

Atmos. Meas. Tech. Discuss., community comment CC1
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Comment on amt-2022-272

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Community comment on "Intercomparison of commercial analyzers for atmospheric ethane and methane observations" by Róisín Commane et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-272-CC1>, 2022

Review of the manuscript: "Intercomparison of commercial analyzers for atmospheric ethane and methane observations" by Commane R. et al.

I enjoyed reading this work that address the need for accurate methane and ethane analyzers to monitor natural and anthropogenic green house gas emissions. Commane R. et al. assess this need by comparing three different commercial analyzers – Aerodyne SuperDUAL, Aeris Mira Ultra LDS, Picarro G2210-i. The authors tested the water sensitivity, instrument calibration, long-term instrument stability and accuracy in ambient sampling for each instrument. The results are convincing and the methodology adopted were well described. The clear language as well as the use of appropriate figures are strengths of this paper. I suggest the authors to put more effort into the description of the need of this study as well as the conclusion following the achieved results. Based on those suggestions and the following comments I recommend that this paper by Commane R. et al. to be accepted after minor revision.

{major comments}

- (1) Good informative title!
- (2) Very good, short and precise Abstract containing all the necessary information!
- (3) Introduction: Easy to follow even if one is not from the field, great wording! Main concern of the introduction is the necessity of this study. What research for instruments have been done before i.e. back the necessity of this study with other sources like doing in the beginning of the methods section (e.g. line 69-71 & for Picarro – line 102). Or also adding why these new commercial analyzers are better than the previous ones and the need of a intercomparison compared to previous studies.
- (4) Good methodology, following a good structure by firstly giving technical information, then the ideal use, possible complications followed by a detailed approach to your analysis.
- (5) The structure and visualization (especially Figure 4) of your results are great. The section "3.4 Long-term instrument stability" misses a discussion and is only describing the results present. Otherwise your descriptions and discussions were short & precise, well done!
- (6) Conclusions and Recommendations: Brief and containing all the major findings, very

good!

Main concern – You do not recommend the usage of Picarro compared to both other instruments but only based on the 2 unrealistic ethane measurements during the plumes. If I understand correctly all the other tests and calibrations were qualitatively indifferent or not significantly worse when using Picarro. Following those findings, I would conclude that future research on the Picarro instrument measuring ethane plumes is needed (as you “only” measured twice) rather than only recommending the other two instruments. One idea could also be to leave the ambient sampling experiment out of the paper until more samples and a concluding review can be reached.

{minor comments}

- General comment: You’re talking about concentrations of methane and ethane, so I suggest to add that in the text e.g. Line 57: “Here, we evaluated three laser-based spectrometers that are marketed to measure ambient ethane and methane *“concentration”*.”
- General comment: Be consistent using either ppbv or ppb (e.g. Table 1 & Figure 1 contain ppb but description and text contains ppbv)
- General comment: Keep the capitalization within your titles consistent (e.g. Line 163 “Characterization of water sensitivity” or Line 126 “Instrument stability”)

- Abstract: Good and compact but some sentences (e.g. starting Line: 13, 16, 21) are very lengthy which could be rephrased into two sentences.
- Line 9 – No point after the title Abstract
- Line 12 – different sources not difference

- Introduction: Explain the term nocturnal boundary layer as it gets mentioned a few times in the result & discussion section.
- Line 46 – add sources “to many studies”
- Line 50 – no “e.g.” needed
- Line 52 – source?

- Methods: Line 71 – sentence is very lengthy.
- Line 90 – “There are...” what should this sentence contribute to the understanding of Aeris technology?
- Line 111 – sentence is very lengthy.
- Line 120 – Reword “calibrated” as it appears 2 times in the same sentence.
- Line 129 – why was the regular zero not performed? – give reasoning
- Line 136 – Rewrite that sentence for clarity, i.e. I don’t understand the meaning behind it.

- Results and Discussion: Well written first paragraph (Line 160)!
- Line 178 – Figure caption misses a point in the end.
- Line 182 – Missing indent
- Line 186 – Do you have a source to the possibility of laser wavelength drift?
- Line 195 – Source to the Aeris engineers is missing
- The findings from (i)&(ii) (Line 183-196) are not very well visible in the graphs, maybe

- a zoom in to the respective "noise sections" would help.
 - Line 208 – remove "of"
 - Line 215 – Description of Table 2: describe the meaning of "Slope +/-, Intercept +/- and r^2 ".
 - Figure 2 – y-axis label is not centered.
 - Table 3 – Add sources of quoted CH₄ & C₂H₆ precision
 - Line 232-243: very good description and discussion
 - Figure 3 – increase the spacing between the upper and lower graph (axis overlap)
 - Line 283 – remove "during"
 - Line 297-304 – very good discussion
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- Conclusion and Recommendations:
 - Line 309 – replace "or" with "of"

Conclusion:

This paper is very well written and offers a clear structure to follow. The two main drawbacks lie in the description of the need of this study based on previous research and the conclusion being based on the results of only one experiment.