

## ***Interactive comment on “Undisturbed and disturbed above canopy ponderosa pine emissions: PTR-TOF-MS measurements and MEGAN 2.1 model results” by L. Kaser et al.***

**Anonymous Referee #1**

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### **General comments**

This paper by Kaser et al. presents results from a 30-day measurement campaign at a ponderosa pine forest. Volatile organic compound (VOC) emissions were measured using the eddy covariance (EC) technique combined with proton transfer reaction time-of-flight mass spectrometry (PTR-TOF-MS). During the campaign, a severe hailstorm damaged pine needles and branches at the site. Effects of this physical damage on the emissions were determined on the canopy scale. In addition, VOC emissions derived from the model of emissions of gases and aerosols from nature (MEGAN 2.1) were compared with the direct EC emission measurements.

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The measurement methods are state-of-the-art and the presentation quality in the paper is good. Only uncertainty estimates are often missing. They would help the reader in assessing the statistical significance of the results and should be inserted in the text, tables or figures (wherever possible). In summary, the paper is well suited to ACP. It contains new information on undisturbed and disturbed canopy scale VOC emissions which will be very useful when developing emission algorithms. I recommend publication after the minor revisions listed below.

### **Specific comments**

P15336, L4–7 (P15350, L14–19 and P15351, L7–14): Is the underestimation of monthly monoterpene emissions always around 40 %? It might be good to rephrase the sentence in the abstract since only one hailstorm event was analysed and the variation is still unknown. How often do such heavy storms occur at the site or the nearby area? Their frequency might give information on their contribution to annual emissions.

P15337, L14–16: Does this imply that monoterpene emissions from ponderosa pine originate mainly from storage pools? Are there any estimates of the contribution of de novo biosynthesis to total monoterpene emissions available? They might help the reader here.

P15341, L12–13: How were the time stamps of the two data sets corrected?

P15341, L20–23: What does the physically meaningful delay time window mean? A delay time of 0 s seems somewhat short given that there was 35 m of tubing (ID?) and the flow was 20 slpm.

P15341, L23–24: How was the delay time (and thus the flux) actually determined? Was it based on the maximum absolute covariance in the physically meaningful delay time window? What were the criteria for “a significant flux” and “no flux”?

P15342, L3–13: Please explain why the thresholds 35 % and 50 % were chosen for the classification and which grades were used in the later analysis. How was the flux

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detection limit determined? And why is it same for all compounds?

P15344, L7–8: How were the daytime detection limit and advection flux for MBO determined? And were they determined only for MBO? How does this detection limit differ from the one mentioned in Sect. 2.3?

P15346, L10–14: Are the differences between the temperature ranges in Table 3 statistically significant (e.g. at the 95 % confidence level)? When the results are compared with the MEGAN 2.1 results in Table 2, it seems that the range 19–21 °C agrees best with MEGAN (not 21–23 °C as suggested in the text?).

P15346, L15–22 and Fig. 6: Do the results of Harley et al. differ from the other results at 285–300 K when the uncertainties in all studies are taken into account?

#### **Technical corrections**

P15344, L14–15: Where do "(black)" and "(grey)" refer to? Should "14" and "four" be "11" and "six"?

All tables and figures: Please add uncertainty estimates (e.g. 95 % confidence intervals) wherever possible.

Table 5: Should "*B*" be "*β*"?

Table 7: Would it be more consistent to use the unit  $\text{mg m}^{-2} \text{h}^{-1}$  for the emission factor? See e.g. Tables 1 and 5.

All figures: Some of the axis labels start with a capital letter and some not. Please check whether ACP has a specific format for them.

Figs. 2 and 4: Please explain what the error bars represent.

Fig. 11: Should "Cumulative flux" be "Cumulative monoterpene flux"?

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