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Interactive comment on "Technical note: mesocosm approach to quantification of carbon dioxide fluxes across the vadose zone" *by* E. M. Thaysen et al.

Anonymous Referee #5

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This technical note presents a mesocosm approach in controlled conditions as a realistic tool for quantification of carbon dioxide fluxes. While the work and results have certainly some merit for the scientific community working on models systems for ecosystem research there are several limitations that prevent me to fully recommend this work for publication in its present form.

Specific comments

1) Methodological limitations. Although I appreciate the difficulty of finding technical solutions for increasing the realism of models systems, the filter disk approach combined with high applied suction may not always a good surrogate for what happens in

natural systems, especially when the authors argue about the increase realism of their system. For example, during summer (the simulated season of the experiment), high evapotranspiration observed in many natural systems prevents the escape/leakage of water into the groundwater and, in fact, upward water infiltration from the groundwater has been often observed and which can be emulated using Mariotte's bottles. While of some originality I don't find that the proposed system is superior to lysimeters approaches which are increasingly more used in ecological research because they are able to perform the same function as the system presented here and in addition, allow for measurements of evapotranspiration and can also include the water table. Furthermore, the diameter of the soil column seems rather small for a study looking at dissolved organic carbon as it runs the risk of increased preferential water flow around the edges of the plexiglas cylinders. Light intensity is also quite low relative to field conditions and constant temperatures for day- and night-time have been used instead of daily temperature profiles. Whit these limitations in mid I suggest to downplay the achieved realism in these systems and concentrate on their reproducibility/reliability. Unfortunately, the very low level of replication cannot provide a high level of certainty that the low variability observed in the response variables did not arise by chance. Hence, the drawn conclusions are way too strong for the presented data.

2) Presentation. The title is too broad, as no other C fluxes have been quantified except DIC in drained water. At line 12 (page 9949), the sentence somewhat makes the reader to think that microbial respiration rates will be presented in this paper – which is not the case. The depths for the gas sampling ports presented at line 25 (page 9950) are not the same with those presented in Fig. 3 for pCO2. Overall, the English could also benefit from a bit of polishing, e.g. "Design and packaging of mesocosms" could be replaced with "Design and setup . . .", ect.

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