The authors appreciate the two reviewers for their constructive comments and suggestions. The manuscript has been revised accordingly. Our point-by-point responses to these comments are provided below. The comments of the reviewers are repeated in italics and our responses following each comment are in bold.

Response to reviewer #1

General Comments:

This paper by Xu et al. entitled 'Insights into the chemical composition of summertime PM 2.5 at the northeast of the Qinghai-Xizang (Tibet) Plateau' presents a comprehensive data set on aerosol particles sampled at the Tibetan plateau. Chemical composition of the aerosol samples were investigated using a suite of analysis technique, including HR-ToF-AMS measurements of water soluble organic materials (WSOM). This data set allows comparing chemical characteristics of aerosol particles with other high mountain sites. For example, the authors have already compared their data with Lee et al. (2012). The data quality looks good. The reviewer believes that this paper provides an important knowledge to investigate aerosol chemistry in Tibetan Plateau and in the free troposphere. The reviewer suggests publication of this manuscript after addressing the following comments.

We thank the reviewer for his/her positive comments.

Specific Comments:

P1317L20 'on. An OM/OC ratio (α) of 1.4 was used for the primary aerosol based on high resolution mass spectrometry at urban site of north China (1.2-.6) (e.g., Xu et al., 2014b; Zhang, J. K. et al., 2014).' Would it be possible to discuss the reason why the value derived from at an urban site of north China can be used to analyze the data of the Tibetan Plateau?

Organic aerosol observed at the Qilian Shan Station of Glaciology and Ecologic Environment (QSS) was mostly originated from lower attitude regions including urban area to east and west of QSS based on the typical diurnal pattern of wind field around the QSS (Xu et al., 2014a). Based on previous studies, the OM/OC ratio for fresh urban organics in northern China is between 1.2-1.6 (Xu et al., 2014b; Zhang et al., 2014). Since it is expected that organics would be oxidized gradually during transport, we use the ratio of 1.4 for OM/OC of the primary organic aerosol at the QSS. These points are now mentioned in the revised manuscript (line 256-262).

P1320L7 ' No larger coarse mode (> 3 μm) aerosols were observed, suggesting that there was relatively little influence from locally produced soil particles.' Figure 3 shows that particles larger than 3 um were detected. Please clarify it.

We made a mistake here. This sentence has been deleted.

P1321L20 'The WSOC and OC concentrations in the QSS were strongly positively correlated (r2= 0.99) with the slope of 0.79.' Figure 5 indicates r2=0.97 for WSOC-OC correlation. Which value is accurate?

It is 0.97. We revised 0.99 to 0.97 in the revised version.

P1323L24 'The highly oxidized MS is very similar to that in study of Lee et al. (2012) (r2= 0.87, Fig. S5), which oxidized the field filter samples collected in a mountain site in the laboratory in a photochemical reactor.' Although those two mass spectra look similar and correlate well, there seem to be two branches in the correlation plot. Would you be able to add possible explanations for this difference? Especially, signals at mz12, 15,30, 39,40, 46, 60,64, and 73 look different.

The differences between these two spectra are probably due to the differences in aerosol sources and characteristics between Lee's study and ours. For example, the presence of significant peaks at *m/z* 60 and 73 in Lee's spectrum suggests the influence of biomass burning aerosols, but our spectrum does not show such influence. The higher signals of *m/z* 29, 41, 42, 43 (mainly $C_xH_yO^+$ ions) and lower *m/z* 44 peak (mainly CO_2^+) in Lee's spectrum indicate an overall lower oxidation degree of the organics than ours. In addition, it seems that ions at m/z 12, 14, 39, 40 were not included in Lee's spectrum. We re-plot the scatter plot (Fig. S5b) by comparing only the same list of ions in these two spectra.

Figure7, Is it possible to compare the data with TD measurement data for pure ammonium sulfate and ammonium nitrate? That comparison helps readers to interpret the data, and it will make comparison with other literature easier.

The thermal profile of sulfate in our sample is similar to that of ammonium sulfate but nitrate appears to be less volatile than ammonium nitrate based on the laboratory study of Huffman et al. (2009). A possible reason is that the nitrate in filter aerosol is main present in the form of less volatile nitrate such as metal nitrate (e.g., $NaNO_3$, KNO_3, and $Ca(NO_3)_2$) and organic nitrate. Indeed, the ratios of NO^+ vs NO_2^+ in mass spectrum of QSS filter samples (Fig. R1) show higher values than that of ammonium nitrate (see below), which is usually resulted from the organic nitrate or metal nitrate (Farmer et al., 2010). Related discussions have been added in the paper (line 406-411) and Fig. R1 is also added in the supplementary material as Fig. S6.

