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Atmospheric Measurement Techniques Discussions

Interactive comment on "Capturing temporal heterogeneity in soil nitrous oxide fluxes with a robust and low-cost automated chamber apparatus" *by* Nathaniel C. Lawrence and Steven J. Hall

Anonymous Referee #1

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Interactive comments on "Capturing temporal heterogeneity in soil nitrous oxide fluxes with a robust and low-cost automated chamber apparatus" by Lawrence and Hall Reviewer prefers to be anonymous The authors present here a significant promise in implementing low-cost but robust automated chambers for intensive temporal soilborne GHG flux measurements. The paper describes the details of the hardware of chamber design, chamber operation, measurement principles, troubleshooting, and data to support the sound functioning of the design. Given the high temporal variability, especially for N2O fluxes, high-resolution measurements are critical and often achieved by auto-

mated chambers. However, their use has been limited due to the expensive nature of the technology. Therefore, ∼$40,000 USD for 16 automated chambers with the level of accuracy and robustness as shown in this study is a significant development. This could lead to greater adoption of automated chambers to curb the uncertainty of N2O flux estimates. Therefore, I think the paper should be published in AMT. I have listed a few questions and suggestions below for the authors' consideration. 1) I was a little confused about how many chambers were closed at a time. For example, with ∼30 min closure period/chamber, only eight chambers could be measured in a four-hour sampling loop. A bit more clarification could be helpful. Also, how did you program the sequence of chamber closure (chamber #1 to 16) during each sampling loop? Was it random or fixed? This might impact bias. 2) One potential pitfall of automated chambers operating at a sub-daily scale is that they can keep the chamber close for a substantial amount of time in a day that can intercept the rainfall. This can impact soil moisture content inside the chamber relative to outside soils. However, this design reduces the closure period to 30 min (usually 45 min to 1 hour in other designs). With 6 sampling loops (4 hours long each), this could keep the chambers closed for 3 hours a day. I am interested to know if this design can be programmed in such a way to not close the chamber when there is rainfall/precipitation happening to allow the water inside the chamber? 3) A table outlining side-by-side similarities and differences (pros and cons) with other automated systems would be interesting. I understand that the authors have discussed that here and there, but a summary would be helpful.

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