

Dear Sébastien Conil

Thank you very much for addressing the comments made by the two referees. The revised manuscript improved and should be ready for publication in AMT after addressing the following mainly minor issues listed below.

Best regards,

Christoph Zellweger

General comments:

- I recommend the paper be once more thoroughly checked by a native English speaker.
- Large parts of the result section are very descriptive and could be shortened.
- Page1 / Line 16: The precision of the measurements have nothing to do with the compatibility goals, which are a maximal allowed bias. Please revise.
- Figure 5: The differences shown in Figure 5 are relatively large (for hourly averages). Are these hourly averages representing the same data coverage for both instruments, or are the differences mainly due to different temporal coverage within one hour?
- Page 9 / Lines 3-6: Is this needed here? If so, more discussion is needed.
- Page 27, Lines 2-4: *'After a long global decrease since the 1980's, the CO decrease has declined for several years after reaching values below 2 ppm (Lowry et al., 2016, Zellweger et al. 2016).'*
Something is wrong here. Should it be ppb instead of ppm? Since when has the decrease declined? By how much? (Zellweger et al., 2016) is not an appropriate citation here; (Zellweger et al., 2009) would be better.
- Section 3.3: Scale issues are discussed in this chapter, and it is concluded that the differences can be explained by the bias in the reference scales. If I understood correctly, all comparisons were made on the same calibration scales. Therefore, I would be careful to call this scale issues, since the differences are probably only due to the uncertainties in the mole fraction assignment during calibration, which leads to small biases of the standards.
- Font size in many figures might be too small to be readable in the final AMT paper.
- The term 'concentration' is widely used throughout the manuscript and mixed with other terms such as 'mole fraction' and 'mixing ratio'. Concentration in the context of GHG measurements is not correct and needs to be replaced by mole fraction or amount fraction (mixing ratio might also be acceptable).

Technical corrections:

Page1 / Line 16: 'travelling instrument audits' instead of 'travelling instruments audit'

Page1 / Line 18: 'annual growth rates are 2.4 ppm/year and 8.8 ppb/year, respectively, for the' instead of 'annual growth rates are respectively 2.4 ppm/year and 8.8 ppb/year for the'.

Page 1 / Line 19: 'at 120m': be more specific, e.g. 'at 120 m above ground'.

Page 1 / Line 19: 'trend' instead of 'trends'

Page 1 / Line 29: 'For methane' instead of 'As for methane'

Page 2 / Line 6: 'the European' instead of 'European'

Page 2 / Line 19: Please cite the latest GGMT report (WMO, 2018) instead of WMO, 2011

Page 2 / Line 25: Andra and LSCE: Please define acronyms

Page 2 / Line 28: Mace Head is not part of ICOS. The term 'global/mountain station like Mace Head ...' is also confusing. I suggest changing to 'gap between remote stations like ...'.

Page 2 / Line 31: Delete 'France'

Page 4 / Line 4: Please define acronym AS

Page 5 / Lines 6-7: Say also something about cluster 2

Figure 3: I suggest defining FM (flow meter) and PT (pressure transducer)

Page 7 / Line 15: 'Short' instead of 'Shirt'

Page 7 / Line 28: 'one minute' instead of 'minutes'

Page 7 / Line 34: 'defined' here seems awkward. Consider to re-phrase, e.g. 'All standards were calibrated following'

Page 8 / Line 3: Wrong scale for CH₄, please correct (should be probably WMO-2004)

Page 8 / Line 5: Is the CH₄ scale here correct (WMO-2004), or should it be WMO-2004A? Scale for N₂O also seems to be incorrect; it should be either WMO-2006 or WMO-2006A. Scale for CO: should it be WMO-2014A (instead of WMO-X2014). Please also use consistent scale nomenclature (currently with and without X etc.)

Page 8 / Line 6: 'measurement' instead of 'the measurements'

Page 8 / Line 15: 'information' instead of 'informations', also instrumentation

Table 1: Define N and K (reference to Hazan et al. is not sufficient). Caption: 2018 2014 – please correct.

Page 13 / Line 6: Please define acronym MLab

Page 13 / Line 16: G2401 instead of G2400

Page 13 / Line 19: 'this information' instead of 'these informations', Table instead of Ttable

Page 15 / Line 1: Title (3.2) should be revised. I cannot understand what is meant here.

Page 17 / Line 23: 'dried Picarro' and 'wet Picarro', and similar expressions later: colloquial, please re-phrase.

Page 18 / Line 2: The sentence 'deviations were either higher than or barely within the ...' should be revised. 'Higher than' and 'barely within' both mean that they were exceeding the goal.

Page 18 / Line 15: Replace 'The aims of such programs are' with 'The aim of these programs is'

Figure caption, Fig. 8: Delete 'in colours' and 'respectively'.

Page 21 / Line 6: Would Zugspitze-Schneefernerhaus (ZSF) be a better choice compared to ZUG? The global GAW site is now ZSF, not ZUG.

Figure 10: There are three lines (red, green, blue) and also the corresponding shaded areas in the same colours, but there is an additional shaded area which is not mentioned. What is this?

Page 23, Line 27/28: Rephrase. Suggestion: 'The station time series exhibit strong variability from hourly to interannual time scales. These variations may be related to meteorological variability, and to variations in the sources and sinks.'

Page 24, Line 6. Full stop after efficient, not after more.

Page 24, Line 33, and Page 25, Line 5: To my knowledge, Yuan et al. do not discuss JFJ data in their paper. Please add a reference for the JFJ seasonal cycle.

Page 29, Line 7: Suggest rephrasing to 'sampling regionally representative air-masses'

Page 29, Line 10: ERIC not defined.

The above list is not complete. There is still potential to further improve the manuscript as suggested by reviewer #1. Another check on language issues, and another attempt to further condense and optimize the structure of the paper should be made.

References:

WMO: 19th WMO/IAEA Meeting on Carbon Dioxide, Other Greenhouse Gases and Related Tracers Measurement Techniques (GGMT-2017), Dübendorf, Switzerland, 27-31 August 2017, GAW Report No. 242, World Meteorological Organization, Geneva, Switzerland, 2018.

Zellweger, C., Emmenegger, L., Firdaus, M., Hatakka, J., Heimann, M., Kozlova, E., Spain, T. G., Steinbacher, M., van der Schoot, M. V., and Buchmann, B.: Assessment of recent advances in measurement techniques for atmospheric carbon dioxide and methane observations, *Atmos. Meas. Tech.*, 9, 4737-4757, 2016.

Zellweger, C., Hüglin, C., Klausen, J., Steinbacher, M., Vollmer, M., and Buchmann, B.: Inter-comparison of four different carbon monoxide measurement techniques and evaluation of the long-term carbon monoxide time series of Jungfraujoch, *Atmos. Chem. Phys.*, 9, 3491-3503, 2009.