

Interactive comment on “Mountain birch – potentially large source of sesquiterpenes into high latitude atmosphere” by S. Haapanala et al.

Anonymous Referee #2

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Emission studies were performed on mountain birch trees at a site in northern Sweden. These experiments resulted in emission rates of a variety of monoterpene and sesquiterpene compounds. These data are used to evaluate the fit of algorithms to model the emission behavior as well as for conclusions on herbivory effects on emission rates. This reviewer appreciates this new contribution on monoterpene and sesquiterpene emissions from boreal trees, in particular the addition of a new data set to the somewhat sparse literature on sesquiterpene fluxes and their role in atmospheric chemistry processes. Previous research has shown large variability in BVOC emissions and research on further deciphering controls of emissions is an active research topic. This manuscript interprets emission changes as an effect of insect infestation. While this research topic is of high interest, this reviewer sees a number of weaknesses in the execution of this study, presented interpretations, as well as in the quality of the

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presentation in this manuscript.

From data in Table 1 as well as from many other related publications it is quite obvious that there is a large variability in BVOC emissions between trees of the same species and as a function of time of year. Deciphering the controls of these variations is a challenging task. There is almost no mention on statistical tools that were applied to test for the hypothesis that emissions were effected by this herbivory. One particular important question is what the sample size for this study was. The only available information is from Table 1. Here, four experiments conducted on four trees are listed during year 2006, with 'N' listing the number of samples in each subset. Now, is this the number of enclosure experiments that were performed on each tree, or is it the number of individual emission samples that were collected from each tree? I suspect that the latter is true, which would then add up to a total of 40 emission samples that were collected?

During the second year, only one of these trees was sampled again, and only over two days, and this time a total of 16 samples were collected?

This reviewer's opinion is that given the variability in the emissions behavior, and uncertainties in the experimental procedures, this number of trees sampled (in year 2), number of enclosure experiments, and number of samples collected is far too small to draw the conclusions presented in this paper.

From the information provided in the manuscript it is not even certain if and to what degree tree Birch 4 may have been affected by herbivore three years earlier, so this whole discussion seems to be pure speculation.

Other specific comments:

5410/12: Is this value (2000 ng g⁻¹h⁻¹) the mean of the actual measured emission rates or a normalized value? A mean of the measured rates would probably not make much sense as that would be highly biased by the elevated temperatures encountered during the enclosure experiment and by the selection of the experiment days.

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P5410/L 13: Please be more specific; 'negligible' is not a defined value.

5413/26: What is meant here is probably 'precision', not 'accuracy'?

5414/2: How can a precision measurement be used to derive an accuracy estimate? Provide explanation or reference how the analytical instrument was calibrated.

5414/19: This reviewer is not certain that 'emissions are strongly dependant on the temperature inside the chamber..' from the review of the data in Fig. 1. For instance, temperatures on day 193 were similar or even higher (ambient) than on day 192, but emissions were lower on that day.

Fig. 2: This figure is deceiving. Emissions data from four trees (?) examined over six weeks in 2006 are compared with emissions from one tree (?), sampled over a single diurnal cycle (?) in 2007.

Fig. 3: Please provide information on the number of samples that went into these data. Do error bars represent the standard deviation? I imagine that the temperature data are mean values? It would be nice to also show x-axis error bars, indicating the variability in the temperature during each experiment?

5415/6-8: This description is confusing and not well worded.

5416/24: "...plant species ..."

5415/9-17: "Average sum emissions" is not a very meaningful terminology to use here. As stated earlier in the manuscript, emissions were highly biased by the fact that air temperatures inside the enclosures at times significantly exceeded ambient levels. In the opinion of this reviewer, normalized emission rates should be used for any quantitative comparisons.

5418/20-27 and Table 1: Given the large experimental uncertainties in these measurements this reviewer does not find it appropriate to report emission results to up to 5 significant figures. Also, please show more clearly which columns belong under the

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headings in row 1.

5419/16-18: Please explain how 'effective temperature sum' is determined. It clearly is not the number of days above 5 deg C?

5419/20: This assessment is highly speculative and lacks any supporting data.

5420/11-12: This reviewer does not understand what this sentence is meant to state.

5421/13: "These interactions ..."

Interactive comment on Biogeosciences Discuss., 6, 5409, 2009.

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