We thank referee #2 for the useful comments to improve the manuscript. We have gone through each comment carefully and answer them below.

The referee comments are marked in *blue cursive*, the author response in black and text added to the manuscript is **bolded**

The article "Long-term observations of atmospheric CO_2 and CH_4 trends and comparison of twomeasurement systems at Pallas-Sammaltunturi station in Northern Finland" by Laitinen et al. presents the atmospheric observations of the greenhouse gases CO_2 and CH_4 from two measurement programs, GAW and ICOS, conducted at a boreal station in northern Finland. The authors intercompared the measurements and also performed a concurrent audit of WCC-EMPA and the ICOS Mobile Lab. Long-term trends were compared and discussed, including a comparison with the Northern Hemispheric mean derived by NOAA. The results show that the comparability and compatibility of the network, including their audit, are mostly fulfilled. Deviations from the Northern Hemispheric trends and growth rates were also addressed.

Overall, the paper is well-structured and makes an important contribution to the comparability and compatibility of the European ICOS and global GAW networks. This is a valuable contribution to the user community relying on greenhouse gas observation data. However, the readability of the paper could be improved, and further explanations could provide more clarity.

I recommend publication after the following comments are addressed:

Page 1, Line 17: In the sentence "We also compared the long time series with the marine boundary layer reference values in the Northern Hemisphere", it is unclear to which station or network this refers. I recommend providing additional context or specifying the station or network being referenced.

Changed the sentence to refer to the NOAA data product:

”...marine boundary layer reference values, **derived by NOAA based on the weekly air sample measurements**, in the Northern Hemisphere.”

Furthermore, we have given a more detailed explanation with reference to the data set used as the reference.

Page 2, Line 22-25: Referring to “Especially in situ measurements of greenhouse gas mixing ratios are needed for quantifying the long-term trends of the greenhouse gases, as well as annual and interannual variations. They are also crucial for top-down emission estimates using atmospheric inverse models, which aim to optimize fluxes based on measured mixing ratios (Peiro et al. (2022), Crowell et al. (2019))”, it would be helpful to elaborate on why in situ measurements in particular are needed for quantifying long-term trends, annual, and interannual variations in greenhouse gases. Remote sensing technologies have advanced and it is unclear from the text why they cannot also provide sufficient data for these applications. A more detailed explanation of the advantages or necessity of in situ measurements compared to remote sensing would strengthen this argument.

Added further explanation:

While remote sensing techniques can also be used for this purpose, only in situ measurements can be directly calibrated to the WMO scales for CO_2 and CH_4, and can be used to link the remote sensing observations to accepted scales (Byrnet et al, 2023)

Page 2, Line 39: "Within the GAW network, the station is referred to as Pallas-Sammaltunturi (station id: PAL) and it reports data on CO_2 and CH_4. Meanwhile, under the ICOS network, the station is named Pallas (station id: PAL), and it provides data not only on CO_2 and CH_4 but also on CO and N_2O. This data is also available as GAW data, as ICOS is a contributing network to GAW": It would be helpful to clarify the term "contributing network" and the relationship between the GAW and ICOS networks. This would make the expected comparability of data from both networks clearer.

Added a further explanation:

"**Contributing networks have signed a Letter of Agreement with WMO, detailing the list and characteristics of the stations to be included in the GAW network as contributing stations. The data from these stations is subsequently available through the GAW data portal**."

Page 3, Line 54: The statement, "To ensure that the station's measurements are compatible with the WMO/GAW goals, they must be compared against other instruments to ensure the differences are within acceptable limits" implies that direct comparisons with other instruments are necessary. However, round robin comparisons might already be sufficient for this purpose. Could you clarify why direct comparison with other instruments is deemed essential, or whether round robin exercises or other methods could achieve the same objective?

Added further explanation:

While travelling cylinders can be used to ensure that the measurement scale is transferred correctly, they do not account for potential biases arising from the sampling system (WMO, 2022). With a co-located measurements with a travelling instrument, the whole sampling system can be evaluated.

