We thank the Referee for thorough evaluation of our manuscript. We appreciate the highly competent, and constructive comments provided. These insightful suggestions for revision have been very helpful, and we are convinced that addressing them will significantly enhance the overall quality, clarity, and impact of our manuscript. Below we respond point by point to the comments and indicate the corresponding manuscript revisions that we have made. Additionally, we corrected a few minor spelling errors we found.

Referee comments

line110, the statement "its sources were identified using PMF" is somehow misleading. PMF factors in AMS data are not always direct sources, but rather chemically or process-defined components that can sometimes be linked to sources after interpretation.

Response: "sources" was replaced by "chemically distinct or process-related components"

Fig. 2. The diurnal cycles are presented as normalized concentration. Please clarify which parameter was used for normalization.

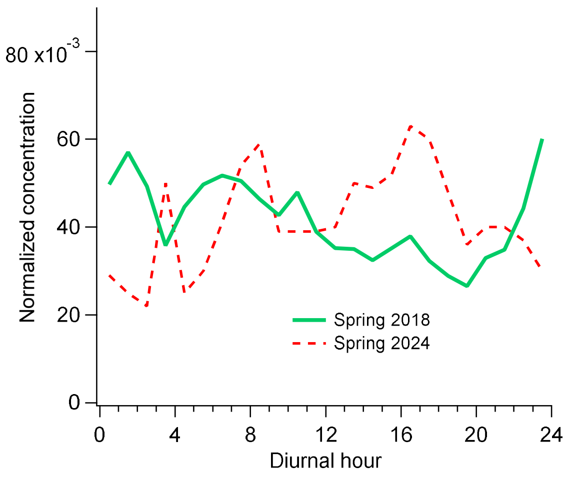
Response: Concentrations in diurnal plots were normalized to the cumulative concentrations over the whole day. Clarification was added to the figure caption.

line210-213, It is difficult to attribute the relatively flat HOA diurnal pattern in spring 2018 solely to airflow and temperature. Moreover, the cycle does not appear truly flat but instead shows a noticeable peak around midnight. Are the air masses in the Helsinki region primarily influenced by southerly or southwesterly winds during the warmer season (spring to autumn)? Considering that the 2018 and 2019 campaigns represent meteorologically similar periods in terms of temperature and air mass influence, one might expect comparable HOA diurnal patterns for these two seasons.

Response: Average diurnal trends for HOA during Spring 2018 and Spring 2024, are shown in figure below. The Referee is correct that HOA peaked at midnight in Spring 2018, while during Spring 2024, the largest HOA concentrations were detected between 8 AM and 5 PM. Even though both campaigns were designated as spring campaigns, the campaign in spring 2018 was conducted much later in the season than spring 2024 campaign, and therefore spring 2018 campaign represented almost summer conditions in Finland. We didn't discuss much about meteorology during the campaigns in the article, since it was not the main topic of the paper, but average temperature and relative humidity during the campaigns were given in Table S1 in Supplemental material. It shows that the average temperature was much higher in Spring 2018 (13 °C) than in Spring 2024 (4.2 °C), as it was conducted mostly in May while the Spring 2024 campaign was conducted mostly in April.

The Helsinki region is primarily influenced by southwesterly and westerly winds but during spring also northern and northeastern winds are more common.

We added text to clarify the difference between two spring campaigns: "Although two campaigns were classified as spring campaigns, the meteorological conditions differed substantially between them. The Spring 2018 campaign was conducted later in the season than the Spring 2024 campaign, and consequently, air temperature was considerably higher during the 2018 campaign."



line213-214, it looks to me that HOA shows higher concentrations in the day than at night in the diurnal cycle (Fig. 2), contradictory to the statements here.

Response: A figure showing the average diurnal trend for HOA during Spring 2018 was given in previous response. The concentrations were smallest in the evening between 5 PM and 8 PM, and largest between 10 PM and 3 AM. The difference between day and night was not large but in general "HOA had higher concentrations at night than during the day" as stated in the manuscript.

line288-289, can you reason BBOA from a dominant local source?

Response: The dominant local source for BBOA was probably residential biomass combustion in fireplaces and sauna stoves. As mentioned in the manuscript, BBOA exhibited a pronounced evening maximum around 19:00 that coincides with the wood burning for heating purposes or warming up saunas. However, as mentioned in the manuscript, the measurement site was located at an area that was predominantly composed of apartment and industrial buildings, however, there is a residential area rather near (< 1 km) that consist of wooden houses with fireplaces and saunas. During certain wind direction and/or other meteorological conditions, the emissions from that residential area can affect the observed concentrations at Helsinki Supersite.

We modified text in Conclusions: "as there are no detached houses with fireplaces in the surrounding area" is now "as there are very few detached houses with fireplaces in the surrounding area"

line295, laser vaporizer should enable the detection refractory organic species due to the presence of BC. How does this capability affect the PMF factors compared to results from conventional thermal vaporizer results? This aspect is not discussed in the manuscript and would benefit from clarification.

Response: The Referee is correct that the laser vaporizer should enable the detection of refractory organic species due to the presence of BC. That aspect was not investigated in this article as the laser vaporizer was on all the time, not switching on/off, and the reference mass spectra with only the tungsten vaporizer was not available. The mention that the laser was on all the time has been added to text as suggested by the Referee 1.

In other studies, it has been found that the laser vaporizer increased the contribution of $C_2H_4O_2^+$ in total OA and oxygenated OA factors (Rivellini et al., 2020), while Wang et al. (2019) identified a substantial fraction of $C_2H_4O_2^+$ in BBOA when operating the AMS with a laser vaporizer only. More generally, OOA factors typically exhibit enhanced $C_2H_3O^+$ signals when measured with a laser vaporizer, whereas CO^+ and CO_2^+ signals tend to be more prominent when using a thermal vaporizer (Massoli et al., 2015; Lee et al., 2017). These details were already included in the article.

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