

**Review of Siegenthaler, Welch, Pangala, Peacock, and Gauci 'Technical Note: Semi-rigid chambers for methane gas flux measurements on tree-stems' submitted to *Biogeosciences Discussions*.**

**Overview and recommendation.**

This paper describes the building and testing of semi-rigid chambers for measuring the flux of gases, in this case methane (CH<sub>4</sub>), from tree trunks. The authors provide a good rationale for the study; there is, indeed, a need to understand more about the importance of fluxes of CH<sub>4</sub> from trees to the overall flux of CH<sub>4</sub> from a range of wetland ecosystems. The presentation is mostly clear and easy to follow, and the testing of the new types of chambers appears to have been carried out rigorously. I think the paper will be of interest to a reasonably wide constituency of researchers interested in CH<sub>4</sub> emissions from wetlands and climate-change scientists interested in modelling the source strength of different land cover types. Given the above, the paper would be a useful addition to the literature. However, the paper does contain quite a few errors. Most of these are minor grammatical or typographical errors, but in some places the descriptions and explanations could be clearer. Additionally, there may be one or two errors in the way the work was done. I recommend these minor errors are addressed before the paper is published. My detailed comments are appended below.

Page 16020, line 8. Sentence starting "We compared...". The structure of this sentence is a little awkward. I recommend re-wording.

Page 16020, line 19. Add '(CH<sub>4</sub>)' after "methane"?

Page 16021, line 8. "flux rates". A flux is a rate; the "rate" here is redundant. I recommend correcting this expression wherever it appears in the document.

Page 16021, line 11. What does "ventilate" here mean? Open the chamber to ambient air or fit it with a fan (or something else)? The explanation here could be a little clearer.

Page 16021, line 16. Can something become "progressively obsolete"?

Page 16022, line 4. "and therefore voids underestimations due to non-optimal integrations" is quite awkward; I recommend re-wording in simpler language.

Page 16022, line 9. "the use of a smaller stem chamber with a larger gas"

Page 16022, line 13. Delete the comma after "challenge".

Page 16023, line 3. "reduced greenhouse gases" is a rather odd expression. Do you simply mean gases produced in anaerobic conditions?

Page 16023, line 5. No capital P needed in "polyethylene".

Page 16023, line 11. Comma needed after "approach".

Page 16023, line 18. Which STP was used? There are 'competing' STPs. Did you use that of IUPAC?

Page 16023, line 23. "but is hardly compressible" – under what loading?

Page 16024, line 2. Here and elsewhere in the document I think this should be "Los Gatos **Research** Inc., Mountain View, **CA**, USA".

Page 16024, line 4. "Polyvinyl Chloride" – capital letters not needed.

Page 16024, line 6. Vent tubes were used. How much did these affect leakage/permeability? I'm not sure if there is an assessment of this effect in the paper. How much gas exchange occurred through the vents compared to the seals?

Page 16025, line 10. How were the chambers deployed when undertaking the empirical estimates of chamber volume? Where they attached to the inert stainless steel cylinders mentioned later in the paper? Also, it is noted here that the dilution tests took seconds, but later in the paper the dead band time is quoted as 90 s. There seems to be a discrepancy here.

Page 16025, line 16. "uncompressible" should be "incompressible".

Page 16026, line 21. "sporadic concentration drawdowns" Why are these typical of a leaking chamber? I would have thought the most common type of leakage was a steady leakage. Was leakage a two-way (iso-thermal and iso-baric) exchange of gases between the chamber and the air outside, or was it pressure driven, due for example to increases in chamber temperature? More explanation here would help. It is interesting to consider what is shown later in Runs 3 and 6 in Figure 6. The sporadic changes in [CH<sub>4</sub>] comprise both sudden decreases and increases, not just drawdowns as suggested by the authors. Why is this? What mechanism in terms of flow of gas across a leaky seal could explain these? In particular, how are the sudden increases explained?

Page 16027, line 9. "*Betula Pendula*" should be "*Betula pendula*".

Page 16027, line 27. "linear regression of declining concentrations" Above it is suggested that leakage occurred sporadically. It's not clear here that the simple dilution tests used by the authors accurately replicated how leaks occur during field deployments. I think a little more explanation would help. It would also be useful to see the dilution datasets.

Page 16028, line 5. A comma is needed before and after "a posteriori".

Page 16028, line 12. I don't think the temperature and pressure recorded by the UGGA's flow cell represent those in the chamber. Therefore, it is not appropriate to use  $T$  and  $P$  from the cell for the flux calculations. This is quite important. In work I have been involved with, we have always measured  $T$  and  $P$  in the flux chamber separately.

Page 16028, line 19. Here and elsewhere in the document "Push" should simply be "push" (no cap needed).

Page 16028, line 20. Here and elsewhere in the document "Off" should be "off". "ICOS" should be given in full – all acronyms should be when first used.

Page 16029, line 12. "Fick, 1855". Did you consult the original? If not then provide your more recent source.

Page 16030, line 10. How did bark roughness affect chamber volume? In very rough barks such as on *Pinus sylvestris* and perhaps some tropical tree species I imagine this could lead to quite big differences to volumes estimated using equation (4).

Page 16030, line 15. The sentence starting "By dividing" is difficult to follow. I recommend re-wording it or breaking it into two simpler sentences.

Page 16031, line 7. " chamber, and that the"

Page 16032, line 2. "concentration developments" is an odd phrase. I prefer "concentration changes" or "concentration increases".

Page 16032, line 5. The  $r^2$  increase is actually reasonably large.

Page 16032, line 9. "an exponential".

Page 16033, line 5. "lightweight, and can be locally sourced"

Page 16034, line 8. " associated ~~to~~ **with** the gas"

Page 16035, line 17. "or by installing a complementary fan if the sleeves were to be built much larger" – miniature fans as used in larger laptops could be used.

Page 16036, line 2. "very rare". How rare is "very rare"? Quite a few wetland tree species can have rough bark such as alder (*Alnus*) and willow (*Salix*). Tropical forest trees also often have rough bark and those that are smooth may have lianas and other climbers growing up them which serve, in effect, to make the bark rough.

Page 16036, line 19. Delete comma after "both".

Page 16037, line 22. " and an optimal"

Page 16038, line 16. The authors rightly highlight the portability of the flexible chambers but they don't discuss the problem of using on-line gas analysers like the UGGA manufactured by Los Gatos Research. These analysers are very accurate and give good data, but are actually quite heavy – at 15 kg without batteries and 17+ kg with batteries (excluding the re-inforced backpack needed to carry them). So, while the flexible chambers are highly portable, the recommendation that they be used with a heavy on-line analyser almost seems contradictory.

Figure 4. The letters denoting the variables in the figure itself should be italicised.

Tables S1 and S2. All letters denoting variables in the caption and the table itself should be italicised.

S4 "*Bad Pinus sylvestris*" should be "*Bad Pinus sylvestris*". Also, why bad?