Page 3, line 84: "The mean wind speed is 6.9 m/s." Please specify the averaging time period over which this mean wind speed was calculated to provide the corresponding standard deviation as an indication of the variability.

Changed to:

The mean wind speed (1996 - 2022) is 6.9 m/s (± 0.5 m/s).

Page 5, line 100: The sentence mentions that both ICOS instruments have been tested at the ICOS Atmosphere Thematic Centre (ATC) before being set up at the station. What about the GAW instruments? Could you clarify their validation procedure?

The GAW instruments are usually checked for normal operation and an initial calibration was performed before deployment at a station. However, more important is the verification procedure during the field measurements, which includes regular measurements of calibration and target standards.

Page 5, line 105: The phrase "the maximum bias tolerable when measuring well-mixed background air" is used in Table 1, but it is unclear what the bias refers to. Could you please specify what is meant by "bias" in this context?

Added explanation:

(the maximum bias **between different datasets** tolerable when measuring well-mixed background air)

Page 6, Table 1: Table 1 shows "the WMO Compatibility goals for CO_2 and CH_4 measurements." Could you please clarify the specific requirements for the ICOS network in relation to these goals?

Added further explanation in Section 1:

… measuring well-mixed background air) and the measurement ranges are presented(WMO, 2024). **The ICOS network aims for the same goals, however covering a wider range (ICOS RI, 2020)**

Page 6, Line 120: The sentence states, "Before that time, the air was measured as wet, and corrections to convert to mole fractions in dry air were applied." It is not clear whether the correction refers only to the dilution factor or if corrections for cross-sensitivities have already been applied. Additionally, it is unclear what the remaining water concentration is after passing through the Nafion dryer and whether any further corrections are applied afterward. Please provide additional information on these points.

Quantified the water content of the sample air in section 2.2:

… in dry air were applied. **Without the dryer, the sample water content was, on average, 0.59 v % (+/- 0.33 v%). With the dryer installed, the remaining water content was on average 0.06 v % (+/- 0.01 v%).**

In addition, removed statement from line 130:

and corrections to convert to mole fractions in dry air were applied

For clarity, as even with the dryer the remaining water vapor effect is still corrected as explained on in section 2.2.1.

Page 6, line 125: "To monitor the quality of the measurements, long-term and short-term target cylinders are measured to identify any drift in the measurements between calibrations." Could you please provide further information on why two target cylinders (LTT and STT) were used instead of just one?

Added explanation:

...measured directly after each calibration. **The purpose of the short-term target is to ensure quality on daily basis, while the long-term target can ensure the continuity of the quality control as the cylinder should last over a decade (Ywer-Kwok et al, 2021).**

Page 6, line 130: "The dry mole fractions can be obtained by sufficiently drying the sample […]". Please specify what is meant by sufficiently.

Added explanation:

… sufficiently drying the sample (**dew points of at most -50 ºC (WMO, 2013))**

Page 7, Figure 3: The abbreviations for the cylinders in the schematic flow diagram (STWS, C1, C2, C3, C4) are either not explained or differ from those used in the text (STT, LTT). Please clarify the terms and ensure consistency between the diagram and the text.

Changed the cylinder abberviations to match the schematic and inlcuded the missing cylinder terms

Page 8, line 134: The sentence states "[…] used at ICOS, the correction coefficients are determined for each instrument individually […]." Could you clarify why this approach is used instead of applying the standard instrument water correction?

Added clarification:

However, as the pressure broadening effect caused by the water vapor in the sample is different for each instrument, the ICOS strategy is to determine the correction coefficient for each instrument individually and apply the correction in the ICOS database (Hazan et al, 2016).

Page 9, line 153: The sentence states, "The calibration standard cylinders used for the GAW analyzers are filled by NOAA, and the STT and LTT cylinders are filled by the FMI." Could you clarify how the FMI concentration is connected to NOAA, and how the assigned concentrations for the STT and LTT cylinders are obtained? Additionally, could you provide more information about the quality assurance process for GAW, similar to your description of ICOS? For instance, NOAA serves as the central calibration laboratory (CCL) for CO_2 and CH_4 in the GAW framework.