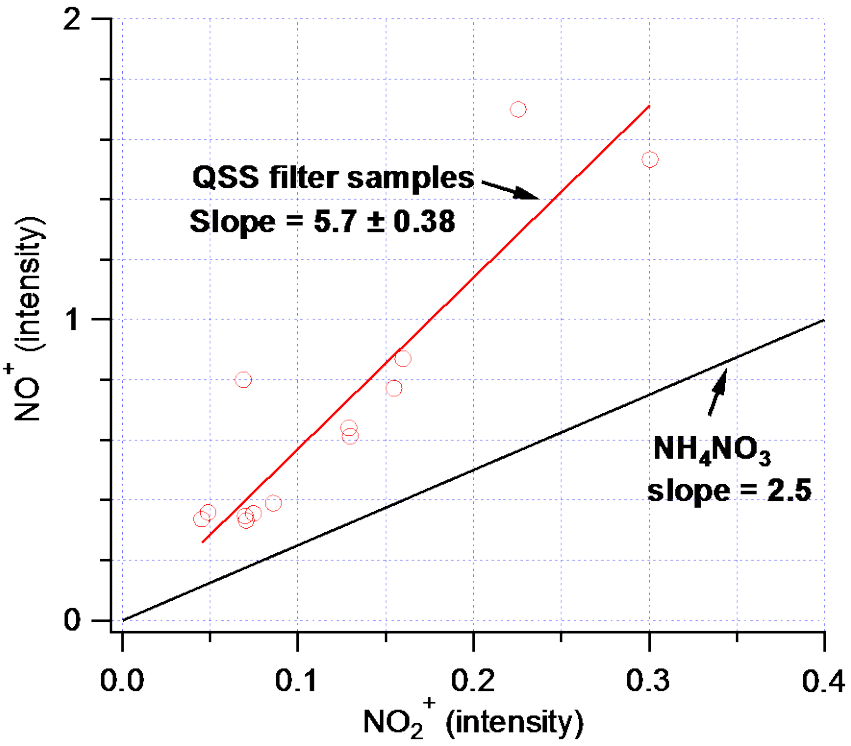

Fig. R1. The scatter plot of NO^+ vs NO_2^+ of QSS filter samples in the high-resolution mass spectra. The ratio for ammonium nitrate is also shown in the plot.

Technical Comments:

P1316L7 'Some of the organic carbon way pyrolyzed'Some of the organic carbon was pyrolyzed

Done.

P1316L17 'IMPROCE ' IMPROVE?

Done.

Figure 2 The figure should look better with higher resolution.

Done.

Response to Reviewer#2

The study used aerosol samples collected in mountain top of Tibet using a MOUDI sampler. In laboratory, the authors obtain OC, EC, inorganic ions, and WSOC, and TON. These data is important to understand aerosol compositions in free troposphere over Tibet. The authors also used HR-ToF-AMS to get the details about the organic matter and indicate ageing process of OM.

The chemical analysis of the composition and aging processes for aerosol particles in this work are systematic and comprehensive. The HOA, SOA, and O/C ratio in this work are very important for better understanding the properties of OM aerosols in the clean background area. The experiment methods are of interest to the readers who concern aerosol particles in some cleanbackground places. In light of the valuable data in the special area, the paper can be published by ACP with one minor revision.

We thank the reviewer for his/her positive comments.

Comments:

1318 Line 7 72%.

Done.

1318 Line 17 No dust storm event was

Done.

1318 Line 20 at the range 1.8-8.0 ug -3 with the average at 3.7..

This sentence has been rewritten.

1318 Line 24 deleted "the"

Thanks. Done.

1319 Line 18 Correlations

Done.

1324, Line 2 deleted further

Done.

- 1325 line2 consistent with.

Done.

Farmer, D. K., Matsunaga, A., Docherty, K. S., Surratt, J. D., Seinfeld, J. H., Ziemann, P. J., and Jimenez, J. L.: Response of an aerosol mass spectrometer to organonitrates and organosulfates and implications for atmospheric chemistry, Proceedings of the National Academy of Sciences of the United States of America, 107, 6670-6675, 10.1073/pnas.0912340107, 2010.

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Xu, J., Zhang, Q., Chen, M., Ge, X., Ren, J., and Qin, D.: Chemical composition, sources, and processes of urban aerosols during summertime in northwest china: Insights from high-resolution aerosol mass spectrometry, Atmos Chem Phys, 14, 12593-12611, 10.5194/acp-14-12593-2014, 2014b.

Zhang, J. K., Sun, Y., Liu, Z. R., Ji, D. S., Hu, B., Liu, Q., and Wang, Y. S.: Characterization of submicron aerosols during a month of serious pollution in beijing, 2013, Atmos Chem Phys, 14, 2887-2903, 10.5194/acp-14-2887-2014, 2014.