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Interactive comment on "Seasonal variation of mono- and sesquiterpene emission rates of Scots pine" *by* H. Hakola et al.

H. Hakola et al.

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Response to referee 1:

We wish to thank the referee for his/her very constructive comments which have been taken into account in the revised manuscript. We feel that the referee's comments greatly improved the quality of our paper. The comments of the referee are addressed below in the order they were made.

We have added more information regarding experimental procedure as recommended by the referee. The word cuvette has been replaced by the word enclosure to better describe the measurement setup. The shape of the enclosures was cylindrical, and they were covered with transparent Teflon film. The purge flow was maintained only during measurements, but the other end of the enclosure remained open during other times, allowing the surfaces to be flushed with ambient air also then. At the time of the experiments it did not seem necessary to keep the flow on at all times- - however, with

our present knowledge- we would choose to keep the flow on.

Unfortunately we have no replicate or duplicate samples, so no information of their variance can be provided.

Ozone scrubbers were carefully tested prior to and after the measurement campaigns to ensure that their efficiency remained unchanged. A sentence stating this has been added to the text.

The sampling volumes have been added.

In the North European climate, 30 C is quite high and does not represent the high noontime emission conditions of the boreal region. However, we completely agree with the referee that it would be more beneficial to the scientific community to scale the emissions to this typically used value. Thus, all emission potentials have now been scaled to 30 C instead of 20 C, as recommended by the referee.

Throughout the manuscript we have called the actual measured emission rate as “emission rate” and the temperature/light scaled emission rate as “emission potential”.

According to the NIST mass spectra library the two unknown sesquiterpenes were a-farnesene and a-caryophyllene, but there are also other sesquiterpenes with similar mass spectra and therefore we cannot conclusively identify these compounds.

The temperature was measured in the enclosure and this is now stated also in the text. During sunny days the temperature inside the enclosure indeed was somewhat higher than ambient temperature.

The referee quite correctly points out that the spores could not reach the enclosure during the measurement. However, as the enclosure was open to ambient air during other times, the branches were then also exposed to spores. We realize that the correlation between the spores and the sesquiterpene emission rates does not prove that the emission would be caused by spores, but we feel that this observation is worth publishing, because it supports the theory that plants emit sesquiterpenes for defensive

BGD
2, S941–S944, 2005

EGU

purposes.

We decided to leave the figures 3 and 4 as they are, because the new combined figure was not very clear. In addition, the purpose of figure 3 is to show differences on the main emission between the two branches, while figure 4 allows the comparison of the different emissions from one single branch. Combining them in a single frame would obscure this purpose. However, we have now combined them as panels a and b of figure 3. The emission potentials presented in the figure are now scaled to (30 C). The referee also suggested that we add the emission potentials in Figure 1. However, we decided to show these in a new figure (Figure 4) showing monthly mean emission potentials together with the error estimates. We feel that this figure would also highlight the statistical significances of the observed differences requested by the referee.

The data in Figure 5 was, indeed, presented as individual data points with regular intervals. This was inherited from our earlier work with more irregular time series where we wanted to highlight the performance of the model instead of temporal patterns. However, the data of July 2004 can adequately be presented as a normal time series and Figure 5 has been redrawn as suggested by the referee. All data points available for this month in our data set are shown in the figure - as they also were in the previous version.

We have now calculated confidence intervals for the monthly emission potentials (Table 1 and Figure 4) and included discussion on the significance of the differences in the emissions from the two branches.

The scaling of the sesquiterpene emissions with the standard beta value of 0.09 was done inadvertently, and we thank the referee for pointing out this mistake. The sesquiterpene emissions have now been scaled using the beta value 0.19, that was found in the present study (average of the two branches) as recommended by the referee. It is indeed more representative and also in accordance with our earlier results.

The modeling section of the manuscript has been rewritten and the terms used in Table

BGD

2, S941–S944, 2005

2 are now described in the text. They are also given in the table caption.

Interactive comment on Biogeosciences Discussions, 2, 1697, 2005.