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Interactive comment on "Emissions of monoterpenes from new Scots pine foliage: dependency on season, stand age and location and importance for models" *by* Ditte Taipale et al.

Anonymous Referee #2

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The study focuses on an interesting and important topic of seasonality of monoterpene emission dynamics, and expands to its importance on secondary aerosol formation. Paper is well written and very easy to read. However, there are some methodological flaws that make the conclusions not well founded.

Most of the results of the paper, if I understood correctly, are based on measurements on one Scots pine shoot. Knowing the intraspecies variability of emissions of VOCs (e.g. Staudt et al., 2001; Bäck et al., 2012), the lack of quantification of variability of the effect of the new foliage is a serious drawback. The data by Aalto et al., (2014) can be taken to show the importance of new needle flush, but its weakness lies in the fact that

is shows data from only one shoot. For national level estimate there should be some indication also on the variability of the data and the robustness of the results.

The authors seem to be in the opinion that the ecosystem emission measurements by micrometeorological techniques are most reliable way to obtain ecosystem scale emission potentials (e.g. page 11). Still the modelling was done based chamber measurement on one shoot. The authors could maybe have somehow scaled the emission potentials they obtained from shoot measurement to fit ecosystem emission measurement. Thus their modeling results would be on a more robust basis.

Furthermore, the paper uses only temperature dependent algorithm, even though is extensively cites Taipale et al., (2011) who show that about 40

The extrapolation of the importance of new foliage to different age classes as well to northern Finland, based on model, can be very uncertain as we do not know if the VOC emission from new needle flush behaves in the same way as in Hyytiala.

The annual average of emission potentiai, as shown in Figures 9 and 10, is not really a good metric. Even large emission potential in spring does not necessarily lead to large annual emission as the temperatures in spring are lower than in summer.

Detailed comments:

Page 1, line 15: ". . .assume that the contribution of BVOCs from new conifer needles is minor to negligible." This statement isounds wrong. The models assume that the contribution of new needles to be equal to mature ones.

Page 6, lines 220-221: ". . .(when data based on Aalto et al. (2014) is not considered)." Why is this part in parenthesis? It seems to me to be an integral part of the sentence, without which it would be misunderstood.

Page 10, lines 364-365: "The spring time differences in emission potentials lead to uncertainties in predictions of monoterpene emissions that are much greater than what has been estimated by Lamb et al. (1987) and Guenther et al. (2012)." The Lamb et

al., (1987) paper dates before a lot of BVOC emission modelling activities and measurements that today form the body of the literature were conducted. I wonder how relevant their estimates are today.

Figure 7: You could add “south” and “north” above the top left and right panels, respectively, to indicate the whole column of panels. Similarly, you could indicate the rows, by e.g. having a label on right side for 10, 25 and >50.

Figure 8 is very confusing. It could be better to divide it to smaller figures, or better indicate what is what. Not including the April data of Taipale et al., (2011) and Rantala et al., (2015) to panels c, I and o seems cherry picking, to make the fit between data look better than it is.

Table 1: Please indicate what is the total emission, so that comparison of “additional” emission has a reference point.

Table 3: 1e7 etc is not proper way to indicate powers of ten. It should be 10^7.

Please check the number of digits on any numerical results given. Giving results this uncertain with three significant digits (implying uncertainty in the order of percents) is excessive.

Additional references

Bäck, J., Aalto, J., Henriksson, M., Hakola, H., He, Q., and Boy, M.: Chemodiversity of a Scots pine stand and implications for terpene air concentrations, Biogeosciences, 9, 689–702, doi:10.5194/bg-9-689-2012, 2012.

Ghirardo, A., Koch, K., Taipale, R., Zimmer, I., Schnitzler, J.-P., and Rinne, J.: Determination of de novo and pool emissions of terpenes from four common boreal/alpine trees by 13CO2 labelling and PTR-MS analysis, Plant Cell Environ., 33, 781–792, 2010.

Staudt, M, Mandl, N, Joffre, R, Rambal, S, 2001: Intraspecific variability of monoterpene composition emitted by Quercus ilex leaves.

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