

Answers to Referee 2 comments

We thank the reviewer for the valuable comments that helped improving the manuscript.

The manuscript utilized a ME-2 based source apportionment approach to analyze 25 AMS datasets collected during the EUCAARI campaign and provided an overview of the organic aerosols in Europe. Four organic components were retrieved at most sites: HOA, BBOA, SV-OOA, and LV-OOA. It is suggested that with the PMF/ME-2 approach, one can better resolve the HOA and BBOA factors generally, especially in resolving the HOA factor at rural/remote sites.

Analyzing 25 AMS datasets is not a trivial task and this manuscript succeeded in providing a comprehensive overview of the OA factors resolved at different sites across Europe. One of the main objectives of the manuscript is to demonstrate the use of PMF/ME-2 technique in source apportionments across multiple sites, ranging from urban to rural sites. While the details regarding this technique have been documented in some previous publications, I think it is important to provide some basic information in this manuscript as well. The use of ME-2 requires a-priori information. However, there are very little information and discussion in the manuscript regarding how the choice of a particular source profile will affect the source apportionment results. Further, a parameter referred to as “a-value” is used to allow for variations in the source profiles. However, the significance of this “a-value” is not discussed. The authors listed some ranges of “a-values” but they should provide more justification regarding the choice of the “a-value”.

Following the suggestions of both Referees, we included a paragraph in the supplementary material to discuss the importance of the selection of a reference mass spectrum. A complete answer to this point is provided in the detailed technical comments at point 2.

One of the advantages of the method outlined in the manuscript is the ability to resolve HOA factor even at remote/rural sites, and/or to provide a “cleaner” separation between the HOA and BBOA factor. This is an improvement over the unconstrained PMF analysis. However, I have some concerns regarding how the a-priori information could affect source apportionment results. In their analysis, OOA components are not fixed. Technically, one should expect the OOA components to be fairly stable and comparable between this PMF/ME-2 analysis and the unconstrained PMF analysis. The authors provided a comparison for the results at a few sites in the Supplementary information (S1-3). There is a fairly large discrepancy between the SVOOA and LVOOA factors resolved by the two methods in the Barcelona dataset, where it appears that the contributions from SVOOA and LVOOA are swapped in the two analyses. This large discrepancy is quite concerning but there is no discussion regarding this. If the OOA source apportionments are so different between the two methods, what does this actually mean? What does this infer about the robustness of their approach? How does one decide which approach gives more “accurate” source apportionment results? This is a critical issue that needs to be addressed. Without further information, it is not possible to tell how the source apportionment results from the two methods compare at other sites. But, I urge the authors to perform a systematic analysis about this

As it stands now, the manuscript provides information such as what factors are resolved at each site and how much each factor contributes to the total OA at each site. There is no discussion regarding what all these mean. While this manuscript provides a nice overview of the source apportionments of OA in Europe, I think this would have been a much more impactful paper if the authors could also discuss their data in the context of the sources and atmospheric processing of the OA across Europe, i.e., providing more scientific context in addition to the source apportionment results.

The main