Added clarification for the GAW QA process:

The GAW QA process includes regular system and performance audits carried out by WCC-EMPA for CO2 and CH4 (Zellweger et al, 2016)

Here we fix a mistake in the text: All the cylinders used for the GAW instrumentation are filled by the FMI but calibrated against NOAA standards:

All the standard cylinders used for the GAW instrument are filled by the FMI, and calibrated against a set of four standard cylinders prepared by NOAA.

Page 9, line 157: The paragraph "2.2.3 Flask sampling" provides further information on the ICOS sampling strategy, but it is unclear how this information contributes to the analysis in the main paper. Could you clarify its relevance in your analysis or consider to leave it out for better flow?

As in response to reviewer 1, we decided to omit the Flask sampling section from the manuscript.

Removed section Flask sampling, moved Auxiliary measurements to 2.3

Page 10, Line 202: The sentence states "In order to account for a potential drift of the travelling standards, they are regularly compared to laboratory standards between the audit campaigns". It is unclear what is meant by "laboratory standards". Are those provided by the CAL-FCL and how current are the assigned values? Could you please provide further clarification on these points?

Clarified:

...they are regularly compared to **the NOAA standards used to calibrate the GAW instument standard cylinders** between the audit campaigns.

Furthermore, in Section 2.2.2:

… **calibrated at the FMI laboratory against a set of four standard cylinders prepared at the NOAA Global Monitoring Laboratory (GML) before being send to the station. These cylinders are regularly calibrated at the GML and the latest calibration for the FMI standards was in July 2018.**

Page 11, line 223: "The WCC-Empa analyzer sampled air from a location close to the ICOS Picarro and the ICOS Mobile Laboratory inlets […]". Could you please quantify what is meant by "close"?

Added a schematic figure A1 to show the inlet locations during the audit

Page 11, line 229: The sentence states, "The lower limit for the wind speed is 3 m/s during summertime (June-August) and 4 m/s during wintertime." Could you please clarify why the difference is made between the wind speed limits for summertime and wintertime?

Added explanation:

... hourly measurements **based on wind statistic, as defined by (Aalto et al, 2015). Due to the differing wind speeds between summer and winter, the criteria is defined separately for the seasons.**

Page 12, line 261:" CO_2 sinks at Pallas are mostly vegetation, and the effect can be seen in the seasonal cycle (7, bottom)." How is this effect distinguished from the seasonal cycle observed in background CO_2 concentrations, such as those in the NOAA marine boundary layer data?

While the seasonal cycle is mainly driven by increased vegetation activity during summer, we agree that distinguishing this effect from the background seasonal cycle is difficult. Instead, we refer now refer to the diurnal cycle which should capture the local effect better.

… effect can be seen in the **diurnal** cycle (**Fig.** 7 **(a)**)

Page 13, Figure 5: In Figure 5, specific years (e.g., 2001) show larger deviations in the CO_2 growth rate at Pallas compared to the MBL growth rate. Could you elaborate on the potential causes of these deviations?

Added discussions:

… growth rate (GR(of about 2 ppm/year at Pallas is comparable to the globally observed changes in CO_2 (Fig. 5). **Measurements at Pallas show, however, larger deviations in the CO_2 GR than the northern hemisphere averages. Partly this can be explained by noting that we compare measurements from one location to an averaged product, which naturally leads to higher variation. A negative GR is observed at Pallas in 2001; this is caused by elevated CO_2 mole fractions during late 2000, and lower values during late 2001. The exact reason is difficult to quantify based on atmospheric measurements alone, however the fall 2000 was warm with little precipitation, which could influence the CO_2 emissions. The summer 2006 and autumn 2010 were both dry with less precipitation than normally, likely influencing the emissions.**

Page 14, line 271: I do not understand why the average hourly difference differs from the average daily difference. If I understand correctly, as described in page 11, line 229 ff, the data was filtered based on hourly averages using wind speed, the standard deviation of the hourly measurements, and a minimum of 60 minutes of data. Since the calculation of the mean is a linear operation, I would expect the averaged deviation between the two instruments to be the same over the same time

period, whether calculated from hourly or daily averages (excluding the confidence intervals, which will naturally differ). Is there an additional filtering process applied? Please clarify and provide further details in the corresponding paragraphs.

