

Interactive comment on “Passive adsorption of neighbouring plant volatiles linked to associational susceptibility in a subarctic ecosystem” by Adedayo Mofikoya et al.

Anonymous Referee #2

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The present work presents a dataset of VOC measurements associated with mountain birch and rhododendron in an arctic environment, in order to evaluate potential associate susceptibility for pests. As such the topic is very interesting to the community and appropriate for Biogeosciences. This reviewer acknowledges that such measurements are difficult to obtain and that the research is novel and original. Overall, the dataset appears to be quite limited (at least to the reviewer, who is working primarily on atmospheric measurements including VOC). The paper is well written, but the results are mainly presented as tables, which are not very enticing. In the opinion of the reviewer the paper could be considered for publication due to the novelty of the dataset, once questions about the methodology are resolved and the discussion is streamlined to the

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underlying data.

General comments

There may be significant methodological issues: (1) There appears to be only one measurement per plot for MB and less than 1 for Rt. These are not controlled for environmental conditions (T, ozone, humidity...), which surely affect emissions/ reactions as well as desorption. The authors should explain, why this does not affect their results or provide additional/ auxiliary data. 2) There does not seem to be a true control for the VOC measurements, where Tenax is used to measure air rather than a branch. Are the authors certain, that they are indeed measuring desorption from MB rather than ambient concentrations?

In the results section, there seems to be a diverging behavior in the moderate group, which dominates the behavior. This needs to be further investigated, and explained (eg. with temperature data) before the hypothesis given in the introduction of the paper can be accepted.

The discussion about associational susceptibility appears to be mainly based on a review of literature, which relies heavily on Holopainen rather than the data presented here. In my opinion this might not be appropriate for a research article, which should focus on the discussion of present results. I suggest to refocus the discussion and to shorten it.

Specific comments

Title: The title might be a bit misleading, given the fact that no associational susceptibility was found/ proven.

L120: “focal plant” » this might be a good location to clarify, whether MB is the focal plant of this study.

L166: “The disposable bags had been pre-heated at 120°C for an hour before use.” » Please state the reason for this treatment. I assume to remove contaminant

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semivolatiles (?)

Section 2.1: In order to help the reader get a better understanding of the site and the plant community, it would be good to add a figure displaying the MB, Rt association in moderate and high density.

Section 2.1: Similar to the upper comment, I would appreciate a physical description of the plant heights and other information here (move key information from S1). How far away are MB and Rt branches (on average)?

L162-164: "One branch from each of the 24 MB trees and 10 Rt branches were selected for volatile sampling: one Rt branches from 6 high Rt density quadrants and a branch each from 4 moderate Rt density quadrants (control had no Rt branches). " » I am a bit confused by this description. Does this mean, that the authors did not sample Rt in each of the plots. Could the authors comment on why this decision was made. It appears to me that one would expect a significant variation in VOC emissions between Rt plants.

L168: "A Tenax TA adsorbent tube" » Could the authors comment on whether the Tenax was pristine or desorbed before use.

L190-191: "Emission rates were expressed as ng g⁻¹ LA m⁻² h⁻¹ for birch leaves and ng g⁻¹ leaf DW h⁻¹ for *R. tomentosum* shoots" » could the authors comment on whether storage in bag or adsorption to the bag may be important. Similarly, as the monoterpenes are sticky, to what extent would flow rate, which is approximately given impact the measurements.

Section 2.2: Could the authors comment on the recovery. I am a bit concerned that the desorption of VOC from the MB could be flow speed dependent as increasing the flow through the bag may increase desorption from the leaf surface.

L219-221: There was no difference in the means of Rt compounds emitted from sampled branches from high and moderate Rt quadrants. Rt branches from high density

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quadrants had higher emission rates per emitting unit (ng g⁻¹ h⁻¹) » These two sentences are confusing. Is there a difference or is there no difference. Or is there a difference for some compounds, but not for others. Please clarify the text.

Results/ Figure 1b-d » This may be an optical illusion, but it appears to me that there the linear trend, which is provided by the trend line is mainly dependent on a diverging behavior in the moderate group, where some plots have virtually no recovery, while others have a high recovery (significantly higher than high density plots).

Section: 3.4. "R. TOMENTOSUM ABUNDANCE AND RECOVERY RATE OF ADHERED COMPOUNDS" » To what extent can we be sure that the measured recovered compounds are indeed desorbed from MB and do not represent ambient air concentrations. Did the authors do a control in which no branch was sampled?

Figure 2a-b » Similar to Figure 1, there seems to be an either/or relationship for the presence of compounds. Could the authors comment on this. Since there seems to be a difference between Ledol/Aromadenalene and Paulstrol (which dominates the total), could the authors comment on the reasons such as vapor pressure . . .

L333-336: "The recovery of other Rt compounds (aromadendrene and ledol) from a small number of MB branches with Rt in the understorey, suggests that Rt presence and density alone may not be enough for adherence of sticky volatile compounds on neighboring plant foliage. Other factors like temperature (Niinemets et al. 2014) and distance (Heil Adame-Alvarez 2010) may play important roles." » This is very apparent from Figure 1. I feel that the paper would have been greatly strengthened by additional measurements of these factors.

L 336: "The vertical distances between the base of Rt shoots and the sample MB branches in our study ranged between 100 – 106cm" » This would be good information for the methods

Section 4.4 » The emissions of VOC are very temperature dependent and temperature

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was measured as part of the sampling. To what extent did the authors look at temperature dependence of emissions and thus also recovery. Can the authors also comment on the impacts of chemical reactions with ozone, which will surely affect transport of MT and sesquiterpenes and thus the potential of 'communication' between Rt and MT. What are the atmospheric lifetimes of these gases?

Technical comments (not exhaustive)

L98: It seems inconsistent that mountain birch is abbreviated by its common name (MB), while rhododendron by its taxonomic name (RT).

L168: "sucked air" » might be a bit too colloquial

L193 and others. Fix references that include the author in the sentence (Guenther et al 2012)

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