

Interactive comment on “Greenhouse gas observations from Cabauw Tall Tower (1992–2010)” by A. T. Vermeulen et al.

D. Lowry (Referee)

d.lowry@gl.rhul.ac.uk

Received and published: 22 November 2010

Parts of this manuscript read as though they have been put together hurriedly to meet a deadline and thus there are many small mistakes and inconsistencies, very vague interpretations of data trends, and some issues with figure and table numbering. Much would have been spotted with another thorough read-through before submission. The section on instrument set-up is done in a lot of detail, and this very nicely displays the evolution of the analytical systems and the great improvements in instrument performance and technological developments that have taken place in the last 15 years. The section describing the data trends has many good figures and a lot of work has clearly gone into creating these, but their interpretation is often vague and lacking any

C2078

quantitative treatment, with terms such as ‘small rise’ being the norm.

The Cabauw tower is a very important part of the European greenhouse gas network so the work needs to be published, but it requires a lot of tidying up. None of the changes are very major so it should be accepted following the revisions.

General

Figs. 10–14 should be Figs. 3–7 to follow the order of the manuscript

Tables 4 and 5 should be 2 and 3 and Tables 6 and 7 should be 5 and 6 to follow the order of the manuscript.

Beware ‘s’ on the ends of words that are not required, such as ‘concentrations gradient’ and ‘concentrations maxima’ and ‘gradients measurements’. This is a regular occurrence. Some words are missing ‘s’ at the end.

The detailed points are outlined below:

Sections 1 to 3

Page 4172 Line 20 – ‘Cabauw tower was erected in 1972’ is better.

Page 4173 line 15 – ‘like those described in’.

Page 4174 line 15 – would be useful to specify the range of temperature.

Page 4175 line 12 – ‘allow the retrieval of’.

Page 4176 line 9 – specify latitude and longitude.

Page 4179 line 6 – this description is currently in Table 4 and not Table 1 as listed here.

Page 4179 line 8 – it would be useful to put noise level into context of annual variability for example.

Page 4180 line 12 – do all 3 stations follow the same analytical protocols?

C2079

Page 4180 line 13 – remove the e from periode.

Page 4181 line 6 – ‘polythene tubes’.

Page 4181 line 10 – ‘aerosols from entering the system’ is better.

Page 4182 lines 20-22 – replace ‘has been’ with ‘was’.

Page 4183 line 8 – remove ‘on’.

Page 4186 line 14 – series.

Page 4186 line 22 – ‘CO₂ into CH₄’.

Page 4187 line 13 – ‘that allow the leading air and oxygen peaks to be carried away from’.

Page 4187 Period C2 – it would be worth to explain why the temperature shown in current.

Figs. 12 and 13 have changed from 70°C to 76°C in the oven and 57°C in the GC. Following which protocol?

Page 4188 line 28 – could some of the high standard deviations not be due to rapidly changing mixing ratios over the period of 3 analyses within the calibration period?

Page 4190 line 11 – this should be Fig. 3e

Section 4

Page 4191 line 9 – Fig.4 shows only data from 2000 not 1992, and it shows data observed at multiple levels not just 200m.

Page 4191 line 10 – remainder.

Page 4191 line 17 – Fig. 5 shows diurnal cycles not daily means.

Page 4191 line 18 – Fig. 5 is 2000-2008 not 2009.

C2080

Page 4191 line 20 – this should be seasonal timescale not monthly.

Page 4191 line 22 – not convinced that the term bandwidth is the best to use here. Is it not better to refer to a range or a percentile limit?

Page 4191 line 25 – refer to Fig. 4 at end of sentence.

Page 4192 line 1 – the years prior to 2000 are not displayed so we cannot see these earlier data.

Page 4192 line 2 – remove the second ‘concentration’.

Page 4192 line 11 – ‘gradients allow in principle the observation of the influence’.

Page 4192 line 16 – 04:00 UTC – should also mention local time, the pronounced effects soon after dawn of inversion break-up and local urban sources are much more familiar to those of us at 06:00 local than 04:00 UTC.

Page 4192 lines 19-20 – ‘very small during day’. The figure suggests that they are very small in late afternoon.

Page 4192 line 24 – not sure what you mean by net uptake of CO₂, as opposed to assimilation (photosynthesis) as used later. Does this not also indicate that there is no evidence for vertical mixing.

Page 4193 line 11 – add ‘(see Fig. 5a,b,c,d)’ to end of sentence.

Page 4193 line 18 – add ‘since 2005’ after the 0.05 ppm.

Page 4193 line 27 – ‘during midday’ – looks like late afternoon on the figure.

Page 4194 line 3 – ‘very similar gradients’ – this is just one example of where some quantification would have been useful.

Page 4194 line 6 – it does not look as though there is a smaller seasonal variation of CH₄ baseline compared to CO₂, but it looks like there is an offset with the lowest mixing ratios of CH₄ being earlier in the year.

C2081

Page 4194 line 15 – what are these extraordinary high concentrations due to?