Added explanation of the phenomena in Section 3.3:

When comparing the data on hourly and daily resolution, it could be expected that the mean difference remains the same on both resolutions. However, as we filter the hourly data and later aggregate this filtered time series to daily values, days with different amount of hourly data points are represented differently in the final daily timeseries, leading to small differences in the comparison of daily and hourly values (i.e., a day with 24 hourly data points would be weighted twice as much as a day with 12 hourly data points in hourly means, while after aggregating to daily means both days would be weighted equally). The hourly data can also be unequally distributed within the days.

Page 14, line 282: The statement "Results of the combined ICOS and GAW audit are presented in Fig. 8" refers to the results obtained by the mobile lab. However, it is not clear whether the results are based on the measurements from both instruments (Picarro G2401 and Spectronus) individually or if they represent the average of both. Please clarify to which instruments the numbers refer.

Added explanation:

… Fig. 8. **In the analysis the ICOS Mobile Laboratory data is measured with G2401 analyzer.**

Page 14, line 284: "As the ICOS inlet is in a slightly different location than the GAW inlet […]". Whilst there is information on the location of each inlet in sections 2.2.1 and 2.2.2, the relative location of both inlets is not provided. Please include this information to give the reader a better understanding of their spatial relationship.

Added figure A1 to provide information on the spatial relationship of the inlets

Page 14, line 293: It is discussed that different flow rates might cause the larger spread in the differences observed between the co-located WCC-EMPA and ICOS Mobile Lab measurements. Have you considered correcting for the different flow rates to validate this hypothesis?

After further thought on the flow rates, we have estimate that the impact on the comparison is negligible as the lines at the site are rather short (compared to for example tall towers) and we compare data on hourly and daily means.

Explained at the text:

While the flow rates of the different instruments are slightly different, the effect of the flow rate is likely small as the lines at the stations are rather short and we are comparing hourly aggregated data.

Page 14, line 298: Please provide information on the type of reference instrument used at HEI, as well as the instruments at CBW and OPE.

Included the types of instruments used at the stations

...fourier transform infrared (FTIR) based travelling instrument to a **GC** reference instrument at Heidelberg (HEI) as well as to local **CRDS** instruments

Page 15, line 312: "There is no significant difference between the cold and warm seasons as in CO_2, indicating little influence of the local vegetation to CH_4". While it is stated that there is no significant difference between the cold and warm seasons for CH_4, background concentrations of methane are generally expected to show some seasonal variation, particularly due to changes in the OH sink. Figure 11 also shows higher mean values in the cold season compared to the warm season. However, it is unclear what the error bars represent and whether they could account for the lack of significant difference.

We have clarified this in the answer to the comment below:

Page 15, line 314: "A seasonal cycle is visible in CH_4". This seems contradictory to the previous statement on line 312. Could you clarify how the observed seasonal cycle aligns with the statement that there is no significant difference between the cold and warm seasons.

Here we are referring to the difference between the Pallas observations and the Northern Hemisphere average, and between those two the difference does not vary from cold to warm season, unlike CO2. We clarify this with the following change:

Unlike for CO_2, there is no significant variation in the differences between the Pallas observations and the Northern Hemisphere averages between the cold and the warm season, indicating little influence of the local vegetation to the CH_4 mixing ratios.

Page 16, Fig. 7: Could you please provide information on the error bars in the figure? What do they represent?

Added explanation to the caption:

… from the trend line) (b). **Data points are hourly (a) and monthly (b) means with associated standard deviations.**

Page 19, line 326: "However, the increase measured at Pallas is significantly higher than on the average in the northern hemisphere, indicating a strong increase of local and regional emissions". Do you have any ideas on the potential sources of these emissions?

