

We thank reviewer #2 for his/her comments. Here are our responses to the specific comments. Changes to the text in the manuscript are printed in italic.

Comment: Quercus Ilex should be changed to Quercus ilex. De novo should be in italic

Response: Corrected.

Comment: p. 11785 l. 29also flushed with 1 m3 h-1. p. 11786 l. 20the plants with CO₂. p. 11787 l. 19pump the relative humidity. . .

Response: Corrected.

Comment: p. 11789 l. 15 I'm wondering why the monoterpenes were identified by Kovacs indices when a GC/MS system was used. I agree that it might be convenient for routine use FID detections is appropriate. However, initially I recommend characterizing the plant emission pattern using the GC/MS device. Please give additional information. In addition, GC/MS will allow seeking for sesquiterpenes in the emission spectrum of the plants. As mentioned in the manuscript undetected sesquiterpenes can be responsible for the weak deviation in the acetone yield from monoterpane oxidation.

Response: We thank the reviewer to point out that the description in the manuscript is not unambiguous. Actually both methods are used to identify the monoterpenes. However due to the similarity between monoterpenes in the mass spectrum especially at low concentrations routinely the identity is additionally confirmed using the Kovacs indices. We changed the manuscript accordingly reading: "In cases where no authentic standards were available the substances were identified by using the specific mass spectra or in case of the monoterpenes *additional to the mass spectra identification the identity is verified by using kovats indices.*"

Comment: p. 11797 l. 19 it must be . . . curve of the monoterpenes. . . as you have no analysis of individual compounds by PTR-MS.

Response: VOC in the SAPHIR chamber during the experiments were performed by both PTR-MS and GC-MS/FID. The data from the GC-MS/FID was used to determine the decay of the individual curves of monoterpenes. For clarification the following was added to the manuscript: "From the decay curve of the individual monoterpenes (*determined by the GC-MS/FID*), it can be estimated that 17% up to 64% of the monoterpenes were oxidized by OH, depending on the substance."

Comment: Legends Generally: you are not consistent whether you write the xy legends of the figs in initial capital letters or not. Please correct.

Response: Graph x-y legends are now consistent.

Comment: Figure 3: a legend should be self-explaining. Please give flow rates, gas exchange volume. Symbols for CO₂ calc. nopolone calc. are not easy to read. Please make it clearer.

Response: The symbol size was increased to better distinguish between open and closed symbols. Additionally stronger colors were chosen for the calculated traces shown in the graph. Information of geometric gas exchange volume and flushout flow rate was added to the legend.

Comment: Figure 4: what do the error bars mean? Standard deviation, standard error?, how many n?

Response: Error bars shown are the standard deviation with a sample size of $N_{PLUS} = 18$ and $N_{SAPHIR} = 37$. The different sample size results from longer time intervals measured in SAPHIR compared to PLUS. We added this information to the caption of Figure 4: “*Error bars shown are the standard deviation ($N_{PLUS} = 18$, $N_{SAPHIR} = 37$).*”

Comment: Figure 5: the blue lines shows calculated monoterpene concentrations in SAPHIR. Please explain in the legend.

Response: “*calculated, TE=1*” was added to the legend to clearly explain the shown time series.

Comment: Figure 6: what do the % values indicate? Mol fraction, or C, or μg ? What’s the deviation between measurements? Even highly constant, the emission rates can vary over time. Have you checked the emission pattern at different time points a day and at the different light and temperatures? I’m sure the patterns will somehow change under dynamic conditions. You use this split between the different compounds for your calculations, so this should be checked.

Response: The values shown are the relative contribution in percent of each compound concentration expressed in ppbv. The pattern shown in Fig. 6 is determined from the BVOC experiment described in section 3.6 during the coupling phase of both chambers in SAPHIR by GC-MS/FID system. This is the pattern which is important to correctly calculate the expected acetone production. The coupling phase was 3 hours long in which the emission pattern of the plants isn’t expected to change significantly. We clarify the origin of the emission pattern and the percentage shown in the caption of Figure 6 as follows: “*BVOC composition of six Quercus ilex trees. BVOC pattern was measured with GC-MS/FID in SAPHIR during the ozonolysis experiment described in section 3.6. Shown is the relative contribution of each compound concentration (ppbv).*” For the temperature and light dependent emission experiments only PTR-MS measurements were available for total monoterpenes, isoprene and methanol concentrations. Therefore no additional information can be given on changes in pattern during longer time periods for these experiments.

Comment: Figure 7: Here you show the light dependences at 3 different temperatures (which temperatures? Leaf or air temperature?). I recommend showing not normalized data. In this case it will be very obvious for the reader realized the temperature effect.

Response: The temperatures shown are air temperatures. We added this information to the manuscript: “Figure 7 shows the dependence of the normalized ($C/C_{1,\max}$) emissions on light intensity at different air temperatures, confirming the well-known strong light-response of isoprenoid emissions by *Quercus ilex*.” The information is added to the caption of Figure 7 as well. The temperature effect is shown in Figure 8 and discussed separately. In Figure 7 the main purpose is to show a similar light response of the emissions at different temperatures. Showing not normalized concentration data the curves of the light response wouldn’t overlap (higher emissions at higher temperatures) and it would be hard to compare the different trends at different light intensities. Therefore we still think that the normalization of the data focus exactly on the effect we should be shown in the graph and the information on the temperature response can be more readily seen in Figure 8.

Comment: Figure 8: explain error bars, SD or SE, how many n, give fit parameters for the Guenther 1993 algorithm (Why haven’t you used the newer version of this parameterization published in 1995?).

Response: The error bars are calculated using error propagation based on the standard deviation for the concentrations at 30 °C and the measured temperature. The standard deviation is based on $n=16$ data points. We added this information to the caption of Figure 8: “*Error bars are calculated using*

error propagation based on the standard deviation for the concentration at 30 °C and the measured temperatures.”

Results of the fit parameters are given in the section 3.5. For easier interpretation of Figure 8 we also added the information to the caption of Figure 8.

The parameterization of Guenther et al. 1993 was used for better comparison with the results of Staudt et al. 1998 which are also using this parameterization. Using the parameterization of Guenther et al. 1995 with our data results in a slope of $\beta = 0.13 \pm 0.01$. Since the result is very similar we choose to keep the fit result we obtained with the Guenther et al. 1993 parameterization to have the direct comparison with Staudt et al. 1998.