

Interactive comment on “A statistical approach to quantify uncertainty in carbon monoxide measurements at the Izaña global GAW station: 2008–2011” by A. J. Gomez-Pelaez et al.

Anonymous Referee #2

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The manuscript ‘A statistical approach to quantify uncertainty in carbon monoxide measurements at the Izaña global GAW station: 2008–2011’ by A. J. Gomez-Pelaez et al. presents a thorough estimation of the uncertainty of carbon monoxide measurements carried out at Izaña. The methodology is sound and covers the most of the relevant contributors to the overall uncertainty. Similar approaches might be used at other stations and for other measurement parameters. Izaña continuous CO data is compared to collocated flask measurements, and the additional uncertainty of the discrete flask sample due to smaller data coverage is also estimated. As such, the manuscript is a valuable contribution for AMT. However, the readability and presentation quality needs

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further attention before publication in AMT. I recommend publication after addressing the following points:

The manuscript is rather difficult to read over large parts. I recommend that the language of the manuscript is checked by a native English speaker, or that the manuscript receives copy-editing for English. It should also be checked if clearer (and shorter) formulations can be used. The presentation quality needs to be improved before publication in AMT.

Specific comments:

P6950 L18–19: I understand what you mean here, but this nevertheless needs to be re-phrased.

P6950 L24: ‘The uncertainty in the differences is determined and whether these are significant.’ This is difficult to understand.

P6951 L5: ‘hydroperoxy’ should be ‘hydroperoxy radical’.

P6951 L14: ‘the quality objectives’ replace with ‘the data quality objectives’.

P6952 L11: ‘might’ instead of ‘my’.

P6953 L10: ‘steel’ instead of ‘steal’.

P6953, description of the RGA system: This needs to be revised. E.g., sentences such as ‘The system is controlled by a computer’ contain no relevant information. Consider to delete this, or alternatively give more (relevant) details.

P6953 L20: It should be mentioned here that NOAA/GMD is the CCL for CO.

Section 3: Do you have any indication of the stability of the standard gases over time? Have they been re-calibrated at NOAA?

Section 4: Overall, the uncertainty estimation carried out in this section is sound. However, the uncertainty of ust does not account for potential drift in the NOAA standards. I

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think that this should be included in a comprehensive uncertainty estimation, although it might be difficult to quantify. Maybe relative stability of the standards over time could be used for an estimate. I didn't understand the difference between the uncertainty of the fit (u_{fit}) and the uncertainty of the response function parameters (u_{par}). Aren't these two uncertainties highly correlated?

P6958, L8/9: The values of these standards are different compared to the standards listed in Table 1. Was this a set of different standards? Since the RGA is non-linear, sufficient coverage of the relevant mole fraction range is very important to obtain adequate calibration functions. Your approach to use the uncertainty of the fit with 5 standards as the minimum uncertainty makes only sense if the calibration functions were similar. Was this the case?

P6958, L9: re-phrase (avoid abnormally).

P6958, L14/16: Sentence 'Taking differentials in ...' is a fragment / makes no sense.

P6958, L19: 'parameters respect' should be 'parameters with respect'.

P6959 L25: '...number of data necessary to compute exactly the mean': This need to be re-phrased. The mean can always be calculated 'exactly' (i.e. the mean of 1 and 2 is exactly 1.5). You probably mean that you increase the uncertainty of the mean if you have a smaller number of data points. With 'exactly the mean' you probably think of the true value. Also 'actual mean' should rather be true value, which is in fact always unknown.

Section 4.1: The distribution of missing values has an influence on the uncertainty and the resulting bias. E.g. it makes a difference if the first three hours of a day are missing or if the three missing hours are evenly distributed over the day in case of a significant diurnal cycle. This is not reflected in the 'representation uncertainty'. This section should also be condensed; it is too long and difficult to follow. The last paragraph (starting P6962 L21) should be moved to section 5.

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Section 5 also needs to be shortened.

Table 1: Is this table relevant for the manuscript? Consider removing, or combine with Table 2.

Figure 1 is not really necessary. Consider removing.

Figure 2: Consider showing the residuals to the fit, e.g. on the second y-axis.

Figure 3: It seems many of the working tanks are slowly drifting downwards with time. This is very unlikely, since drift in CO tanks is usually in the opposite direction. Could this be due to an upward drift in the NOAA tanks over time?

Figure 5 shows the individual contributions of the different uncertainty components to the total uncertainty u_{tot} . The total uncertainty must always be larger than any of the individual contribution. However, this is not the case for a large period in 2008, where u_{pr} is larger than u_{tot} . Please comment / correct.

Figure 7 is not needed; the annual cycle can be seen in Figure 4.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 6949, 2012.

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