**We thank the referee for the work and the constructive comments. We will work on the revised paper accordingly. The answers to the comments are given below.**

**Comment 1:** Page 12054 line 22: Ortega et al. (2008) extensively discussed dynamic cuvettes in two reviews, it may be worth mentioning.

**Answer:** We agree with the referee and we will add the reference.

Reference: A: Ortega, J. and Helmig, D.: Approaches for quantifying reactive and low-volatility biogenic organic compound emissions by vegetation enclosure techniques – Part A, Chemosphere, 72(3), 343-364, doi: 10.1016/j.chemosphere.2007.11.020, 2008

**Comment 2:** Line 25: a twin cuvette approach was also adopted for branch cuvette by Fares et al. 2010 (Atm. Env.) Table 1 could be modified accordingly.

**Answer:**

We agree with the referee. Fares et al. 2010 is added to the table 1 (see below).

Table 1: List of previous studies in the research field of $O_3$ and PAN flux measurement on plants under laboratory condition.

| Reference | Gas species | Plant species | Instrument | Method | Inlet mixing ratio | Regulated Humidification within the cuvette | Deposition velocity mm $s^{-1}$ |
|---|---|---|---|---|---|---|---|
| Wang et al. (1995) | $O_3$ | *Populus tricocarpa, Populous deltoids, Phaseolus vulgaris, Cucurbita sativus, Cucurbita pepo* | $O_3$-Analyzer Dasibi 1003 | Single dynamic chamber (inlet & outlet measurement) | < 200 ppb | No | 0.02 – 0.05 |
| Van Hove et al. (1998) | $O_3$ | *Populus nigra, P.brandaris, P.robusta* | $O_3$-Analyzer | Leaf chamber (inlet & outlet measurement) | 30 – 100 ppb | No | --- |
| Fares et al. (2008) | $O_3$ | *Quercus ilex, Populus nigra* | $O_3$-Analyzer Model 49 | Plant chamber, gas phase reaction chamber | 100 ppb | No | 0.9 – 1.8 |
| Fares et al. (2010) | $O_3$ | *Citrus limon,Citrus reticulat, Citrus sinensis* | $O_3$-Analyzer DASIBI mod. 1008-AH | Branch dynamic enclosure | 40 – 160 ppb | No | 11 |
| Teklemariam & Sparks (2004) | PAN | *Zea mays, Triticum aestivum, Helianthus annuus, Catharanthus roseus* | GC (ECD) Limit 5 ppt, precision better than 1% > 200ppt | Single dynamic chamber (inlet & outlet measurement) | 0.8 – 18 ppb | No | 0.03 – 0.3 |
| Okano et al. (1990) | PAN | *Herbaceous species* | 2x GC (ECD) For inlet and outlet | Single dynamic chamber (inlet & outlet measurement) | 190 ppb | No | 0.3 – 3.1 |
| Sparks et al. (2003) | PAN | *Zea mays, Phaseolus vulgaris, Pinus contorta, Mangifera indica, Quercus velutina, Quercus rubra, Abies grandis, Picea engellmannii* | GC (ECD) Limit 5 ppt, precision better than 1% > 200ppt | Single dynamic chamber (inlet & outlet measurement) | 250 ppt | No | 1.8 – 4.9 |
| This study | PAN, $O_3$ | *Quercus ilex* | $O_3$-Analyzer Model 49i, GC (ECD) LOD 1 ppt, precision 2% < 800ppt | Dual dynamic cuvette system (4 position measurement) | $O_3$: 60 ppb PAN: 280 ppt | Yes 40-90% | See Sect. 3.2.1 |

Reference: Fares, S., Park, J. H., Ormeno, E., Gentner, D. R., McKay, M., Loreto, F., Karlik, J. and Goldstein, A. H.: Ozone uptake by citrus trees exposed to a range of ozone concentrations, Atmospheric Environment, 44(28), 3404-3412, doi:10.1026/j.atmosenv.2010.06.010, 2010

**Comment 3:** Page 12062 line 6: did you consider the possibility that reactive monoterpenes could react with ozone in the gas phase? ABA is known to interfere with the biosynthetic pathway of Monoterpene formation, so this may affect O3+Monoterpene reaction and therefore ozone flux in the cuvette.

**Answer:**

We did not consider the gas phase reactions of monoterpenes with ozone as the residence times within the cuvette are short (3.4 min). However, we agree with the referee that this is a critical point which should be considered when VOC species with a high reactivity are present, such as sesquiterpenes. For Quercus ilex cuvettes run under purified ozone free air and with an atmosphere containing 50 ppb ozone (ambient air) (Bertin et al., 1997; Staudt et al., 1997; Kesselmeier et al. 1997) showed the same monoterpene species composition (labile as well as stable compounds). We conclude that the non-stomatal effect is low. The effect of ABA on the monoterpene production would affect the monoterpenes synthesis on an even lower level. We will remind the reader by an inclusion of a short discussion of this aspect of non-stomatal sinks within a forest ecosystem (see also comment 8).

