Reviewer #2

General comments

Kohl and colleagues developed an automated plant chamber to measure trace gas and VOC fluxes from plant shoots. The system includes cooling elements, removal of transpiration water and an automated system to replace fixed CO2. With this system it should be possible to relate trace gas exchange of plant shoots –related to leaf area- to environmental conditions and plant physiological patterns. In their manuscript they introduce the chamber technique itself and provide substantial results from initial tests a 'Transpiration rate (dynamic chamber mode) per dry weight')nd validation experiments.

In general, the manuscript is very well written and easy to follow. The design of the chamber is well thought out and will certainly improve the current technique to measure trace gas emissions from plants in the field. Also the test measurements appear to have been well carried out and the results are convincing. The section about measurement uncertainties including interferences with VOC is adequate. Although often discussed, only a couple of experiments take interferences with VOCs into account.

We thank Reviewer #2 for their positive feedback and their suggestions how to improve the manuscript.

What about the leakage associated with the shoot entrance? Could this be a problem by causing different leakages when changing branches between measurements, thereby leading to different leakages?

We agree that the shoot entrance is definitely a weakest point for the tightness of the shoot enclosure. We address this by conducting nightly measurements to quantify the leak rate in each individual chamber, and to measure ambient concentrations, so at the very least the leakage rate can be taken into account during flux calculations. This will become particularly important during the future development of the system for field measurements (where e.g. wind forces can weaken the sealing over time).

We added the following sentences to the Results and Discussion section: "It is, however, possible that during longer experiments the sealing around the shoot inlet deteriorates due to physical stress, leading to larger leakage in shoot with tree branches compared to empty controls. It is therefore important to continuously monitor the tightness of each chamber throughout such experiments, as is currently done with automatic nightly measurements" (L424-429).

Did you observe any artefacts due to pressure effects in the system?

Pressure artifacts associated with the beginning and end of chamber closures can be seen e.g. as 'spikes' in Fig 5c. However, we excluded the time periods immediately after closing the chambers during which these artifacts occur are excluded from data analysis. The chambers themselves are vented to the atmosphere and should not undergo pressure changes >50 mbar. This is also important as we learned that any significant pressure difference to ambient air leads to the development of leaks in the chamber sealing.

We added the following sentence to methods section "In both cases, data measured during the the first 180 sec after the closure start and the last 60 sec before the end of the closure were removed to exclude minor artifacts resulting from pressure effects (visible e.g. in Fig. 5c) and the mixing of distinct air volumes" (L222-224).

Moreover, I've got a remark regarding plant physiology. Gas exchange depends on stomatal conductance. Would it be possible to calculate stomatal conductance of leafs with the parameters given by your chamber system? If so, it might be possible to relate stomatal conductance to trace gas fluxes. It could be interesting to see how fluxes change depending on stomatal conductance/humidity/light etc.

Yes, that is the intention behind measuring CO_2 and H_2O fluxes concurrently with the trace gas fluxes. **We added stomatal conductance values to Table 3 and the Results and Discussion section** (L393-394)**.** We also added the formula used to calculate stomatal conductance to methods section (L245-253).

The manuscript is of high quality and deserves publication in Atmospheric Measurement Techniques. Therefore, I recommend publication of this manuscript with minor revisions.

Thanks again for your positive response to our work!

Minor comments

Fig 5+6 Please revise figure label (x and y scale + legend), the letters are too small or -in case of the legend- overlap.

Have changed the figures accordingly.