

We thank referee #2 for the comments (in blue).

Calibration: you are planning a recalibration of the tanks once every 10 years (page 7/8). How do you ensure the link with the WMO scale during this long period ?

Reply: Generally this remote place makes it difficult to sent tanks there. Thus, the goal is to have the calibration tanks in the field for a long time period.

The cited paper [Keeling et al., 2007] indicates that no significant drift in the tanks is to be expected within a 10 year time span. Furthermore, the regular target tank measurements can be used to detect drifts in tanks. Even in the case of a similar drift in all tanks, regular flask comparisons can be used to detect it (not necessarily down to WMO scale).

For the future we plan to include the ZOTTO site in Cucumber comparison experiments. We add this information to the paper (p. 1408 line 2): “*Cucumber*” *intercomparison experiments between different stations and laboratories are intended to ensure the link to WMO scale during this time (<http://cucumbers.uea.ac.uk/>). WMO recommends an inter-laboratory comparability of 0.1 ppm for CO₂, 2 ppb for CH₄ [GAW Report No.186, 2007].”*

Data quality assessment: I think this part needs to be more elaborated. It would be interesting to have a figure showing the whole time series of the target gas or residuals from the calibration fit. Also comparison with flask data is mentioned but there is no indication about the precision of the flask analyzer. I guess there is a long delay between the sampling and the analysis. Is there a drift correction applied to the flask data ? How many flasks have been compared to the in-situ measurements ?

Reply: The time series of the target tank measurements have been included as new Fig. 5. The paragraph about flask comparison has been extended (p. 1415 line 21ff). We mention the measurement precision of the flask analysis of 0.08 ppm CO₂ and 1.3 ppb CH₄. Please have a look at our response to referee #1, too.

The delay between air sampling and analysis is on average six months. The flask design is optimized for isotopic oxygen measurements, thus, it minimizes storage effects (e.g. PCTFE seals). As shown by Jena GASLAB experiments on a 420 days timescale, storage effects for CO₂ and CH₄ can be excluded as well.

The paragraph 3.8 describing the meteorological measurements is not relevant for this publication dedicated to the CO₂/CH₄ analyzer. It should be removed.

Reply: The paragraph is substantially shortened. It will refer to the Supplement, where we put the information that, in our opinion, is useful and complementary (see also answer to Referee #1).

Introduction: references for the Northern Hemisphere carbon sink need to be updated

Reply: We add one sentence to p. 1401, line 20: “A carbon sink of 1.5 ± 0.6 PgC/yr is identified in this region by analyzing the vertical distribution of CO₂ in the atmosphere [Stephens et al., 2007], in line with an estimate of 1.3 ± 0.5 PgC/yr according to net ecosystem productivity estimates [Luyssaert et al., 2008].”

New References:

Stephens, B. B., Gurney, K. R., Tans, P. P., Sweeney, C., Peters, W., Bruhwiler, L. M., Ciais, P., Ramonet, M., Bousquet, P., Nakazawa, T., Aoki, S., Machida, T., Inoue, G., Vinnichenko, N., Lloyd, J., Jordan, A., Heimann, M., Shibistova, O. B., Langenfelds, R. L., Steele, L. P., Francey, R. J., and Denning, A. S.: Weak Northern and Strong Tropical Land Carbon Uptake from Vertical Profiles of Atmospheric CO₂, *Science*, 316, 1732-1735, doi:10.1126/science.1137004, 2007.

Luyssaert, S., Schulze, E. D., Börner, A., Knohl, A., Hessenmoller, D., Law, B. E., Ciais, P., and Grace, J.: Old-growth forests as global carbon sinks, *Nature*, 455(7210), 213-215, doi:10.1038/nature07276, 2008.

Line 32: In the past...: Most of the stations are still located on coastal, mountain or remote sites, but I agree that during the last two decades we have seen emerging new continental stations with more local footprints.

Reply: In combination with the comment of referee #1, we have clarified our statement and change p 1401, line 27 to: "*Sites for measuring atmospheric background signals* are mainly situated on remote coastal or mountain stations to suppress local disturbances for inverse model estimates of carbon sources and sinks."

Figure 1: I guess this is the footprint corresponding to the top of the ZOTTO tower, but this is not clear from the legend.

Reply: Yes, Figure 1 shows the footprint of the 301 m level. We have added this information to the legend.