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

Anonymous Referee #2

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The paper investigates the seasonality of biogenic emissions in the boreal region with respect to measurements on two branches of Scots pine. This dynamic of biogenic emissions over the year was neglected for a long time in emission inventories. Especially, the results about sesquiterpene emissions are very precious as almost nothing is known about sesquiterpene emissions from vegetation particularly the emission behaviour over the year.

Unfortunately the study suffers from the very limited data set as only one measurement per day (in the afternoon) was conducted in the frame of one vegetation period. Moreover the artificial change from natural conditions (debudding) without measurements at replicates is problematic. Conclusions from the results have to be stated very carefully. Therefore the statement that the increase of the emission potential in autumn is due to the new needles could not hold as a sustainable evidence but has to be stated as a

point of indication (resulting in more investigation of this aspect).

The interpretation that the increased sesquiterpene emission of branch A should not come from the new developing buds (p1705, line 4-12) is critical, as you have to take in mind, that you troubled the plant system by debudding the branch. Therefore an unexpected reaction of the plant (in contrast to the emission behaviour of the untreated branch) could not be excluded (and again, replicates might be very helpful to characterise this). This point should be discussed in more detail and drawn deductions have to be stated very carefully (especially in the abstract and the conclusions!). The character of a case study should be emphasised in a revised version of the manuscript as only one branch per treatment was investigated.

Concerning you measurements, it is not clear in which way 7-day running medians are presented in Fig. 1: In the experimental you say that you have conducted one measurement per day excluding Weekend. So, as I understand a presentation of 7-day median values would result in at least 4 data points per month. However, it seems to me that you have presented all measured data (15-20 data points) and not medians in that plot. Please comment on that point.

Typically the emission of vegetation as known so far is a complex mixture of different compounds (especially concerning to the class of sesquiterpenes). I wonder, if the mentioned compounds are the only players in the total emission. What about other compounds? Were additional emissions detected? Have mixing ratios been to low to be quantified?

The stated isoprene emission should be clearly classified or otherwise not taken in account. The MBO degradation to isoprene can be easily reconstructed by analysing reference MBO in the used GC/MS system. This of cause is also important for the quality of the MBO emission values. Clarify of what degree the error by degradation is.

The modelling description is very short and it gets not too clear which algorithms were used for simulation. As I understand the mentioned algorithm (p1705, line 28 and

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p1706, line 10, temperature dependent algorithm) is equation (5) in Guenther et al. 1993. That should be cited from the original that is Tingey & Manning 1980: Tingey, D.T. & Manning, M. (1980) The influence of light and temperature on monoterpene emission rates from slash pine. Plant. Physiol. 65: 797-801, assumed it is used in the original way for the calculation of standard emission rates.

At p1705, line 27f the modelling of sesquiterpene emissions of July are stated with reasonable agreement. What about the other measurement results of other months? There is nothing said about the quality of the calculated emission potential for other compounds and other seasons of table 1. This has to be given in more detail in respect to the values in table 1.

As already noted by the authors (p1707, line 2) the data base to evaluate emission algorithms by this study is very small (one data point per day). Diurnal measurements are needed to comprise the dynamics in the emission behaviour to really get the simulation in a algorithm to be heavy duty. Then there also might be seen differences in the ability to simulate the emissions with different temperature/light algorithms.

The statement on the induction of sesquiterpene emissions by spores in the air is in combination with the lack of data presented in the manuscript for that part not acceptable. To back the interlinkage of spore release and sesquiterpene emission more data must be shown and discussed. In contrast, the stated influence of methyl jasmonate on sesquiterpene emissions is no of essential interest in that scope and only makes sense in a broader discussion of defence strategies. Also the statement on a ozone effect is to short to be helpful in the framework of the study.

In general, the results should be discussed with literature in more detail to receive an impression how this case study fits into the mosaic of past emission studies.

– Minor revisions:

-Formula (1) (emission rate) not really necessary to be shown

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-p1701, line 9 experimental: “temperature” and “light intensity” as normalisation terms should be mentioned with the values in brackets

-p1701, line 2 results: ...in the emission later... [in the year] ...than the monoterpenes” [in the year] should be added to clarify

-Temperatures should be given consistently in k or °C for better reading (e.g. p1706, line 5-6)

-There is no need to name additionally detected sesquiterpenes with 1 and 2, as they are mentioned only once in the text

-Table 2, EO has to be defined somewhere (e.g. in the caption?)

-Figure 1, figure caption: change “...in the same tree.” to “...of the same tree.”

-Figure 1b, What is shown in the graph: Is this the sum of sesquiterpenes or only caryophyllene? Please clarify the caption in the graph

-Figure 5, Error bars have to be explained in figure caption -Figure 1, give “7-day...” instead of “7 day...” in the caption

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