

## ***Interactive comment on “New foliage growth is a significant, unaccounted source for volatiles in boreal evergreen forests” by J. Aalto et al.***

### **Anonymous Referee #2**

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The study by Aalto et al. brings on light an overlooked topic and provides new insights on BVOC emissions. The results indicate that a large fraction of the emitted VOCs originate from the growing process, challenging the empirical models that incorporate temperature and light driven emissions. Nevertheless, no comparison between the measurements and the model is presented. I think that it would have been valuable if the authors enriched their results and arguments with such comparisons. In general, the manuscript is well written and includes a large amount of data collected during three consecutive years. Considering its scientific value and presentation quality it certainly deserves publication but some points should be better addressed beforehand.

#### Specific comments

P1L23: It would be better if you provide quantitative values with uncertainties

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P1L24: Supporting results are needed

P2L1-5: This study does not investigate new aerosol formation events. Therefore, I would suggest transferring this sentence to the introduction or removing it completely.

P2L13 : The study of Bourtsoukidis et al. (2012) also involves the effect of ozone for the above mentioned sesquiterpenes.

P3L1-2 : Please provide a reference.

P4L16-18: Why did you choose to close the cuvette with this rate? In other studies (eg Ruuskanen et al., 2005; Bourtsoukidis et al., 2012) the authors operated their systems by closing the cuvette 3 times per hour and therefore they gained better resolution. Do you have any indications that such frequency might alter the emission responses?

P4L20: what was the retention time? Which were the losses for the compounds measured?

P4L25: Briefly report averaged variations on the parameters measured during one closure

P4L29-31: what about possible effects of removing the buds? (eg. Hakola et al., 2006)

P5L2: what was the temperature of the heated line?

P5L11: counts per second or mixing ratios instead of concentrations would have been more accurate

P5L32-33: Can you present a ratio? Did you conduct any GC-MS measurements to ensure that there was no isoprene emitted? Additionally and according to the literature (Fall et al., 2001 and Warneke et al., 2003) other aldehydes and ketones can be also found in this mass and it worth mentioning.

P8L5: Report here (ii) the days of elongation for each year

P8L26: In addition to the figures, a table presenting the quantitative differences would

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be useful to the reader. The following sentence can be revised, including discussion from the table.

P10L3-5: I think you should be more careful when speaking about “total emissions” since you were only monitoring few VOCs. It would be best if you wrote “total measured emissions” (also in other parts). Moreover, a table with the contributions for each of the three periods would very helpful and informative.

P10L21: This is an important finding and you may consider adding it to the abstract. Please add the uncertainties in the values given.

P10L28: the “about 100days” should be changed in something more accurate

P13L12: The errorbars at Fig 7 do not allow speaking about “significantly different diurnal patterns”

P13L29: The word evidently suggests that such comparisons have been performed. Please add a figure in which you will demonstrate the differences between the model and measurements or reformulate the sentence.

#### References:

Bourtsoukidis, E., Bonn, B., Dittmann, A., Hakola, H., Hellén, H., and Jacobi, S.: Ozone stress as a driving force of sesquiterpene emissions: a suggested parameterisation, *Biogeosciences*, 9, 4337-4352, doi:10.5194/bg-9-4337-2012, 2012.

Fall, R., Karl, T., Jordan, A., and Lindinger, W.: Biogenic C5 VOCs: release from leaves after freeze-thaw wounding and occurrence in air at a high mountain observatory, *Atmos. Environ.*, 35, 3905–3916, 2001.

Hakola, H., Tarvainen, V., Bäck, J., Ranta, H., Bonn, B., Rinne, J., and Kulmala, M.: Seasonal variation of mono- and sesquiterpene emission rates of Scots pine, *Biogeosciences*, 3, 93-101, doi:10.5194/bg-3-93-2006, 2006.

Ruuskanen, T. M., Kolari, P., Bäck, J., Kulmala, M., Rinne, J., Hakola, H., Taipale, R.,  
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Raivonen, M., Altimir, N., and Hari, P.: On-line field measurements of monoterpene emissions from Scots pine by proton transfer reaction – mass spectrometry, *Boreal Environ. Res.*, 10, 553–567, 2005.

Warneke, C., de Gouw, J. A., Kuster, W. C., Goldan, P. D., and Fall, R.: Validation of atmospheric VOC measurements by proton-transfer-reaction mass spectrometry using a gas- chromatographic pre-separation method, *Environ. Sci. Technol.*, 37, 2494–2501, 2003.

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Interactive comment on *Biogeosciences Discuss.*, 10, 18121, 2013.