

## ***Interactive comment on “In-situ observations of the isotopic composition of methane at the Cabauw tall tower site” by T. Röckmann et al.***

### **Anonymous Referee #2**

Received and published: 9 March 2016

This paper describes a field comparison of two new instruments for measuring the two major stable isotopes of methane in the atmosphere. The instruments are ground-breaking, the paper is well written and the interpretation is interesting. I recommend it for publication in ACP with relatively minor suggestions for changes.

Specific comments:

- Bag samples from the Royal Holloway University of London laboratory are presented in Figure 2, but not referenced anywhere that I can find in the main text. I think these measurements should either be discussed in the body of the manuscript, or removed from Figure 2.
- I don't know if this is a convention in the literature, but my understanding of the nomenclature used in this paper is that "isotopic signature" is used to describe the isotope ratio

C1

of the CH<sub>4</sub> emitted from a particular source, whereas "isotope source signature" or just "source signature" is used to describe the combined isotopic signature of the sources that might have contributed to a measured air mass. I found this a very confusing (e.g. see L378 - 380), and perhaps not the most descriptive set of terms. Perhaps I am confused, but I wonder whether the authors could come up with a naming system that describes these terms more clearly. Mainly, when I read the term "source signature" I think that it must refer to the delta value that is the property of a particular source. This does not seem to be its use in this paper.

- L51: "representative of"
- L94: Shouldn't this be "Pee Dee Belemnite"?
- L159: What does "limited air conditioning mean"?
- L162: Define "o.d" in this section.
- L271: "a lower offset in d13C of 1.58permil". I think this statement would benefit from spelling out a little more clearly. What was the offset before, and how has it changed?
- L286 - 288: What adjustments were made? Can you provide general details?
- L318: ERA interim
- L334: I presume this is following some spin up period? Are the delta-values at ~steady state before the model run?
- L369: This sentence is a little confusing and doesn't quite follow from the previous one. What was "done separately" for the SNAP categories?
- L385: "This method allows ... to be determined"
- L429: I don't think "Inter-calibration" is the correct term here. I think you mean "Inter-comparison"? This section doesn't describe a calibration exercise.
- L466 and Figure 3: It looks to me like there is some non-linearity in the comparison

C2

between the two instruments for delta-D? The values at the lower end of the scale appear to be significantly lower for the TREX-QCLAS. Is this true? E.g. if a 2nd order polynomial were fit, it looks to me like it would come out with some curvature. I think this deserves a comment.

- L498 - 499: TM5 does indeed seem to perform very well. However, I think this line is somewhat subjective (e.g. use of the term “remarkable”) and should be removed.

- L508: I’m a little unclear what this line means. Do you mean simply that this offset is seen globally?

- L520: “showed, that”. . . I don’t think the comma is needed.

- L569 and Figure 7: I’m a little concerned about the points in Figure 7. My understanding of the MKP is that it is an hourly “running” 12-hour Keeling plot. Each point in Figure 7 is then the 6-hourly average of the “12-hour running intercepts”. Therefore, it seems to me that what we’re seeing at each point is a doubly smoothed estimate of the source signature during some ~18-hour period. Wouldn’t this analysis be more transparent if a “normal” Keeling plot were calculated during a block 6 or 12-hour period? Otherwise it becomes more difficult to understand what these points really show and what time period they correspond to.

- L644 - 645: delete “even”

- L654: This is a good example of where the term “source signatures” is confusing. I’m not sure whether you’re referring to the particular isotopic ratio of the methane emitted from a source, or of something about the bulk source mix that you’ve inferred from the air mass.

- Figure 7: At the point where this Figure appears and is referenced, it’s not clear what the “a” and “b” refer to in the event labels. I think the Figure caption should be expanded to explain when these events were.

- Figure 7: I think these points should have error bars.

C3

- Figure 7: The reference to Rigby et al. (2012). The original “mean” values are from Snover et al (2000), which I think should be cited. The ranges are those assumed (somewhat arbitrarily) for the inversion in Rigby et al (2012).

---

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-60, 2016.

C4