**Comment 4:** Page 12064 eq. 9: if you assume that intercellular leaf concentration is 0 for both PAN and $O_3$, the equation formalisms does not need to be shown. Possibility that non-0 concentration of $O_3$ occur could be discussed in the text, especially if you can demonstrate from your experiments that the relationship between vmr(out) and $FO_3$ is not linear under conditions of high vmr(out). This does not seem the case looking at fig. 13. Using a fast growing species with high stomatal conductance may lead to different results.

**Answer:**

The equation (9) is only for the understanding of the following equation (10). In this case, I would prefer to keep the equation (9) as it is. As you mentioned, we could only see a linear relationship between vmr(out) and $FO_3$ according to figure 13 which means the assumption of zero levels of $O_3$ within the leaf under our experimental conditions is correct.

**Comment 5:** Page 12071. Fig 9: the figure is really hard to read, too much important information for such a small picture. It is not clear why the time reference of the flux unit is missing, e.g. $FO_3$ should be nmol $m^{-2}$ $s^{-1}$.

**Answer:**

We would like to leave all the information in the figure as it is. We agree with the referee that this is important information to demonstrate the activities of a

living leaf. We will check with the publisher to enlarge the figure by printing on one page. We will rewrite the units (see Fig. 9 below).

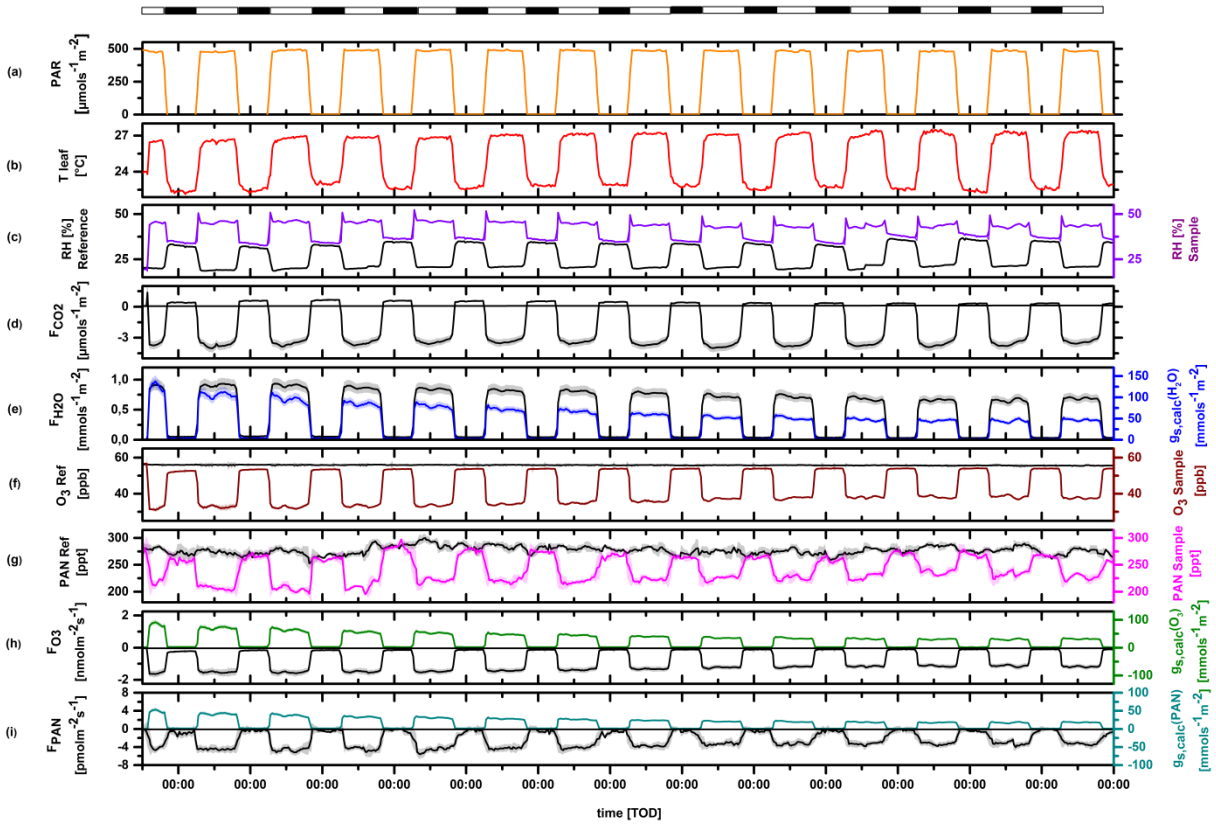


Fig. 1: Long term flux measurement of *Quercus Ilex* at constant initial mixing ratio ($O_3$ = 57 ppb, PAN = 280 ppt) over 14 days. a) light density, b) leaf temperature, c) relative humidity of the reference (black) and sample (violet) cuvette, d) $CO_2$ exchange flux, e) transpiration rate (black) and stomatal conductance to water vapor (blue), f) $O_3$ mixing ratio of the reference cuvette (black) and sample cuvette (brown), g) PAN mixing ratio of the reference cuvette (black) and sample cuvette (magenta), h) $O_3$ exchange flux (black) and $O_3$ conductance (green), i) PAN exchange flux (black) and PAN conductance (dark cyan). The diurnal cycle of light was simulated by a climate cabinet with 13 hours light period (white balk) and 11 hours dark period (black balk). The inner area of the cabinet had a temperature of 25 °C and relative humidity of 50%.

