

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

Anonymous Referee #2

Received and published: 30 June 2018

This paper represents many years of BVOC data at a boreal forest in Hyytiälä, Finland. The major advancement was detection and measurement of reactive sesquiterpenes, particularly β -caryophyllene, in ambient air. There is also quantitative evidence of BVOC oxidation products, carbonyls, alcohols, and acids coming from the forest. Analyzed data showed predictable temperature dependencies and contribution to oxidative capacity of the atmosphere as well as SOA production.

This manuscript is very detailed and informative; I just have a few minor comments.

Sampling and Calibration

Because the major “breakthrough” is the ambient quantification of very reactive com-
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pounds, 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)?

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)

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

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

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?

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

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.

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”?

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

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

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.

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

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?

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.

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".

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

Pg 7, lines 12-13: rephrase sentence

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

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

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

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

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

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

Figure 4: Define AMCH

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.

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