

Interactive comment on “A novel Fast Gas Chromatography based technique for higher time resolution measurements of speciated monoterpenes in air” by C. E. Jones et al.

Anonymous Referee #2

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Jones et al 2014 present a novel method using Gas Chromatography to measure speciated monoterpenes in air. A GC-FID has been tuned for measurements of several monoterpenes within 11-22 minutes whilst maintaining the low detection limit of commonly used “slow” Gas Chromatographic methods. The authors describe details of the newly developed method and its application for plant chamber and atmospheric measurements in comparison with an established method – the PTR-MS. This study falls within the scope of AMT and hence should be published after addressing the following comments:

1) p. 10923, l. 2: Please, define the abbreviation OBVOC when mentioning it for the
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first time in the abstract.

2) p. 10924, l. 10: Here is a typo in “monoterpenes”.

3) p. 10924, l. 9-20: In this paragraph characteristics of biogenic emissions are described. However, I found that no references were given to support the various statements.

4) p. 10928, l. 0-20: This part reads like an introductory part. The motivation is given for studying biogenic emissions in a plant chamber. Also typical constituents and concentration levels are discussed. I would like to propose to either include this part into the introduction or shorten it and highlight the key-points, such as characteristics in concentration, mixture and advantages of the Fast-GC method. Similarly, this could be done for p. 10930, l. 12-24. Possibly, a table could help to shorten but still provides all the information needed for the different methods.

5) p. 10930, l. 2: The method GC_AMBIENT I was described and a chromatogram presented in Fig. 3. However, no data was shown in the application section. I understood that this method has a time resolution of 11 minutes, which is the highest of all presented methods (GC_CHAMBER – 14 min (p.10929, l.10) or 16.5 min (p.10929, l.21) or 17 min (p.10935, l.24), GC_AMBIENT II – 19 min (p.10930, l.28) or 22 min (p.10937, l. 28)). It is a pity that no data were presented for this method. Has this method been applied for either the plant chamber or atmospheric measurements? In Figure 3 a chromatogram was presented from measurements in unpolluted ambient air. Are there more data available? I think that in order to emphasize the improvements of the Fast-GC you would need to provide an example of data and the comparison to conventional instruments for this method as well. If there are no publishable data available, you could still describe the method GC_AMBIENT I as a suggestion. In this case, you would need to modify abstract and conclusions, and explicitly state that only GC_CHAMBER and GC_AMBIENT II have been applied and compared to the PTR-MS.

- 6) p. 10932, l. 20: Why did you not use the VOC gas standard mix (1 ppmV) and diluted it "online" to the needed concentrations? A small flow of the standard gas (e.g. 5 sccm) diluted into a high flow (e.g. 5000 sccm) of e.g. synthetic air or nitrogen can provide concentration levels that are comparable to ambient (e.g. 1 ppbV).
- 7) p. 10934, l. 14-16: Did the uncertainty vary with the different methods (GC_CHAMBER, GC_AMBIENT I, GC_AMBIENT II)? What are the detection limits?
- 8) p. 10935, l. 5: More in-depth discussions of each study will be presented elsewhere. Is there already a reference that you could give?
- 9) p. 10935, l. 10: Was the zero air, which was introduced into the chamber, humid?
- 10) p. 10935, l. 27: Good agreement between the sum of monoterpenes has been observed between Fast-GC and PTR-MS measurements. This is presented in Figure 5. Could you please quantify how good was this agreement (e.g. via a correlation plot, Pearson coefficient)? Could you comment on the occasions for which the two instruments differ from each other (~ 50 min, ~ 350 min)? Is the difference significant or within the uncertainties of the measurements? Were all the measurements above the detection limit?
- 11) p. 10936, l. 4-6: Here you point out that the Fast-GC is smaller, lighter and consumes less power than conventional systems. These are great advantages of your system and you should specify precisely how small and light it is (as well in comparison to the PTR-MS). Why don't you include a picture of your equipment?
- 12) p. 10936, l. 22: Please give a description of your inlet lines. How long was the inlet, was a filter used for particles, was the line heated and insulated? I think Figure 1 presents as well some details about the sampling flows and position of the ozone scrubber. Maybe, just refer to Fig 1 and give some more details about the sampling strategy.
- 13) p. 10936, l. 25: How did you decide on the position of the ozone scrubber? Why

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was it placed directly before the instrument and not at the beginning of the sampling line?

- 14) p. 10937, l. 20: Were all terpenes lost in the ozone scrubber with the same rate?
- 15) p. 10938, l. 10: What was your instruments detection limit?
- 16) p. 10938, l. 12-13: Similar to comment 10). Please give numbers of how good is the agreement between PTR-MS and Fast-GC measurements. In order to compare and judge on the two instruments performances a list of uncertainties, detection limits, time resolution, slopes of correlation plots and correlation coefficients would be great.
- 17) p. 10938, l. 25: Your summary seems more like a brief discussion.
- 18) Table 2: In this table and in the main text, you present the total analysis time of each method. Please, could you double-check these times and try to be consistent. It would be good to present the methods that were used for determining the chromatograms as presented in Fig. 2-4, and Fig. 5-6. Were the same methods used?
- 19) Figure 2-4 are very good graphs. Just, in order to help the reader, it might be useful to shade or draw lines throughout all graphs (a-c) when parameters in the program (a) were changed.
- 20) Figure 5: Could you please include error bars?
- 21) Figure 5: In Figure 6, GC method and cycle time are given in the caption. Could you please include these here as well?
- 22) Figure 6: Were the concentrations of monoterpenes measured at the detection limits of the instruments? A comparison between PTR-MS and Fast-GC detection limits would be interesting.
- 23) Figure 6: Please add labels to the x-axis.
- 24) Figure 6: Please include instrumental uncertainties.

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