

Reply to Interactive comment on “Six years of high-precision quasi-continuous atmospheric greenhouse gas measurements at Trainou Tower (Orléans Forest, France)” by M. Schmidt et al.

Reply to Referee #2,

We would like to thank to the two referees for their very helpful comments and suggestions which will improve our manuscript. We provide here explicit responses to all reviewer comments. In the following, the referee comments are in black color, followed by our replies in blue color.

Anonymous Referee #2

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The submitted manuscript presents the instrumental setup for greenhouse gas observations at a tall tower in Trainou, France. The setup in Trainou is carefully designed and nicely implemented along with an adequate calibration and quality control scheme. The presentation is clear and the technical aspects are described in sufficient detail. Thus, the paper is definitely within the scope of ‘Atmospheric Measurement Techniques’.

However, a major part of the used instrumentation and also large subsets of the data are already published in the literature (see Yver et al. (2011, Tellus) for the CO and H₂ observations and Lopez et al. (2012, JGR) for the N₂O observations) (both cited in the present manuscript). For example, a large portion of Table 2 (GC parameters) is identical with Table 1 of Lopez et al.

This point should be more clearly made. Moreover – even if data analysis and interpretation is not the main subject of AMT – a scientific interpretation of the data is largely lacking and should be somewhat expanded, again, taking into consideration that parts of the data are already scientifically explored. Previous findings based on the H₂, CO and N₂O interpretation could be briefly summarized and discussed in the context of the full dataset.

Referee #1 proposed to delete the paragraph with the trend analysis whereas referee # 2 recommended to expanding it. Hence, we decided to keep the discussion as it is, but we clarified that we simply provide an update on the record presented and discussed in parts earlier. This is because we wanted Some of the N₂O, H₂, and CO data were already presented, but for a shorter time series (until Sept 2010). Here we want to show the complete picture of available in-situ data for Trainou tower and its variability their behavior for different sampling heights.

The length of the so far gathered dataset is of minor importance considering the present status of the paper. Therefore, I recommend entitling the paper ‘High-precision quasi-continuous atmospheric greenhouse gas measurements at Trainou Tower (Orléans Forest, France)’.

We changed the title according the referee suggestion.

Finally, the paper seems to be a bit hastily written. The paper might profit from a careful run-through to eliminate existing sloppiness and slips of the pen. See also my comments below.

We have carefully revisited the paper. Thank you for your detailed comments.

Specific comments:

Explain all acronyms, such as FTS, CSIRO, MPI, CMSL, ANSTO, ICOS (and maybe others that I missed to list here).

done

Page 570, line 11: erase 'after some initial problems', reword that it reads 'The ultimately achieved short-term repeatability . . . '.

done

Page 570, line 12: revise 'for the GC system of of 0.05 ppm'

done

Abstract: H2 is mentioned when listing the repeatabilities but not below for the in-situ and flask comparison, the growth rates and the gradients. Why?

We added the H2 flask comparison and also described the gradients in Chapter 4

Page 573, first paragraph: can the emission inventories be verified with the observations?
In principal yes, as we have shown in Lopez 2012 and Yver et al., but it is not the scope of this paper.

Page 573, line 8: I suggest to replace 'For the year 2005, . . . ' by 'Prior to the installation . . . '. Like that, it rather indicates the motivation for the modeling study, I guess.

Done

Page 573, second paragraph and Figure 1: I do not understand why modelled wind data are shown (for a year when no GHG observations where made) when meteorological observations should be available (according to 3.4.1). Please show real meteorological data for the years of the GHG observations in Figure 1.

We have only one wind sensor at the tower, and this measurement is unfortunately impacted by the wind shadow of the tower. Therefore it is not representative. We add the following sentence to paragraph 2: " We have only one wind sensor at the tower and the measured wind direction and velocity is unfortunately biased by the wind shadow of the tower.

Page 574, line 19: erase the comma.

done

Page 578, line 22: you mean ' . . . a Parker purifier . . . ', right?

We modified to purifier (Model Chromgas 1000, Parker)

Page 579, lines 9-10: 'The slope of the correction function would be 0.07 . . . '. Why 'would be'? 'The slope is 0.07 . . . ' ???

We changed

Page 581, line 1: write ' . . . we automatically transfer . . . '

done

Page 582, lines 6-7: didn't you produce sufficient hydrogen or was the produced hydrogen not sufficiently dry? If it was the latter, write ' . . . not sufficiently dry hydrogen.'.

We changed to sufficiently dry hydrogen.

Chapter 3.4.4: why are no $^{14}\text{CO}_2$ results shown? If no reference was made to these observations later, I suggest to remove this chapter (the same holds true for 3.4.5) and to merge both into a chapter such as 'Additional measurements'.

We removed chapter 3.4.3 and 3.4.5 and added as suggested a chapter 3.6 Additional measurements. Here we present also other cooperation, like FTIR from University Bremen and also the airborne measurement program.

Chapter 3.5: Add numbers for H2.

Done

Chapter 4.1: how were the trends calculated? Is the annual cycle subtracted first? If not, start and end of the time series for trend determinations have to be at the same time of the year, at least for species with a distinct annual cycle. Please elaborate on the procedure of trend determination.

We added two sentences describing the way how we compute the seasonal cycle and the trend.

Page 586, line 8: write '... at the 180 m level ...'.

Done

Page 586, lines 20-21: revise sentence.

We revised this sentence to "Yver et al., (2011) described already the first year of CO and H₂ time series. We confirmed their findings of seasonal cycles at Trainou station with minimum values for CO mole fraction in July and for H₂ in September respectively."

Page 586, line 26: replace 'due to soil sink' by 'due to uptake of H₂ by the soil'.

Done

Page 586, line 27: what is this sentence doing here? How about the growth rate and the seasonal cycle for ²²²Rn?

We wrote a small paragraph including seasonal cycle of Radon.

Page 587, lines 21-25: rephrase this sentence.

We rephrase this sentence.

Page 589, lines 2-4: What happened after June 2012 and the some months of closing? Were the measurements resumed?

We clarified which measurement was stopped and which after a break continued.

Page 589, lines 4-6: 'In 2013 the station will be upgraded by CRDS analysers ...'. Update this statement.

We updated this statement

Page 589, line 7: remove comma.

Done

Figure 2: what is an 'ethalon bath'?

We corrected the typos error and replaced ethalon by ethanol