Added explanation:

… regional emissions. **These emissions are most likely caused by increase in wetlands or anthropogenic sources (Tenkanen et al, 2024).**

Page 19, line 335: "As the drying process eliminates most of the moisture from the sample, the variation is reduced". Please quantify the remaining moisture in the sample in section 2.2.1.

Quantified the water content of the sample air in section 2.2.1:

… in dry air were applied. **Without the dryer, the sample water content was, on average, 0.59 v % (± 0.33 v%). With the dryer installed, the remaining water content was on average 0.06 v% (± 0.01 v%).**

In addition, removed statement from line 130:

and corrections to convert to mole fractions in dry air were applied

For clarity, as even with the dryer the remaining water vapor effect is still corrected as explained on line 148.

Page 19, Line 336: "The discrepancy could also be caused by better performance of water vapor correction of the GAW analyzer compared to the ICOS analyzer". Is the procedure for determining the water vapour correction different for the GAW and ICOS analysers, which might explain why the GAW instrument performs better?

Added explanation for the water vapor correction assesment to sections 2.2.1 and 2.2.2

For the ICOS analyzer, the correction coefficients are determined by the ATC during the initial instrument test by first measuring a dry gas stream from a cylinder, and then humidifying the stream for 20 minutes a step with 0.25 v% steps from 0.5 v% to 2v %, 2.5v % and 3 v%. The coefficients for CO_2 and CH_4 are then determined with the following equation:

$C_w/C_d = 1 + aH + bH^2$ (1)

Where C_w is the measured wet mole fraction, C_d is the dry mole fraction (measured when H = 0), H is the measured water vapor concentration and a and b are the correction factors.

And

Similarly to the ICOS analyzer, the instrument specific water vapor correction factors are determined as well. The approach used by the FMI is similar to that of ATC; a dry gas stream is humidified using a self-build instrument, ranging from 0 to 3.5% (Aaltonen et al, 2016). The coefficient are then calculated using Eq 1.

Page 20, Figure 10: In Figure 10, specific years (e.g., 2005-2007, 2010, 2011) show larger deviations in the CH4 growth rate at Pallas compared to the MBL growth rate, or even opposite trends. Could you elaborate on the potential causes of these deviations?

Added further discussion:

CO2, the GR of CH4 varies more for Pallas than for the northern hemisphere average. This can be expected, as local variations in sources and sinks affect the mole fractions at the site more than the hemisphere averages. Especially in 2006 and 2010 the GRs observed at Pallas were negative. A study by Tsuruta et al. (2019) found that during those years the CH4 emissions in Finland were lower than usually, which is a likely explanation for the lower mole fractions observerd at Pallas during those years.

Page 21, Line 356: "Furthermore, all the instruments are calibrated using a separate set of calibration standards, which could cause differences in the calibrated values". Have you considered performing cross-calibrations of the cylinders to confirm this hypothesis?

Added two tables with results from cross-calibrations to the Appendix A1 and A2 as well as discussion to chapter 3

To account for possible differences in the calibration standards, the ICOS Mobile Laboratory cylinders were measured with the ICOS analyzer, and the WCC travelling cylinders were measured with the GAW analyzer. The results of the measurements are presented in table A1 and table A2. The calibration cylinder measurements show that for CO_2 the ICOS analyzers

measurements differ on average from -0.09 ppm to 0.01 ppm to the assigned cylinder values, and the GAW analyzer differs from -0.05 ppm to 0.03 ppm.

and 4

...all the instruments are calibrated using a separate set of calibration standards, **leading to slight differences in the calibrated values. To quantify this effect, during the audit the ICOS analyzer measured the ICOS Mobile Laboratory calibration standards, and the GAW analyzer measured the WCC travelling standards. The results of the calibrations are presented in tables A1 and A2. For CH_4, the ICOS analyzer measured 0.12 to 0.54 ppb lower values than the assigned values of the cylinder, and the GAW analyzer measured 0.16 to 0.72 ppb higher values.**

Page 25, line 391: "[…] and all the other systems are connected to the same inlet." I understand that the inlet lines are closely located but distinct (e.g., section 3.2). Could you please clarify this point?

