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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Summertime and wintertime atmospheric processes of secondary aerosol in Beijing" *by* Jing Duan et al.

Anonymous Referee #3

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This manuscript by Duan et al. presents measurement results in Beijing summer and winter with a focus on the secondary aerosol formation processes. The paper is overall written in fine English, and present results in a relatively clear way, but there remains some unresolved issues before its acceptance. (1) A natural but critical question is novelty of the findings. The campaigns were conducted in 2015 (a bit old data), and a large number of AMS studies have been conducted in Beijing in recent years. Similar conclusions were already reported previously, for example the formation mechanisms of sulfate (and nitrate) in summer (photochemical dominant) and winter (aqueous-processing dominant); the links between photochemical oxidation with LO-OOA and aq-processing with MO-OOA were also reported previously in Beijing (and some other cities); also, the methods used to conduct such analyses are also similar to prior stud-

ies. The authors must clearly state what new findings this paper can offer, and in the meantime, to highlight the differences of your results from previous ones (for instance, in Fig.2, you should also add results after 2015) (2) P2 Line 33-37. The aqueous formation of sulfate is indeed controversial, therefore I do not suggest the authors to make conclusions on it. For example, you state, "this pathway, has been ruled out...". This is still an open question in my opinion. (3) I have a similar doubt with another reviewer regarding the PMF factors. The presence of ISOOA is in question. In urban environment of Beijing, even in summer, it is unlikely to have a significant biogenic SOA factor, this was very likely due to your initial input in ME-2. This is should be carefully checked. In addition, the terminology of different OA factors should be considered more carefully. As you used a Q-ACSM, which is unable to calculate the elemental ratios, how can you define a more (or less) oxidized OOA? If this is only based on the spectral characteristics or similarities with previously identified factors, you should state it clearly in your manuscript. (4) In Figures 4 and 5, it is better to show the correlation coefficients. (5) Some researchers argue that ALWC and Ox may not be effective indicators for aqueous processing and photochemical processing, even though a few studies conducted similar analyses. There could be large uncertainties, and the data are also of large scatter, therefore complicates interpretation of your results. Such uncertainties should be discussed. (6) Other influencing factors should also be considered when you look into the correlation of OOA factors with ALWC or Ox. For example, you tried to minimize the influence of PBL height by using delta CO; such influences from weather conditions rather than chemistry itself may also affect your analyses here. How about you investigate correlation of OOA/delta CO with ALWC, for example? In addition, I also suggest to discuss influences of different air masses on the correlations.

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