Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Sesquiterpenes identified as key species for atmospheric chemistry in boreal forest by terpenoid and OVOC measurements" *by* Heidi Hellén et al.

Heidi Hellén et al.

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Anonymous Referee #2

Thank you for the very good comments. We have considered them and we have improved our manuscript based on them as explained in more detail here:

Sampling and Calibration

Because the major "breakthrough" is the ambient quantification of very reactive compounds, I am interested in the sampling techniques and calibration that were used. VOCs were calibrated using dilute liquid standards injected onto the adsorbent. Can

you describe that a little further? What concentration ranges were used? Was it injected using a syringe or put into an air flow? Is this representative of the sampling technique (using liquid vs. gas-phase compounds and not accounting for losses in the sampling system)?

- In our system we inject liquid standards into the tubes prior flusing them with a flow of clean nitrogen for 10 minutes to remove the methanol/water used as solvents. For most of the studied compounds, no gaseous standards are available since they are not stable in the gas bottles. However, we have compared the gas and liquid standard methods for the main monoterpenes and aromatics and have optimized this way our liquid standard method, getting good results in the comparisons. For volatile organic acids (VOAs) the method has been compared with PTR-MS measurements in Hellén et al. (2017). We added a better description of the calibration method to the manuscript.

I understand the sampling of for GC-MS2 was a sub-sample from a larger flow (2.2 L/min). Please clarify the text; it took me awhile to figure this out. Part of the confusion is the use of "extra flow" terminology (pg 5, line 3)

- 'extra flow' was corrected to 'inlet flow' and the text was clarified.

Pg 5, line 14: "used method" does not make sense here

- It was changed to 'this method'.

Pg 5, line 19: "suffering by the most degradation" needs to be re-phrased.

- The sentence was rephrased.

Sampling for GC-MS3 used two different types of inlets. Is that correct? Why was that done? I do not understand "stainless steel tube was used to destroy ozone" (pg 5, line 25). How was ozone destroyed?

- In 2012 we published an article on this ozone destruction method (Hellén et al. 2012a). This is now better explained in the manuscript.

Pg 5, line 26 omit "a" before 40 mL/min

- This has been corrected.

Content: The idea that p-cymene (4-isopropyl toluene) is partially anthropogenic can be mentioned sooner (pg 9, line 23) to explain why it has a different pattern.

- We added a sentence about this at the suggested place.

Pg 10, line 32: what is meant by the fact that MT data is more abundant? How is that different from the fact that there is "very little data on atmospheric SQT concentrations"?

- There is very little data on ambient concentrations and on emissions. These are two different type of data.

Pg 12, line 10: elaborate a bit on the anthropogenic sources of MACR.

- An explanation has been added.

Pg 17, line 4: What is LC-UV?

- It has been corrected to 'LC', which is actually explained earlier in the manuscript.

It would be nice to have a table outlining your major BVOC species, their reaction rate constants, and their vapor pressures. In other words, outline the data used to make the graphs.

- The list of the used reaction rate coefficients and vapor pressures were added as supplementary table S1.

Figure 2: why is the propanic acid so high in June?

- The highest concentrations of all VOAs were measured in June together with the highest temperatures. VOAs were measured with GC-MS2 and the measurement period was different than for GC-MS3. This is explained in the manuscript in section 3.1.5.

Figure 5: There is a stronger correlation with monthly measurements vs. daily measurements of MT concentration and temperature. Why wasn't the monthly data included for SQT?

- A figure including monthly mean SQTs has been added.

Wording Be sure to fix the grammar throughout this manuscript. Here are a few examples.

When referring to PTR-MS and GC-MS, be careful of the verb agreement. You can either use the abbreviation to represent the instrument (e.g. gas chromatograph) or the technique (gas chromatography). I think you chose the former, but then you need to ensure there are articles (e.g. "the", "a", etc.) before the abbreviation and a corresponding verb.

- A language check was done now by a native speaker for the whole manuscript.

Section 2.3: the text below the equations does not agree with the content of the equations. For example, "x" is not in the equation. I think all of the "ks" should be lowercase (reaction rate constants), but one was uppercase. Rephrase the explanation so that you don't use "yields are yields".

- This section has been corrected.

Pg 6, lines 28-29: rephrase this sentence; it is confusing

- This has been rephrased.

Pg 7, lines 12-13: rephrase sentence

- This has been rephrased.

Pg 9, line 22: insert a comma after "terpeniods"

- This has been added.

Pg 13, line 12: change "aq" to "a"

- This has been changed.

Pg 14, lines 9-13: re-work this sentence because it is wordy. I don't understand the "also dilution air" phrase.

- The sentence was rephrased.

Pg 26, line 1: re-define "OxPR" here

- We re-defined "OxPR" here.

Pg 26, line 13: "indicate" lost an "e"

- 'e' has been added.

Pg 26, line 28: change "effect" to "affect"

- This has been changed.

Figure 4: Define AMCH

- AMCH is now defined.

Figures 5 & 7: move the y-axis to the edge of the graph (not at x=0) because it makes it difficult to read the y-axis values.

- This has been corrected.