

Interactive comment on “Snowpack concentrations and estimated fluxes of volatile organic compounds in a boreal forest” by H. Aaltonen et al.

H. Aaltonen et al.

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We thank the Referee for his insightful comments and suggestions to improve our manuscript. Below are our responses to comments and suggested additions.

It would be useful to put the measured VOC fluxes in context with other reported values (e.g. how does the winter flux from soil compare to e.g. summertime vegetation production – even if just an order of magnitude comparison; how does it compare to other types of VOCs from soil, etc?). The authors mention that the VOC concentrations were similar to (unpublished) belowground VOC measurements collected during the snow-free period, but don't go much beyond that to put these measurements into

C491

context otherwise.

- Wintertime VOC fluxes were already compared with summertime forest floor fluxes. We have also added more comparisons to Ch. 4.3 in the revised manuscript.

The authors should make some mention in the methods of the instrumental/method blanks. The analytical variability is rather high in some cases – this is calculated from "parallel samples" but it is not clear if this represents replicate "environmental" samples or variability based on analysis of replicate standards? Were any lab studies done to determine what the typical recovery of analyte is under typical sampling conditions (e.g. to approximate wall losses, etc)?

- We have added more information to the text in Ch. 2.2. The analytical variability was determined using replicate standard analysis. The variability showed with the results described environmental variability, i.e. between measurements places. Wall losses were tested in laboratory (not existed), but not in field conditions.

Specific comments/suggestions: Abstract, line 1: suggested wording "Soil provides an important source of volatile organic compounds (VOCs) to ...". To where? Atmosphere? State so explicitly.

- Corrected as was suggested, sentence also clarified.

Abstract, line 13: "...suggesting soil as the source for terpenoids."

- Corrected as was suggested.

Abstract, line 13: It is unclear in the abstract alone what you mean by "forest damages", it becomes clear in the text of the manuscript, but this sentence needs clarification if it is to stand alone in the abstract.

- Forest damages were clarified.

Abstract, line 19: "...when other biological sources, such as plants, have lower activity."

C492

- Corrected as was suggested.

Page 529, line 1: sentence referring to above or below soil surface activity ... isn't it rather apparent that the activity necessarily comes from above or below the surface? Where else could it be?

- It was meant that the increased emissions were due a change in biological processes, not in physical ones. The sentence was clarified.

Page 529, sentence beginning "The air chemistry in the troposphere..." seems out of place as written. Perhaps starting the sentence with something like "Because the soil could be an important VOC source..." will make this clearer.

- The beginning of this sentence was changed.

Page 529, line 14: "...biological contributions to these fluxes..."

- Corrected as was suggested.

Page 529, line 26: "...but could also act as sinks..."

- Corrected as was suggested.

Page 530, line 20: "We measured the concentrations of terpenoids inside the snow-pack..."

- Corrected as was suggested.

Section 2.3: Use section title of "Supporting" data instead of supportive?

- Corrected as was suggested.

Page 536, line 9: Instead of saying the temp "never dropped even to -1C", it would be clearer to say the temp "never dropped below X".

- As the lowest humus temperature in the first winter was close to -1°C, the sentence was changed to "never dropped even below -1 °C".

C493

Page 537, line 27: "However, for the sesquiterpenes the ratio was similar in both winters..."

- Corrected as was suggested.

Page 541, line 1: "...organic compounds are affected not only by..."

- Corrected as was suggested.

Page 543, line 2: "...already in section 4.1..."

- Corrected as was suggested.

Table 2: Define if 0 cm represents the soil surface or the snow/air interface.

- Table caption was clarified.

Figures 2, 3 and 4 are difficult to read. The lines in 2a are hard to distinguish, especially using just black and white figures. The data points in Figures 3 and 4 are hard to see, they need to be made darker, bolder, colored, larger, etc.

- Figures have been clarified in the revised manuscript. See below.

Figure 4: Is panel (a) meant to not have any data shown?

