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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source Apportionment of Fine Aerosol at an Urban Site of Beijing using a Chemical Mass Balance Model" *by* Jingsha Xu et al.

Anonymous Referee #1

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GENERAL COMMENTS The manuscript presents a study conducted in 2016-2017 in Beijing to estimate the sources of OC in the fine PM fraction using the CMB source apportionment technique. The analytical procedures are described in detail and the manuscript presents a great deal of results which are compared with previous studies in the same or nearby areas. The study focuses mainly to the fine OC fraction. This should be better reflected in the title. In addition, the objectives of the study should be better specified. The apportionment of PM2.5 is a secondary outcome of the study based on OM/PM2.5 ratios from the literature, which introduces a considerable amount of uncertainty. This aspect of the methodology should be clarified to the reader in the presentation of the results. In addition, the reliability of the CMB in relation to other

source apportionment techniques should be better documented. Despite the number of samples (31 in winter and 34 in summer) is coherent with the CMB technique, it is quite limited to represent the variability of meteorological and emission situations in a complex situation like a megacity. Some of the presented results need more discussion to explain what is their relevance for the purposes of the study. For instance: What is the added value of comparing Beijing with a rural location? What is the importance of distinguishing between haze and non-haze days? The readability of the text could be improved by removing the repetition of data already presented in figures and tables. The conclusions should explain what is the added value of this study with respect to the previous knowledge on PM2.5/OC sources in Beijing. In addition, the authors should underline how the combination of two different approaches (CMB and PMF) contribute to obtain more complete/robust estimations.

SPECIFIC COMMENTS Abstract: the abbreviation SNA is not explained Abstract Line 46: this sentence is misleading as the CMB did not apportion any source of secondary OA. Line 73: This statement is not fully correct. At present, there are many numerical tests to support the decisions about the best solution in PMF. The citation here is out of date for this topic. Line 78: "composed" instead of "comprised". Line 80: Explain where. Line 86: Provide references about the reliability of CMB compared to other source apportionment methods. Line 99 and foll.: The list of source profiles is redundant here as it is mentioned in the methodological section. Line 111: Did you check if the number of samples is enough to describe the average conditions in the studied area? Line 137: Federal Reference Method of which country? Please, provide a reference. Line 142: EUSAAR2 method, a reference is needed. Line 215: How did you check that no relevant sources are missing? Line 215: The used source profiles should be provided as table (e.g. suppl. info). Did you check that the sources do not vary considerably within the sampling interval (e.g. winter, summer). Line 256 -257: The period does not match the one described in section 2.5 to compare the results of the two studies you have to align the two time windows. Line 260: What's the importance of distinguishing haze and non-haze and how was the threshold between the two defined? Line 280:

Correlation could be also caused by dispersion- dilution mechanisms. Line 303: This statement is not supported by the data. The agreement is only good in winter for offline and in summer for online. Line 312 and foll.: This behavior could also be explained by the loss of semivolatiles from PTFE filters Line 326 and foll.: Section 3.3 seems not to be in line with the objective of the study. In the introduction you claim that the study focuses on sources of PM2.5 with particular reference to SOA. However, the focus of the study is on OC sources. Line 357: Coal cannot be considered a single contributor but as a single fuel type. Line 370: Cl- has many sources, not a good candidate for tracer. Line 372: In Fig 5 there is no clear relationship between Cl- and coal combustion in summer. Line 529: Provide more information about this site. Why is it important for this study? Table 3: It is too complicated to read, I suggest to convert it into a bar plot with error bars Line 546: More discussion is needed about the different size fractions used in the two methods and how this affects the single sources. Line 564: What is the meaning of OOA1,2 and 3? The profiles of the AMS sources should be shown in a figure Table 4: Please, add the names to the single columns. Line 631 and foll.: This calculation of PM2.5 contributions using OC/PM2.5 ratios from the literature introduces a considerable amount of uncertainty because of the variability of such factors. The uncertainty of these results should be clearly illustrated to the reader. Lines 633-638: It is not necessary to repeat the information that is already available in Table S3. Line 649. Specify what does the range after the value means. Is it a confidence interval, a standard deviation or something else? Does it includes the uncertainty of the OC/PM2.5 ratios? Line 652 and foll.: Since these results are in a table it is not necessary to list them here. Figure 9: I suggest to replace the daily data with the overall averages (now in table S4). Conclusions: this section is mandatory according to the instructions for authors of this journal

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