

Interactive comment on “Feasibility study of using a “travelling” CO₂ and CH₄ instrument to validate continuous in-situ measurement stations” by S. Hammer et al.

Anonymous Referee #2

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Review of ‘Feasibility study of using a “travelling” CO₂ and CH₄ instrument to validate continuous in-situ measurement stations’ by Hammer et al.

The submitted manuscript presents results from validation experiments at greenhouse gas monitoring sites in France, the Netherlands, and Germany. It provides much useful information and definitely merits publication in Atmospheric Measurement Techniques. It is well written and structured. However, the manuscript is rather long, also a bit wordy and too detailed in some places. To my mind, the main focus of the paper should be on highlighting the general potential of such quality control activities exemplarily

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corroborated on the basis of the lessons learnt from the two campaigns. Thus, I ask the authors to carefully screen the document (and the tables) if all detailed site-specific information is really needed to come to the conclusions drawn in the manuscript. See also the general comments below for suggestions to shorten the paper.

General comments:

At some places in the manuscript the authors use the bare station name/acronym (e.g. page 7153, lines 22-23: ‘At OPE, the intake system test was performed ...’), at others it is followed by ‘station’ (e.g. page 7142, lines 16-17: ‘At Cabauw station an additional error contribution originates ...’). Be consistent.

Isn’t the official name of the Cabauw research station ‘CESAR’?

There is an excessive use of acronyms that make the manuscript at some places hard to read. Remove also some acronyms that are introduced but not really used afterwards, such as on page 7143, lines 13 – 14: ‘... WSs are provided to all field stations by a central laboratory, the Scripps Institution of Oceanography (SIO). Each working standard is calibrated prior to and after usage against the SIO primary calibration ...’. My suggestion is to remove ‘(SIO)’ and to replace ‘SIO’ in the second sentence simply by ‘Scripps’. Same page further below, there is no need to introduce ‘RR’.

I recommend to carefully consider if all tables are really needed, especially since nearly all numbers are also mentioned in the text and Table 4 again contains a good deal of numbers already presented before.

Chapter 5 on quality management hardly refers to the actual site validation made with the travelling instrument. Even if it provides useful information, it could be completely removed and could be considered to be part of another more general paper on quality management in air composition measurements.

Appendix A is a rather Heidelberg system-specific issue and might also considered to be skipped.

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Specific comments:

Page 7142, lines 8 – 9: 'the Heidelberg gas chromatographic system ...' sounds somehow odd. Why not simply: 'Observed differences between the TCI and a gas chromatographic system ...'

Page 7142, line 12: explain acronym 'OPE'.

Page 7144, line 12: what are 'end-to-end' QC measurements? Explain acronym 'QC'.

Page 7144, line 27: add a reference that it was also agreed during the last Meetings of Experts on Carbon Dioxide, Other Greenhouse Gases and Related Tracers Measurement Techniques that parallel measurements with a travelling instrument during audits of the World Calibration Centre are preferable. See e.g. WMO-GAW Report #194.

Page 7147, lines 12 – 13: 'Remove 'and the observatory takes part in the ICOS Demo Experiment.' Move 'operated by ECN' to the previous sentence.

Page 7148, lines 9 – 10: what is a level 1 site? Remove the sentence. The ICOS Demo Experiment is already mentioned above.

Page 7148, lines 19 – 21: How is the ambient air pressurized?

Page 7148, line 22: what is an 'ICOS integrated demonstrator prototype'? Is it simply the G1301 from Picarro?

Page 7148, lines 23 – 25: Do you show some results of the second Picarro analyser? If not, skip this sentence.

Page 7149, line 27 f.: Is the FTIR non-linear above 2500 nmol mol⁻¹ CH₄?

Page 7150, line 21: I suggest covering all disturbing effects (contamination, leaks, but also depletion or memory effects) by the term 'artefacts'.

Page 7153, lines 2 – 4: I don't understand the link between the length of the tubing and the quality of the connection.

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Page 7155, lines 2 – 3: Skip sentence 'Ambient mole fractions varied ...'. Sentence doesn't provide any additional information. The ranges are easily observable in the figure itself. Same for the OPE (page 7157, lines 2 – 4).

Page 7156, line 3: what is a target gas?

Page 7157, line 23: the temperature fluctuations of 10K: is that the observed day-night-difference?

Paragraph 3.4: This part is particularly wordy and has some potential to be shortened (especially the first paragraph of 3.4). Why not simply showing the histograms and stating the 75%-25% percentile difference is used as a quantity to evaluate the compatibility.

Page 7158, line 18: Aren't these simple histogram plots. Why not calling so?

Page 7164, line 10: replace 'impressively' by a more scientific term.

Page 7165, line 4: What's the role of the entity called ICOS Atmospheric Thematic Centre?

Page 7165, lines 13 – 15: Sorry, I do not get this sentence. Do you speak about a separate inlet line at the home base for quality controlling the travelling instrument before and after the audit?

Figure 6: The standard deviations are much larger for Heidelberg than for the actual audited sites. Is the GC system – especially considering the inferior precision for CH₄ in comparison to the novel measurement techniques – a suitable system to act as a reference to quality control the FTIR?

Page 7166, lines 2 – 3: this is a statement made by the Greenhouse Gas Experts Meeting and should be properly referenced. (see e.g. GAW Report #206).

Minor comments:

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Page 7142, line 16: typo: 'there' -> 'their'

Page 7148, line 13: typo: 'sample'

Page 7164, line 8: 'detect' seems to be printed in italics. Why?

Page 7170, line 15: typo: 'snap-shot like'

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 7141, 2012.

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