Clarified this point in section 3.2 as well as added a figure A1:

The WCC-Empa analyzer sampled air from **the same inlet** as the ICOS and the ICOS Mobile Laboratory instruments

Minor changes:

Page 1, Line 13: For clarity, I recommend changing "World Calibration Centre (WCC)" to "World Calibration Centre (WCC-EMPA)" as there are multiple World Calibration Centres (WCCs) within the GAW program.

Changed according to the comment

Page 2, Line 21: Please change "Accurate, long-term observations of the atmospheric greenhouse gas […] to "Accurate, long-term observations of atmospheric greenhouse gases […]" to reflect the plural of the gases being studied.

Changed

Page 2, Line 22: I recommend changing "[…] in the composition of the atmosphere […]" to "[…] atmospheric composition […]" for better fluency and conciseness.

Changed

Page 2, Line 50: "[…] ICOS aims to capture the entire carbon cycle. This includes atmospheric mixing ratio observations of different greenhouse gases, as well as […]": For clarity, I would recommend explicitly mentioning the key components of the carbon cycle, such as CO2 and CH4, as not all ICOS-related observations (e.g., SF6) are part of the carbon cycle: "[…] atmospheric mixing ratio observations of CO2 and CH4, as well as […]"

Changed to:

[…] of **CO_2 and CH_4,** as well as [...]

Page 3, line 58: “One of the central facilities of the ICOS ATC is the ICOS Mobile Laboratory, is tasked with this exact purpose: auditing the different atmosphere stations by means of parallel measurements and cross-comparisons.”: The term "central facilities" may cause confusion if it is not the official terminology used by ICOS. To avoid misinterpretation, I suggest rephrasing the sentence as follows: “The ICOS ATC is composed of various components, including the ICOS Mobile Laboratory, which is tasked with this exact purpose: auditing the different atmospheric stations through parallel measurements and cross-comparisons.”

Changed the sentence as suggested

Page 3, Line 83: For clarity, I suggest to rephrase the sentence “The prevailing wind direction atop the Sammaltunturi is in the West - South axis (Fig. 2 (B)), with very little wind coming in from North” to “The prevailing wind direction atop Sammaltunturi is along the west-south axis (Fig. 2B), with very little wind coming from the north.”

Changed the sentence as suggested

Page 5, line 90: I suggest to replace “in sense“ to “in terms”: “During the last 25 years, greenhouse gas instrumentation has undergone substantial improvements in terms of precision, measurement frequency, and user-friendliness."

Changed as suggested

Page 5, Line 93: Please remove “based” in the sentence: “Later, in January 2009, both instruments were replaced by a single cavity ring-down spectroscopy (CRDS) instrument capable of measuring both species simultaneously”

Removed word ”based” from the sentence

Page 5, Line 95: The sentence states, “These instruments were producing data for the GAW network, which was later supplemented by a separate CRDS-based instrument producing data for the ICOS network.” To improve clarity, please specify the time frame for "later".

Changed to:

… was **in 2017** supplemented by a separate CRDS instrument producing data for the ICOS network.

Page 5, line 98: I suggest to use “dry mole fraction” instead of “mole fraction” to improve clarity: “These commercially available CRDS instruments are capable of measuring dry mole fractions of […]”

Changed as suggested

Page 6, line 113: Please remove “ in the sentence “[…] directly after each calibration.”

Removed

Page 6, line 125: The sentence states, “To monitor the quality of the measurements, a long-term and short-term target cylinders are measured to identify any drift in the measurements.” Please add “between calibrations” at the end of the sentence, as the calibrations will correct for any drifts.

Changed as suggested

Page 6, line 128: For clarity I would reorder the sentences and add "with varying ambient water content" to: "The water vapor present in the sample air dilutes the mixing ratios of CO_2 and CH_4, as well as broadening the absorption peaks. In order to make the measured mixing ratios comparable between different stations with varying water content, the effect of water vapor in the sample must be removed. The resulting dry mole fraction is the comparable physical quantity to report."