- The panel (a) is empty on purpose; it was meant to clarify that at the first sampling we found some monoterpenes (Fig. 3a) but not any sesquiterpenes.

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C494

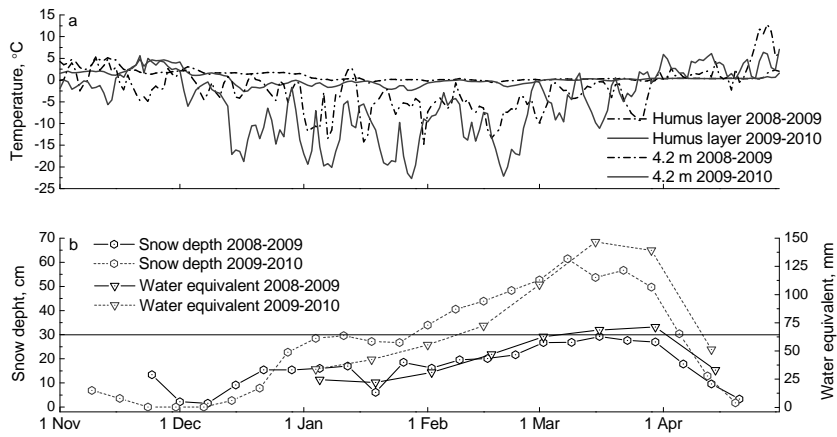


Fig. 1. Figure 2. Temperature, snow depth and water equivalent at SMEAR II

C495

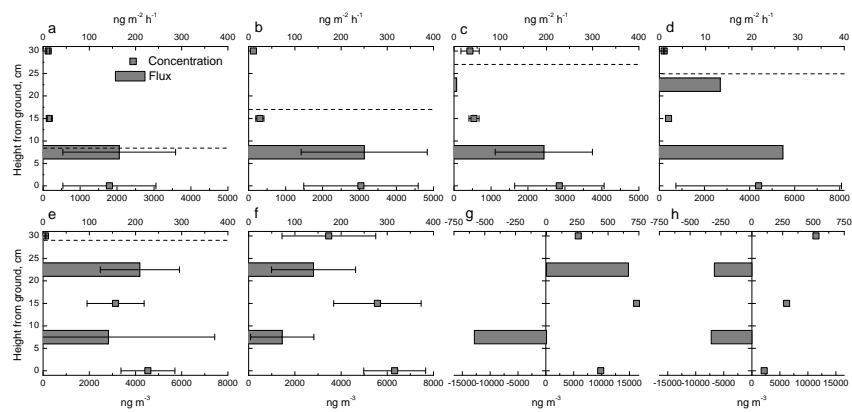


Fig. 2. Figure 3. Total monoterpene concentrations and estimated fluxes in the snowpack

C496

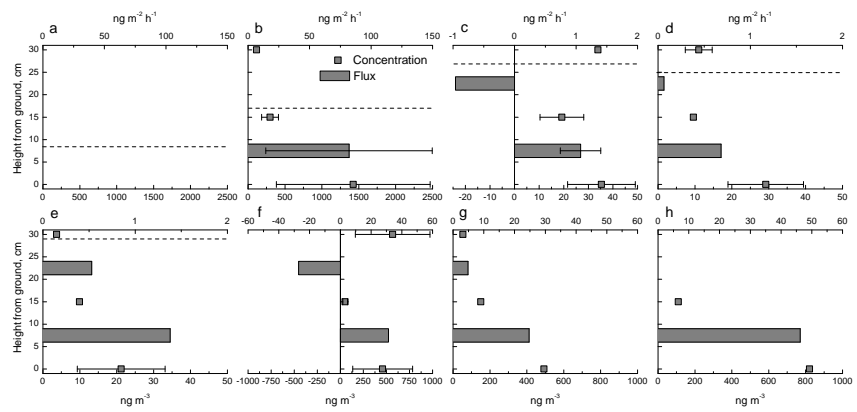


Fig. 3. Figure 4. Total sesquiterpene concentrations and estimated fluxes in the snowpack