

Atmos. Chem. Phys. Discuss., referee comment RC3
<https://doi.org/10.5194/acp-2021-606-RC3>, 2021
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Comment on acp-2021-606

Anonymous Referee #1

Referee comment on "Continuous CH₄ and δ¹³CH₄ measurements in London demonstrate under-reported natural gas leakage" by Eric Saboya et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-606-RC3>, 2021

General comments:

The topic of the manuscript "Continuous CH₄ and d¹³CH₄ measurements in London demonstrate under-reported natural gas leakage" by Eric Saboya is very timely provided the need and the political ambition (e.g. EU Methane Strategy as part of European Green Deal) to reduce emissions. In addition, analytics get available to provide sector specific information, applying isotopes or additional tracers.

I agree to the earlier reviews, that the presentation is rather descriptive and would benefit from some more guidance / motivation in all sections. In addition, I have some specific and technical corrections, which should be addressed.

In summary, the manuscript is a valuable contribution to this field of research and the technical quality is very good so worth publishing in ACP after careful revisions.

Specific comments:

L120: I appreciate the effort the authors invested to assess the quality of their calibration procedure. Nonetheless, best practice should at least be mentioned to guide future studies.

1) Please refer to the respective WMO GGMT guidelines (e.g. <https://community.wmo.int/meetings/ggmt-2019>). For instance; provide information and uncertainties (CH₄, d¹³C) on the applied standards (air tanks), mention the preference for

two-point calibration.

2) The applied calibration procedures are somewhat unclear, the term "difference" could be replaced by "offset correction". The " $d^{13}\text{CH}_4$ ratio calibration", which was finally selected might not be common practice for isotope studies, is there any reference to refer to?

3) The criteria standard deviation of the target tank might not be suitable to decide on the best calibration approach? How about differences between measured and true $d^{13}\text{CH}_4$ values, but again, if differences in $d^{13}\text{CH}_4$ between calibration and target tank are small, this cannot be tested.

L490: Discussion: The authors should discuss the benefit from using additional isotopic ($d\text{DCH}_4$) or gaseous tracers (e.g. C_2H_6).

Technical corrections:

L34-36: Please reformulate this sentence to make it better readable.

L38-44: This section would fit better after L60?

L94ff: It is not possible to relate the information in the text to Figure 1, e.g. the "~20 small sewage pumping stations and a waste facility south of the site in the Battersea area", some more information on the map or in the legend would be helpful.

L116: The "Allan precision" and not "variance" should be / and possibly is reported? Please clarify and correct.

L160: Please state whether there is an effect of H_2O on CH_4 concentrations? The sentence "A water correction range between 0 % and ..." (L 165) should be reformulated.

L233: Figure 2: the black box could be replaced by a different colour to improve visibility.

L285: On plots a) to e) emissions are provided as \log_{10} values, is it possible to provide

"normal" emission values?

L292: The first section provides information on CH₄ mole fractions only, so remove the term "and d¹³CH₄ values".