Changed as suggested

Page 8, line 135: The sentence states, "For the GAW analyzer at Pallas, the coefficients are determined by the FMI." This information would be more appropriately placed in the GAW section for better clarity and structure.

Moved to section 2.2.2

Page 9, line 147: Typo. Please correct "ever" to "every".

Corrected

Page 11, line 252: The sentence states, "Consistent with the global trend, the CO_2 levels have risen […]". For clarity, I would recommend adding "at Pallas": "Consistent with the global trend, the CO_2 levels at Pallas have risen […]"

Added as suggested

Page 12, line 254: Does the "average in the Northern Hemisphere" refer to the average over the entire Northern Hemisphere or specifically the marine Northern Hemisphere? Please clarify.

Added the clarification for ”MBL” (marine boundary layer)

Page 12, line 255 (and following paragraphs): The format"'95% CI: -8.0 ppm–11.8 ppm" may be misleading, as it could be interpreted differently by some readers. To clarify that the interval ranges from -8.0 ppm to 11.8 ppm, I suggest using a more explicit format, such as "95% CI: [-8.0 ppm, 11.8 ppm]" or "95% CI: (-8.0 ppm to 11.8 ppm)". This suggestion also applies to the following paragraphs where a similar format is used to describe confidence intervals.

Changed the confidence intervals to format: **95% CI: [-8.0 ppm, 11.8 ppm]**

Page 12, Line 256: "[…] with a mean difference of 4.10 ppm uses an additional leading digit. Consider simplifying to "4.1 ppm" for consistency.

Changed as suggested

Page 13, line 280: Typo in "[…] is 0.01 ppm ppm […]". Please remove one "ppm".

Removed extra ”ppm”

Page 16, Line 314: Typo: "(Fig 11" with missing ")".

Added missing bracket

Page 16, line 314: Typo: Change "Amplitude of the diurnal cycle" to "The amplitude […]"

Corrected typo to : **The amplitude**

Page 19, line 345: Please change "When the data is filtered […]" to "When the data are filtered […]"

Changed to: **When the data are filtered [...]**

Page 26, line 410: Typo. Change "WDCGH" to "WDCGG".

Corrected

Added figures:

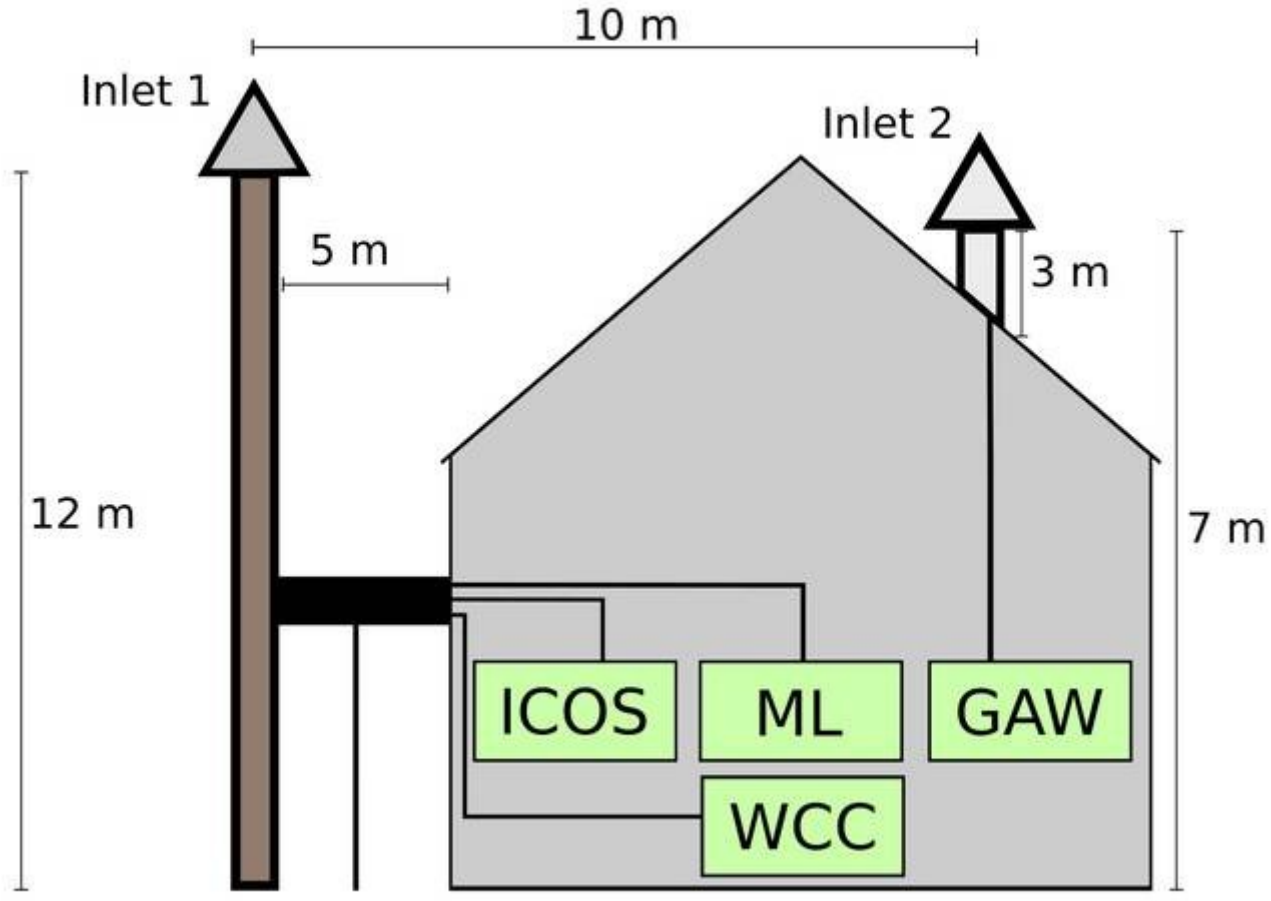

Figure A1. Schematics of the measurement setup during the audit at Pallas. ML refers to the ICOS Mobile Laboratory instrument.

Added tables

	CAL 1	CAL 2	CAL 3
CO_2, assigned [ppm]	379.24	414.46	449.39
CO_2, measured [ppm]	379.21	414.37	449.40
ΔCO_2 [ppm]	-0.03	-0.09	0.01
CH_4, assigned [ppb]	1985.48	1799.53	2210.77
CH_4, measured [ppb]	1985.36	1798.99	2210.63
ΔCH_4 [ppb]	-0.12	-0.54	-0.14

Table A1. Cross-calibration of the ICOS Mobile Laboratory calibration standards with the Pallas ICOS analyzer: The assigned values of the cylinders, average measured values with the GAW analyzer, and the difference of measured value to the assigned value.

	CAL 1	CAL 2	CAL 3	CAL 4	CAL 5	CAL 6	CAL 7
CO_2, assigned [ppm]	378.12	387.39	406.99	411.21	417.53	412.70	427.81
CO_2, measured [ppm]	387.15	387.39	407.01	411.18	417.48	412.67	427.80
ΔCO2 [ppm]	0.03	0.00	0.02	-0.03	-0.05	-0.03	-0.01
CH_4, assigned [ppb]	1883.44	1890.78	1933.20	1953.82	1963.81	1998.97	2191.22
CH_4, measured [ppb]	1884.16	1891.23	1933.69	1954.13	1964.16	1999.13	2191.50
ΔCH_4 [ppb]	0.72	0.45	0.49	0.31	0.35	0.16	0.28

Table A2. Cross-calibration of the GAW travelling standards with the Pallas GAW analyzer: The assigned values of the cylinders, average measured values with the GAW analyzer, and the difference of measured value to the assigned value.