

## ***Interactive comment on “Comparison of CO<sub>2</sub> and O<sub>2</sub> fluxes demonstrate retention of respired CO<sub>2</sub> in tree stems from a range of tree species” by Boaz Hilman et al.***

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Thank you for your comments. Major concerns were raised and addressed below.

The question of appropriateness of ANOVA tests for ARQ data. The perception that relative measurement errors increase in smaller signals is correct. However, we used ANOVA for compare measurements in which the gas fluxes were in similar magnitude, thus the supposed analytical errors are similar. In addition, our instrumental design minimizes analytical errors. Most of the ARQ results in the paper, including those ANOVA was applied with, were measured in the Hampadah, a closed-system contains both CO<sub>2</sub> and O<sub>2</sub> analyzers. The inclusion of both analyzers in the same sys-

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tem means that temperature and pressure effects will occur simultaneously, and will be canceled while dividing the CO<sub>2</sub>/O<sub>2</sub> measurements. Thus, no systematic bias in the ARQ estimation is expected. It was demonstrated in very good precision for duplicate ARQ samples ( $\pm 0.01$ ) (Hilman and Angert, 2016). The O<sub>2</sub> measurement with the Hampadah is validated by measurement of O<sub>2</sub> by mass spectrometry; Licor and optode measurements are also calibrated to ensure accuracy (Hilman and Angert, 2016). Yet, the precision in the gases concentrations is poorer than for ARQ and the error for the fluxes are higher than for the ARQ. Therefore, the ARQ measurement can be regarded as direct measurement thus compatible with ANOVA. As results are measured for multiple trees, the most important expression of uncertainty is how reproducible the measurement is - and how does that standard deviation across measurements compare to the expressed error for an individual measurement.

Regarding the comment about possible different mechanisms in different stem anatomies - we are not refuting that. In the discussion, L401-404, we mentioned that the ARQ value can be the result of combination of effects. In the revised paper we would further highlight that the mechanisms responsible for a given ARQ value may vary between species and wood anatomies.

Regarding your last point about connecting the stem measurements and possible PEPC fixation to canopy-level CO<sub>2</sub> and O<sub>2</sub> measurements, we would be happy to include discussion of this in a revised paper. We have additional unpublished results of simple labeling experiments that demonstrate dark fixation in 1-2 species, providing confirmation to PEPC activity. However, the other comment of the reviewer is that this paper already is complex because it includes results collected at multiple sites and multiple times. If the editor/reviewer prefer we can include such discussion and also the additional results in the revision.

Hilman, B., and Angert, A.: Measuring the ratio of CO<sub>2</sub> efflux to O<sub>2</sub> influx in tree stem respiration, *Tree Physiology*, 36, 1422-1431, 10.1093/treephys/tpw057, 2016.

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