

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-387

Anonymous Referee #2

Referee comment on "Metrology for low-cost CO₂ sensors applications: the case of a steady-state through-flow (SS-TF) chamber for CO₂ fluxes observations" by Roger Curcoll et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-387-RC2>, 2022

This paper presents a new Steady-State-Through-Flow (SS-TF) system based on low-cost Air Enquirer kits, including CO₂ and environmental parameter sensors. The CO₂ sensor is calibrated in a chamber where environmental parameters can be controlled. Multivariate regression models are derived from comparison with reference CO₂ measurements and applied to the CO₂ soil flux measurements. Conceptually, this work on application of low-cost sensors for a high temporal and spatial monitoring of CO₂ soil flux is useful, but requires more evidence on the performance evaluation of a new SS-TF system to be published in AMT.

- Only 5 comparison during 2 days of experiment are provided for the evaluation. This size of dataset is extremely limited. 2 days are not enough to catch all possible range of variations in environmental parameters that might affect the correction of the low-cost CO₂ measurements and calculation of the soil flux measurements. Moreover, it would be necessary to have an explanation and a correction for the mismatch observed when NSS-NTF shows negative flux.
- For the evaluation of this new SS-TF system, I would prefer to see comparison with a commercial soil flux measurement system instead of comparison to NSS-STF measurement system using the low-cost sensor.

Specific comments

Line 97-100. Detailed description on the calibration chamber system is needed. How is the calibration experiment designed? For example, at what temperatures is the experiment held and for how long?

Line 138. How well would the measurements at the top of the flux chamber represent the gas exiting the chamber? How much bias or uncertainty would be introduced with this assumption?

Line 195-196. Is concentration first averaged and then used to calculate the flux? Or is the flux calculated using the original temporal resolution of the CO₂ measurements and then averaged?

Line 197. What is the temporal resolution of the CO₂ measurements? Is the RSE also calculated with 10 minutes averaged dataset? If not, the RSE would be different for the 10 minutes averaged flux.

Figure 5. What's the difference between the 2 sigma error and the extended error?