Referee 2:

This technical note presents the effect of the storage in different conditions on the molecular composition of aerosol produced in chamber and collected from ambient air. I absolutely agree with the authors on the crucial need to understand the effect of storage on the organic matter composition and I particularly appreciate the dual approach, taking into account the trends of specific m/z and on the global composition of the samples. The objectives of the study are clear and the methodology is well written and detailed. This work deserves to be published.

Nevertheless, few points can be improved:

The authors investigate 3 storage conditions for filters and extracts: room temperature, -20°C and -80°C. I would have added also 4°C. This could be extremely interesting for the extracts, because it is the temperature of the autosampler for many instruments (LC-MS, IC-MS…). Do the authors have an idea of the effect of storage in refrigerated conditions?

The reviewer mentions an important point and we agree that 4° C would be an important temperature to investigate because of the wide use of fridges and autosamplers. However, including another temperature condition would not have been feasible during this study but should be subject of future studies.

Unfortunately, it is not possible to predict the stability of organic particle components at 4° C from the data acquired here.

Regarding the storage conditions, at lines 56-61, the authors reported that storage conditions were evaluated for inorganic ions, EC and OC analysis. No references are reported. What are the current guidelines from research infrastructures? Are they comparable with those presented in this work?

We added several references discussing effects of storage on inorganic ions, EC and OC (Line 59-60). Because these studies do not compare storage conditions for molecular level organic particle composition (as we do it in our study), it is not possible to directly compare them with our work.

We are not aware of any research infrastructure guidelines.

SOA samples seems more perishable than ambient aerosol samples: few hours of sampling are enough to change the composition of the organic matter. Sampling in chamber should be performed in refrigerated conditions?

We did not look at changes in particle composition at 4°C and therefore cannot estimate how much this would slow down compositional changes.

For chamber experiments, it might be challenging to perform particle sampling at refrigerated conditions, but it would be advisable to collect particles for as short of a time as possible and freeze the samples immediately after collection.

The extraction procedure reported at line 98-99 is reported in previous studies or was designed for this study in particular?

This procedure was adapted from our previous study, Keller et al., 2022, and adapted for the needs of this study (mainly drying down samples in the concentrator instead of using nitrogen), as now explicitly stated in line 95-96.

The PCA enables a global view of the variation of the composition of the samples with storage. However, I miss some details of the statistic study, like the methodology for the normalization of the intensity of the peaks. This is essential when the analysis is performed on a large database like mass spectrometry results.

We thank the reviewer for pointing this out.

We re-analyzed the entire data set with $\log_{10}(x)$ normalized intensities. These results are shown in Fig. S3, S7, S9 and S11 and are very similar to the non-normalized data, the only difference between the normalized and the non-normalized PCA scores plots are the four week extracts in the β-pinene SOA. Corresponding text has been added on lines 178-180, 252-254 and 293.

I also feel that the PCA can be better exploited to understand the effect of the storage: is there a trend in the clusters?

We address this in lines 181-191. Labels in Figure S2 shows a temporal trend and clustering of the different storage times.

For example, looking at the room temperature extracts in Fig 1, I would expect that short storage times would be closer to the initial sample.

We were also surprised by this but it seems as if even a day of storage at room temperature is sufficient to change the chemical composition of samples significantly, both stored as filters and extracts.

I found very interesting the behaviour of cis-pinonic acid. May it be considered as a proxy to study the desorption or the sublimation of semivolatile organic compounds?

We agree, cis-pinonic acid could potentially be used in future studies as a proxy to detect and describe processes as the ones mentioned by the reviewer.

HVAS = ? high volume aerosol sample, I imagine

Yes, the abbreviation is given in line 88. HVAS = High-volume ambient aerosol samples.

I think that the objective of this study is to provide some guidelines on the storage of filters and extracts for aerosol samples. I expected to find these guidelines in the conclusions but I didn't. In my opinion, the authors should put the basis for a standardization of the methodologies in aerosol sampling for molecular characterisation and clearly state the procedure to adopt in order to improve the comparison of samples.

We agree with the reviewer. We added a sentence about a possible best practice for organic aerosol storage at the end of the conclusions section (line 375-378).

References:

Keller, A., Kalbermatter, D. M., Wolfer, K., Specht, P., Steigmeier, P., Resch, J., Kalberer, M., Hammer, T., and Vasilatou, K.: The organic coating unit, an all-in-one system for reproducible generation of secondary organic matter aerosol, Aerosol Sci. Technol., 56, 947–958, https://doi.org/10.1080/02786826.2022.2110448, 2022.