Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-259-RC1, 2018

Atmospheric Measurement Techniques Discussions

Interactive comment on "Characterisation of $\delta^{13}CH_4$ source signatures from methane sources in Germany using mobile measurements" *by* Antje Hoheisel et al.

Anonymous Referee #1

Received and published: 30 October 2018

AMT-2018-259 - Review

General Comments:

This is a well written manuscript describing a very careful set of measurements of local isotopic carbon source signatures. The authors rightly point out that high quality measurements of source signatures is a critical aspect of using isotopes to quantify and attribute regional and global methane emissions. This paper, building on previous work, demonstrates practical methods and analytical guidance for quantifying isotopic source signatures. The authors are careful to report uncertainties at every stage of the process, which is important to all isotope analysis.

The writing is clear and concise, and the English usage and grammar is excellent.

Specific Comments:

One clear omission is the C2H6 / CH4 signatures from the individual plume measurements. A great deal of important work is done in calibrating the C2H6 channel from the instrument, but then the field data from this channel is not presented. Reporting these ratios would serve to validate that the instrument is reporting reasonable values; conversely, if the ratios do not make sense (e.g., if the landfill C2/C1 ratio is not zero within uncertainties), then that may point to an additional unknown systematic error in the system. For example, these data could be easily added to Table 2.

Similarly, for the bag samples of the local natural gas source, the measurements of the ethane content would be an interesting addition to the manuscript. Furthermore, the ethane content in the natural gas infrastructure is generally recorded by the natural gas distribution company; the values obtained from the analysis could be compared to the known values.

A second aspect of the manuscript that could use more attention is the calibration of d13C-CH4. Hoheisel (2017) is cited, but at least a brief description should be provided here (and/or a more detailed description in the supplemental material). For example, there are terms in Fig 3 (e.g., dCH4_Nominal) which are not even described in the text. This is critical information if these data are to be used in partitioning of global or regional methane emissions. It is not clear from the text or the figure whether standards with a range of isotope ratios was used in the calibration; please clarify.

Detailed Comments and Questions:

P1L3: "Therefore..." poor word usage. Rewrite.

P3L17: polypropylene

P3L27: 260 amp-hr. check units

P3L28: Supplier & Model Number for the inverter

P4L3: How were the valves triggered for “replay” mode? Add a description.

P6L24-25: Relative increase of which uncertainty? This statement is unclear. Please clarify.

P7L29: Please provide a brief description of the York fit.

P8L12: Why do the Keeling and MT methods produce identical source signatures and uncertainties (as shown in the figure)? I assume that this is a error in the preparation of the figure. If not, please explain.

P10L13: It’s surprising to me that north sea gas is high in ethane content and heavy in isotope ratio. Generally heavy isotope ratios are associated with low C2+ content. Please confirm these values.

P11L33 (for example). The plume peak heights should be reported above the local baseline value, rather than absolute methane values. Please clarify in the description (e.g., “Peak height above baseline”)

P12 Landfill section: The isotope signature of landfills are complicated by a) the isotope signature of the source material in the landfill, this fractionation that occurs by the anaerobic bacteria, and the further fractionation that can occur in the landfill cap where the methane is consumed aerobically.

P13: WWTP: The methane emissions from WWTPs can come from various locations and processes within the facility, and these processes may have different isotope signatures. Further, different WWTP plants employ different techniques to digest the waste; some discussion of these processes and their likely impact on your measurements would be helpful.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-259, 2018.