Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Long-term measurement of sub-3nm particles and their precursor gases in the boreal forest" *by* Juha Sulo et al.

Anonymous Referee #1

Received and published: 5 September 2020

In this manuscript, five years of sub-3 nm particle concentrations obtained with the PSM and three years of precursor vapor concentrations measured with the CI-APi-ToF at the boreal environment are presented, and possible correlation between particles and vapors are examined. This is a unique dataset analyzed and the results are definitely worth being presented in ACP after few minor revisions.

A general comment is the presentation of variabilities of the various atmospheric constituents' concentrations. After the presentation of the full data series for both particles and vapors I would like to see a summarizing Figure for the annual variability of each parameter so that the reader can have a direct impression about the seasonality observed. With regard to diurnal variabilities presented, I recommend normalized rather than absolute values to be used. Additionally, tables with descriptive statistics should

be included.

Specific comments:

Line 169: The red plusses do not contribute to this Figure, they look rather as an apparent red line. A table summarizing what is shown in Figure 2 would be more helpful to understand how much data was eventually excluded from the analysis. What is the benefit from dividing the data in these three categories eventually?

Line 213: Does the comparison with the NAIS refer to the whole measuring period included in this study? If so, what changes for the different instruments used?

Line 325: In Figure 2 the tick marks of the months suggest an earlier start of the season (is it because the mark is set for the mid of the month?).

Line 348: The discussion of Figure 5 is not clear to me. In all data figure, 1.3-1.7nm do not show any variability. 1.1-1.3 nm present a clear maximum in the evening, but only a weak maximum at noon. 1.7-2.5 nm show a clear minimum during night-before sunrise, higher concentrations during the day and maximum values during the evening. I recommend for all diurnal patterns and given the seasonality presented in Figure 6 to present normalized diurnal patterns so that these variabilities become more evident. I also think that there are extremely low values at 00:00 especially for the 1.3-1.7 nm mode that need to be double checked, the rapid drop at NPF days might result from not valid data-it definitely looks weird.

Line 380: No, it does not, there is a single maximum in the evening. Once again I recommend normalizing the values, so that any variability becomes more evident.

Line 385: It looks quite similar to spring to me. A table with statistics of the various concentrations described would be most helpful for the reader to understand the variations described.

Line 407: I see a lot of outliers for high values but none for low values. Once again the pluses are not contributing to the discussion of the Figures, they are rather confusing.

To me, there are pluses that are within the 95th percentile, it has to be clearer.

Line 419: Once again I believe that normalizing the data will produce much better Figures. Additionally, the authors could consider presenting in the same figure the various vapors to assist the eye to identify the variations during the various seasons.

Line 421: Figures 8 and 9 are mixed up, 9 comes before 8, probably in the text as well.

Line 459: It does not look that "sharp".

Line 462: Tables with descriptive statistics will provide the reader a more quantitative perspective of the Figures.

Line 505: This is true for the event periods. However, it is worth mentioning that all vapors have statistically significant correlation with the lower size bins for all data, which implies that these vapors play a significant role in the formation of clusters.

Line 546: What about the correlations described earlier, are they logarithmic as well?

Line 552: HOM Nitrate dimers.

Technical corrections:

Line 39: "in the atmosphere" repetition.

Line 43: Period before "Studies".

Line 144: Period mark repetition.

Line 144: Is it perhaps "thought" rather than "though"?

Line 301: It should be Table 1.

Line 508: Remove paragraph.

Line 558: Remove "correlations".