Page 4194 line 19 – need to refer to the figure at the end of this sentence. The seasons used in Fig. 6 need to be defined. Which months are you using for each? Is this Dec Jan Feb for Winter of Jan Feb Mar? Otherwise it is difficult to interpret early spring, which could be early March and not really spring at all. Similarly for all the seasons (early / late summer / autumn) because these terms as used in the text don't quite fit with expected trends.

Page 4195 line 1 – 'lower levels, due to higher inversion height' or something similar.

Page 4195 line 3 – add 'due to change in air mass origins'.

Page 4195 lines 11-12 – 'small to zero' – needs some quantification.

Page 4195 line 17 – Omega blockade? This seems to be a popular term at KNMI but can you explain this for the readers. Why this detail here when there is no explanation for much of the variability discussed?

Page 4197 general – The numbers of Figure 7 do not match up with the text. CH4 is 7c not 7b and 7a and 7b seem as though they are the wrong way round considering the text later on this page.

Page 4197 line 21 – the vertical gradient almost disappears for CH4 as well and earlier in the year than CO2.

Page 4197 line 23 – 'at the 200m level, due to assimilation.'

Page 4198 line 8 – remove 'second'.

Page 4198 line 9 – this is repeating an earlier sentence.

Page 4198 lines 10 and 11 – it is not clear if these amplitudes are for differences between vertical height as in Fig. 7 or the range of amplitudes for different years in the record.

C2082

Page 4198 – before Section 4.5 – It is possible that 2.2 Concentration Footprint section will go better here than where it is directly ahead of the instrumentation description.

Page 4198 line 15 – 'This allows the derivation of global budgets'.

Page 4198 line 19 – 'to be able to construct'.

Page 4198 line 28 – 'are of a similar order of magnitude'.

Page 4199 lines 9-11 – based on your comments here and the precisions given in Table 2 is it wise to use the 1992-1997 data in the comparison with Globalview data?

Page 4199 line 20 – the choice of method used to derive the figures used in Table 3 does not match those used to derive figures 8 and 9.

Page 4199 line 21 – Mace Head with a capital H.

Page 4200 line 10 – the overall trend from 2000 might be similar to Mace Head for CH4 but the shape of the trend is very different.

Page 4200 line 17 – Do you have any reasons for this? Poor emissions data? Sources continuing to emit after so-called closure e.g. landfills, coal mines?

Page 4201 line 22 – remove 'so'.

Page 4201 line 25 – refs need rearranging to be chronological.

Page 4202 line 9. The IPCC report is not in the reference list and this does not cover your period C anyway so no comparison with your best period of data.

Page 4202 line 15 – 'will allow improvement of'

Tables

Table 3

a) You are using Mace Head only so this might be typical of 40-60°N globally, but not be termed a Global trend.

C2083

- b) How can you use 2010 as part of the period as it is an incomplete year to work out a global trend? Secondly I doubt that the Mace Head data is available yet for much of the year.
- c) How much of the differences in observed CH₄ trends can be related to improvements in analytical precision of your instrumentation?
- d) Why display the results of only one of the methods used to derive the trend, particularly when for CO₂ and CH₄ they are not the results of method B that you have used to plot the graphs for Figs. 8 and 9? Are these the methods with the closest fit to the Mace Head data?

Tables 6 and 7.

- a) Specify the data is for the 200m height in the captions.
- b) The text mentions the achievement of 95% data coverage in recent years but these tables suggest that even for Period C2 they are varying between 81 and 92%. Is this the figure after both instrument failure and bad data have been removed?
- c) There are some surprisingly large jumps in the lowest percentile data means that correlate with your change from Period A to B and B to C and these don't correspond to global trends. Are these purely down to meteorology?

Figures

General – the axes labels are very small and difficult to read on most figures, particularly in printout and without going to very big enlargement on the PDF version.

Fig.1 – A scale would be useful

Fig.4 – Because of the order of plotting of the data series, it is not possible to see if the baseline varies from one height to the next

Fig.5 – This nicely shows how little background air the Cabauw site records. The text

C2084

suggests that this figure is showing averaged data for 2005-2009 not 2008. Does this figure show the complete dataset without any filtering?

Fig.6 – a) This figure is for CO₂ as in text and caption, but the axes are labelled CH₄.

b) This is where the lack of definition of the seasons in Fig.5 causes some difficulty. Otherwise 22 May to June 19 would be purely late spring, and 20 Aug – 10 Sep would be late summer and not Autumn.

c) No explanation that the large diurnal cycles at this time of year are enhanced biological cycles in the main growing season.

Fig.7 – Need to specify which method has been used to calculate the means used in this figure. Is it the middle 50% of the data only (method B) as used in Figs 8 and 9 and specified in those captions.

Figs.8 and 9 – Specify method B in these captions for ease of cross-referencing with the text. The methane harmonic fit has an interesting double peak with the first in autumn. Is there evidence from local sources to explain this, that could be mentioned in the text?

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 4169, 2010.

C2085