

## ***Interactive comment on “Influence of Intense secondary aerosol formation and long range transport on aerosol chemistry and properties in the Seoul Metropolitan Area during spring time: Results from KORUS-AQ” by Hwajin Kim et al.***

### **Anonymous Referee #2**

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[Overall]

This study analyzes the emission sources and SOA formation processes in spring in the Seoul Metropolitan Area (SMA). The field measurement was well planned and a good data set is provided. The authors analyzed the data carefully and showed some interesting findings. However, the paper is too long, and does not reasonably focus on what they really want to know. Therefore, it is probably OK to be published in this journal after appropriate revision according to the following comments.

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[Major comments]

(Overall) The length of the manuscript is better to shorten into half or two-thirds. The information and analyses should be more focused what the authors really want to know. Please clearly state the major findings in the main body and abstract. Less-important information should be shortened or moved to the supporting information.

If I understand correctly the motivation of the authors, I recommend changing the constitution of the manuscript as follows. (1) The information written in Section 3.1 and 3.2 seems not critical. So the volume of these sections can be shortened greatly or may be merged into other sections. (2) It may be good to restructure the result section into three: (1) haze event, (2) high organic event, and (3) high sulfate event. Then authors can state the pollution mechanism and sources for each event.

(Overall) The authors indicated the importance of SOA on PM mass. It is good if the authors can show where (which region) the precursors (e.g. VOCs and NO<sub>x</sub>) came from, and the relative importance of ASOA and BSOA. In addition, please clarify the area or area size (and time scale) of “local”, “regional”, and “long-range transport”.

(Overall) Recently, in many places especially in cold season, biomass burning is a large source of ambient PM. It would be good to state about how large of the biomass burning in this field campaign.

(p4,L1-15) The motivation of choosing “spring” as the study season should be clearly stated. It may be good to show average PM levels in four seasons in SMA. Are winter and spring the worst?

(p7, L15-17) I am bit curious about the validation method of AMS quantification. Did the authors validated AMS and SMPS quantification accuracy independently? I think the parallel measurement can give us only supporting information.

(p11, L2) “haze periods, high organic/or sulfate period”. . . These three periods should be shown in Fig.2. Fig.2 is too small and busy. The reader cannot pick-up the informa-

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tion correctly. Fig.11 and Fig.S20 is good. So it may be good to move Fig.S20 to the main body of the manuscript.

(p17, L31) “The diurnal pattern of COA displayed a large evening peak at  $\sim 19:00$ , i.e., dinner time, and a small lunch time peak at  $\sim 12:00$ .” I cannot see these peaks in Fig.8f. To me, it is highest at around 22:00 and decrease by 18:00.

(p20, L20-21) “17:09 to 17:15” It is good if the authors can explain why the SOA increased in the evening (not afternoon). Is the SOA formed in the afternoon then transported? Or formed in the evening?

(p23, L11) Please clearly state why you can conclude “spring plumes were long range transported”.

(Fig.1) The scales in Fig.1a&b cannot be read. Larger scale map (about 50-100 km size) is better in Fig.1a. Fig.1c,d,e are too small to read. “industrial facilities are located (west and south) and agricultural and biogenic areas (east and south)” cannot be understood from this map.

(Fig.3) Two of the right bottom figures (Org-EC and HOA-LV-OOA) should be shown in the same style of other figures.

(Fig.8 e,f,g,h) The figure is too busy. BC, NO<sub>3</sub>, Ozone, etc should be moved (or omitted) to other figures.

[Minor comments]

(Abstract, p2, L1-2) It is better to insert a simple explanation in the begging of the abstract about why the authors selected “spring” as the measurement season.

(p3, L17-19) Doesn't Korea have environmental quality standard of PM<sub>2.5</sub>? If they have, the authors should show these values as well here.

(p3, L20-21) The approximate area size (x km<sup>2</sup>) of SMA should be described.

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(p7, L1, and others) I think the URL information should be moved to the “References” section.

(p7, L25) “Fig.6a and b” seems not correct figure number.

(p13, L3-4) “~20.0 ppb” should be “~20 ppb”. “~41.7 ppb” should be “~42 ppb”.

(p13, L22) “. . .number concentration (Fig. 3),”. Fig.8 should be cited here.

(p21, L29) “Fig.12” should be “Fig.11”.

(Table 1) The “0” at the column of “minimum conc” should be shown as “ND”. The “-” at the column of “Fraction of total PM” should be shown as “100”.

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