**Comment 6:** Page 12100: Figure 10 shows identical pictures!! Please add the picture related to ozone.

**Answer:**

We apologize for the mistake. The misprinting was not noticed in the page proofs and will be corrected accordingly (see below).

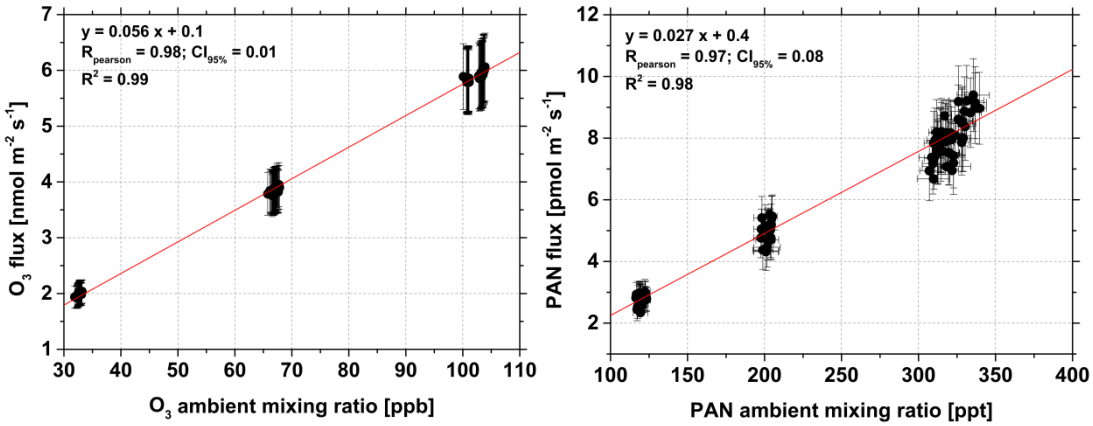


Fig. 2: Behavior of $O_3$ and PAN flux with rising ambient mixing ratio. Both experiments were performed separately.

**Comment 7:** Page 12073. Can you demonstrate that the % reduction in stomatal conductance due to ABA is equal to the % reduction is $FO_3$? Otherwise the experiment lead to interesting alternative hypothesis on further $O_3$ sinks inside leaf and/or in the gasphase.

**Answer:**

In our experiment, the reduction of the stomatal conductance due to ABA was 91 % and the reduction of $FO_3$ was 90 %. This means they correspond almost perfectly. Nevertheless, the results show the situation under laboratory condition. We agree with the referee that there may exist further sinks for $O_3$ for example at higher ambient humidity or in the gas phase, especially under outdoor-conditions. See also comment 3.

**Comment 8:** Page 12074 line 10: you may consider discussing the recent paper by W. Jud et al. on ACP for what concern surface reactions.

**Answer:**

This paper is not dealing with the electrical surface conductance, we are discussion on this page. However, we agree with the referee and the authors of the relevant paper that special structures or organs can exist at the plant surface as in the case of glandular trichomes of Nicotiana tabacum and may be releasing volatile organic compounds impacting gas phase chemistry. This is a further contribution to non-stomatal ozone sinks which should be kept in mind. However, the overall non-stomatal sink for ozone seems to be of higher importance when discussing a complete forest ecosystem. We will discuss this aspect shortly in the revised paper (see comment 3).

**Comment 9:** Page 12076 line 7: the mentioned papers indeed showed that RH control was applied by passing air through a bubbler and controlling by dew-point generator. Perhaps the authors can mention that RH was not finely controlled, but saying that a humidification system was not used is not correct.

**Answer:**

We will specify that RH was not finely controlled.

**Comment 10:** Page 12076 line 9: Fares et al. 2010 is cited but not present in the reference list

**Answer:** Fares et.al 2010 is not cited at page 12076 line 9. But consider the **comment 2.** Or maybe you mean page 12078 line 9. Than you are absolutely right! Anyway, Fares et al. 2010 is now included in the reference list.