Review of Peltola et al.: "Evaluating the performance of commonly used gas analysers for methane eddy covariance flux measurements: the InGOS inter-comparison field experiment"

General Comments

The manuscript of Peltola et al. evaluates the performance of eight types of fast methane analyzers when used for measurements of methane fluxes by the eddy covariance methodology. The comprehensive study is very relevant since the analysis of methane fluxes between ecosystems and the atmosphere is a strongly growing research field. This intensification of methane research is fostered by the fast development of several competing lines of fast analyzers. As these methane analyzers are comparatively fresh on the market and have quite different technical requirements than the previously more extensively studied carbon dioxide/water vapor analyzers, methodological research is essential for establishing a sound basis of methane flux research. The manuscript by Peltola et al. is particularly useful for non-specialist scientists by making aware of - and giving solutions for - a wide variety of practical problems that are typically encountered when working with eddy covariance methane flux measurements. The derivation and discussion of equation (5) for correcting density and spectroscopic effects on half-hourly averaged fluxes is very interesting and highly valuable especially for users of analyzers that do not measure water vapor in parallel to the methane concentrations. I would recommend this paper to all scientists starting with eddy covariance methane flux measurements.

Unfortunately, the comparison of the only open-path instrument (LI-7700) with the closed-path instruments is hampered by an inappropriate data-logging set-up. Due to the degradation of the measurement resolution to about 20 ppb due to the data-logging set-up, a reasonable assessment of data quality and coverage is not possible. This problem is addressed by the authors at several places in the text; however, I think that this problem should be high-lighted even more carefully, also in the captions of Table 2, Table 5, Figure 3 and Figure 6. These comparative tables and figures are the easiest way to find information about how the analyzers' performances compared to each other. To avoid misunderstandings, the data logging problem should be mentioned directly at all of these important comparative tables and figures. It should be also made clear that this problem is an external and not an instrument-specific problem. (E.g., page 844, caption of Fig. 5: I suggest writing something like: "The LI-7700 data are clearly affected by an external data logging problem which is not caused by the analyser."

I agree with Referee #2 that the authors should better discuss the limitations of their study regarding the evaluation of analyzer suitability for long-term measurements. For long-term measurements, long-term stability is an important analyzer property which could not be investigated in the two week campaign presented by this manuscript.

The manuscript is very well written. I have only a few suggestions for setting some more commas and hyphens, which I list in the technical comments.

I recommend the manuscript of Peltola et al. for publication in Biogeosciences after minor revisions.

Specific Comments

Page 802, line 14: What kind of vegetation? Grass?

Page 802, line 18: Was this wind direction sector filtered out? Was the disturbance of this tall building considered problematic when wind came from this direction? Or is it assumed that problematic effects would be identified by the quality control tests?

Page 803, line 3 and line 15: Why was the reason to use two anemometers instead of one? Distance between sample intakes and anemometer?

Page 811, line 7: I recommend to mention already here that it has to be assumed that the drier completely removes the water or at least the water fluctuations.

Page 811, line 15: Another recent publication on the issue is Runkle et al (2012) [Runkle B.R.K., Wille C., Gažovič M., Kutzbach L. (2012): Attenuation correction procedures for water vapour fluxes from closed-path eddy-covariance systems. Boundary-Layer Meteorology 142(3): 401-423.]

Page 817, lines 10-12: Is there an idea why the FMA2 should have this structured noise?

Page 817, lines 25-26: Was this linear interpolation internally done in the G2311-f instrument?

Page 818, line 15: I suggest adding “nearly” before “identical”

Technical Comments

Throughout the text: Please write consistently “CH_4” or “methane”

Page 801, line 2: I suggest hyphenating “time-consuming”

Page 803, line 19: I suggest “different” instead of “separate”

Page 803, line 25: Insert comma after “Unfortunately”

Page 803, line 26: Insert comma before “and”.

Page 803, line 28: Place comma after “oversight”

Page 804, line 19: Remove “measured” or “reported”; place comma before “and”

Page 808, line 6: I suggest hyphenating: “system-specific”

Page 808, line 13: I suggest writing “accuracy” instead of “precision” here.

Page 808, line I suggest adding “mole fraction” after “CH_4”

Page 811, line 20: I suggest hyphenating: “sampling line-specific”

Page 811, line 22: place comma after “however”.

Page 813, line 8: Place comma before “and”

Page 814, line 14: Remove “values” before “cross-covariance values”

Page 816, line 29: Place comma before “and”

Page 817, line 1: Place comma after “For example”

Page 823, line 8: Place comma after “instruments

Page 839, caption of Table 5: I suggest starting a new sentence after “analysis”. As it is now, it reads awkward.