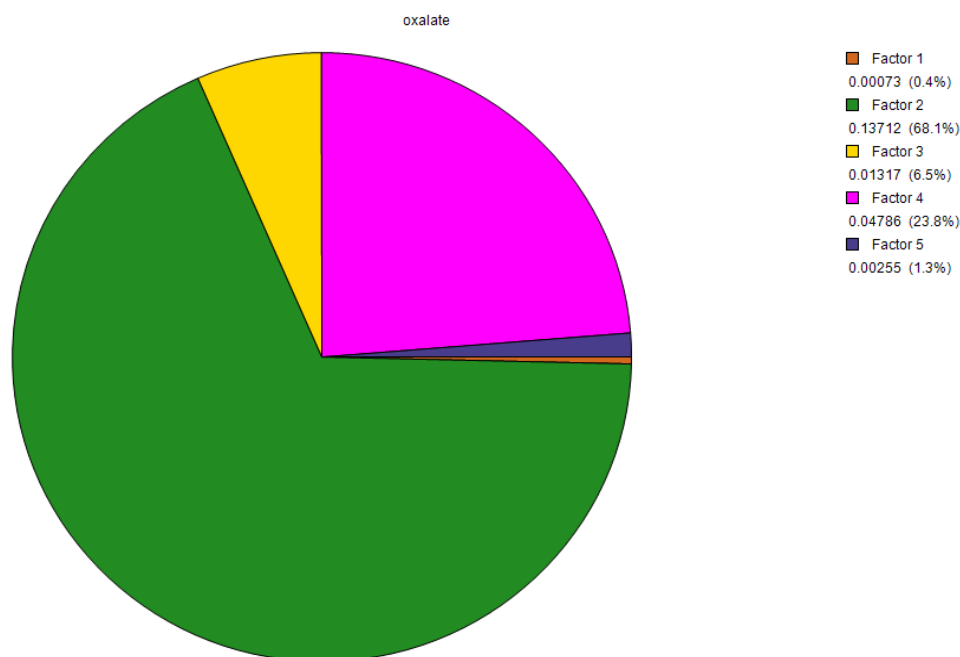
My specific comments are listed below.
(1) In the introduction, please state what knowledge gap this paper attempts to fill in. For example, what is new of the present work compared to previous studies in Shanghai and other cities mentioned in the introduction?

Yes, thanks for the good suggestion of illustrating the meaning and new findings of the present work at the introduction part. Please see the Introduction in the revised manuscript.

(2) The results and discussion section contains a lot of general discussions, but they give few new findings in term of the sources and processes of oxalate. These general discussions can be shortened, and more in-depth analysis of the data should be included. The large part of the discussions replies on simple analysis of correlation of oxalate with other parameters. I suggest the authors consider use a multi-variate analysis such as PMF to examine the relationship of oxalate with other tracers of aerosol sources and meteorological parameters.

Thanks for the advice. PMF analysis had been tried to apply to the $PM_{2.5}$ data set involving 119 samples and seven variates, which were the concentration of oxalate and the aerosol source tracers. Five factors were obtained contributing to the atmospheric oxalate in Shanghai as shown in the figure below. Factor 1 had a high loading of potassium, representing the biomass burning source. Factor 2 had a high loading of oxalate itself. Factor 3 had a high loading of nitrite, representing the primary source of urban vehicle emission. Factor 4 had a high loading of nitrate, sulfate and ammonium, representing the secondary formation pathway through gaseous-phase/aqueous-phase oxidations. Factor 5 had a high loading of aluminum, representing the crustal source.

oxalate

Factor 1
0.00073 (0.4%)
Factor 2
0.13712 (68.1%)
Factor 3
0.01317 (6.5%)
Factor 4
0.04786 (23.8%)
Factor 5
0.00255 (1.3%)

Basically, the result of PMF analysis was in accordance with that of the oxalate source identification by correlation analysis. Secondary formation from VOCs precursors contributed most to the aerosol oxalate in Shanghai, while direct vehicle emission and crustal sources contributed limitedly.

However, such multi-variate analysis may not be the best solution for examining the relationship of oxalate with other tracers of aerosol sources in this case. First, the variates themselves were the aerosol source tracers' concentration and the amount of the variates was not so much that made it was not so meaningful to apply such an analysis. Correlation analysis with statistical tests could do the work. Second, the PMF analysis based on the data of 119 all-year-round samples obscured the seasonal distinction of the sources. For example, biomass burning was a special secondary source of oxalate with a seasonal stamp of autumn which could not be seen from the PMF result. (Number of the samples in each season was not enough to run the PMF model and to make the result significative.)

(3) The discussion on the contribution of oxalate and WSOC to haze lacks sufficient support from the data collected in the present study. The good correlation of oxalate does not necessarily indicate the importance of WSOC in visibility decrease. To quantify the contribution of each aerosol component to visibility reduction, these components should be individually measured. The mass extinction confident should be considered, so does the hydroscopic property of each component. For example, the IMPROVE program in the US adopts the following formula:
Bext (Mm-1) = 3f(rh)[Sulfate] + 3f(rh)[Nitrate + 4[Organic] + 1[Soil] + 0.6[Coarse Mass] +10[EC] + 10
Where: Bext (Mm-1) is the extinction coefficient,which is proportional to the inverse of virual range; [Sulfate] = $(NH_4)_2SO_4$; [Nitrate] = NH_4NO_3,[Organic] = 1.4[OC]; [Soil] = 2.2[Al] +

2.19[Si] + 1.63[Ca]+ 2.42[Fe] + 1.94[Ti]; [Coarse Mass] = [RSP] - [FSP]; f(rh) = hygroscopic species growth function

Alternatively, the authors may apply a multiple linear regression to Bext and the contributing aerosol components.

Thank you for the advice. The objective of this study was aerosol oxalate in Shanghai as well as the organic matter in aerosols the compound could represent. The content of calculated OC and observed main inorganic ions in $PM_{2.5}$ was compared, reflecting the two categories were equated to each other in amount. However, as you suggested, the optical property of the components should be taken into account when the atmospheric visibility was concerned. Support from literature and result of our relevant study was added in the revised version. Please see Section 3.3 in the revised manuscript.