Biogeosciences Discussions

Biogeosciences Discuss., referee comment RC2
https://doi.org/10.5194/bg-2022-153-RC2, 2022


# Comment on bg-2022-153

Anonymous Referee #2

---

Referee comment on "The paradox of assessing greenhouse gases from soils for nature-based solutions" by Rodrigo Vargas and Van Huong Le, Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-153-RC2, 2022

---

**General Comment**: Title of the manuscript: "The paradox of assessing greenhouse gases from soils for nature based solutions" addresses an important topic and will help to improve our understanding of the greenhouse gas fluxes from the soils. Manual chamber techniques are currently widely used for measuring the three GHG fluxes from soils, since they allow parallel deployment of multiple treatments and lands. However, it requires a lot of care and post-field lab analyses thus limiting temporal representations due to its labour-intensive nature. Since soil N2O and CH4 exhibit sporadic peaks due to their time resolution, a significant problem may arise here; however, CO2 may not be a big concern since it tends to be highly autocorrelated. The availability of automatic chamber sampling thus improves this time resolution concern but they are quite pricey.

In this manuscript, as compared to a fixed sampling, the author presents a novel approach for monitoring soil GHG fluxes using temporal univariate Latin Hypercube sampling. The authors used an annual dataset (Sept 2014-Sept 2015) for the three GHGs monitored at 45-minute intervals in a temperate forest. By using temporal univariate Latin Hypercube sampling, each subset of GHGs in the annual dataset is selected based on its statistical properties and temporal patterns. This method reduces bias introduced by fixed sampling, especially for small samples size. In the end, the authors conclude that while these results are crucial for assessing GHG fluxes from soils and reducing uncertainties concerning soils' role in nature-based solutions in the future, the approach needs to be tested across different ecosystems, which may result in different site-specific recommendations.

I thus believe that the topic is very interesting and of great relevance to Biogeosciences. The manuscript is well written and has a good structure in terms of design and evaluation results. There is a great deal of work done by the authors in discussing the results, and they have well referenced them. Apart from a few minor changes to the manuscript, I believe that the work is very relevant and very important. For example, the authors should briefly explain the annual weather pattern for the study area. It would be interesting to see how this vary annually to relate with the trend pattern of the gases. Since means from univariate Latin Hypercube sampling and fixed sampling did not differ statistically, is it possible to estimate annual GHG fluxes by adjusting weekly fixed

sampling?

**Specifically**

LN 106: What is the reason for using 45 minutes rather than hourly intervals?

LN 117: Could a flux calculation that only considers the highest R2 eliminate low fluxes?

LN 232: Does this site's N2O lack a temporal dependency for any biological reason?

LN 243: Include the CO2 unit after 5.9, also LN 257 include unit of CH4 after -0.93,

LN 545: Figure A1 does not indicate the graph for soil CO2 (FA CO2), but repeats soil N2O (FA N2O) fluxes.

LN 569: The horizontal blue line is not clear. Could you consider using brighter green instead?