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Atmospheric Measurement Techniques Discussions

Interactive comment on "Constraining the Accuracy of Flux Estimates Using OTM 33A" *by* Rachel Edie et al.

Anonymous Referee #1

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The EPA OTM 33A measurement technique is a mobile inspection method that can provide rapid assessment (∼20 minutes) of whether a near-field, near-ground-level source is leaking and at what rate. The method has been widely used to detect and quantify methane emissions from oil and gas production well sites. The method was originally submitted by EPA's Office of Research and Development for inclusion in the Other Test Category (OTM) and is currently in draft form. Several researchers, including EPA's ORD, have previously performed controlled release tests involving single point-source releases to assess the performance of OTM 33A. This study expands on these previous tests by assessing OTM 33A performance under more realistic conditions using a faux oil and gas well site with multiple leak sources from typical well pad equipment. Since the most commonly used OTM 33A emission rate quantification ap-

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proach (i.e., the point source Gaussian) assumes all emissions from a site converge to a point source, the use of a more realistic test environment with multiple sources provides a means to test the limits of this assumption. The authors' conclusion that, under this more realistic test conditions, OTM 33A has a "small but statistically insignificant low bias" and "does not drastically underestimate total emissions for an ensemble or group of measurements," is supported by the data and the analysis presented here. The paper is well written and the subject matter addressed here is important. However, the authors should consider providing additional details before the paper can be accepted for publication. In particular, the section describing OTM 33A sensitivity to source distances needs to be revised and clarified. Specific comments are provided below.

Page 2, line 13 to 14. Please expand on or provide a specific reference for the statement that VOC-rich emission sources are difficult to measure with onsite techniques.

Page 2, line 25 to 26. This sentence combines tracer flux method limitations (e.g., measurement distances) with method disadvantages (e.g., tracer flux techniques often require more implementation time than OTM 33A). It might be useful to distinguish between the two. Also, please provide a specific reference for the method limitations/requirements.

Page 4, Section 2.3. The OTM 33A emission rate quantification approach (the point source Gaussian) presented in this section is one of many possible quantification methods for OTM 33A. Other techniques (e.g., backward Lagrangian stochastic models) may have different performances than the PSG approach utilized here.

Page 4, lines 21 to 22. Please note that EPA considers the method to be more broadly applicable (i.e., not just for emission detection and quantification at point sources). EPA specifically identifies three source assessment modes for OTM 33A: (i) concentration mapping, (ii) source characterization and (iii) emission rate quantification.

Page 6, Section 3.1. The description of the OTM 33A test releases should be in the

Methods section. Similarly, the Methods section should include an overview of statistical tests performed, which are described in later sections under Results.

Page 6, lines 17 to 18. Please spell out how many “multiple release points” there were.

Page 6, lines 21 to 22. What informed the choice for the emission range tested here? Were the authors limited to this range? This has potential implications for how broadly applicable the results are, especially when larger emission rates (beyond the $\sim$ 2kg/h rate) are encountered in the field.

Page 6, lines 23 to 24. Did the authors perform tests at different source-to-observation distance configurations? If so, it would be helpful to provide a range/basic statistics here. Additional comment on this below.

Page 9, Section 3.3.1. This is an important section. Unfortunately, important details are missing. What was the average source distance for all test releases and how does this compare to the average in the Bell et al. study and in the EPA test? The data is shown in Figure 13, but it would be helpful to describe it here. Were there any measurements that were repeated at different source-to-observation distances to test OTM 33A sensitivity to source distances?

The second paragraph also needs more clarity. There is ambiguity in how the % changes in source distances were calculated. The % change could be based on (i) measurements of an emission source(s) at different observation distances, which means several 20-min samples of one known release were measured at different observation distances spanning a range of 20 m to 200 m, or (ii) fixed observation location, but the source-to-observation distance is varied (post-measurement) based on whether one assumes an average distance for all onsite sources or distance from a single known point source onsite. In the latter scenario, the difference in source distance would be no more than 6 m, the maximum separation distance for the multiple sources onsite (page 6, lines 17âĂŤ18), which is small in the context of the 20âĂŤ200 m range. Please provide more details in this section to help the reader understand

how the variability in source distances was assessed. Also, a plot showing the OTM % error as a function of source distance (similar to Figure 10 for wind speed) may help illustrate the point.

Page 9, Section 3.3.3. It is not clear here whether the sampling probe height was fixed or adjusted for different measurements. In Section 2.1 the sample inlet on the mobile laboratory is described to be located “4 meters” above the ground. And source heights are described to vary from 0âĂŤ3 meters above the ground (page 6, lines 17âĂŤ18). In testing OTM 33A sensitivity to source heights, were there specific configurations where one or more source heights was/were greater than the sampling probe height?

Page 10, lines 13 to 14. This is partly correct. The Alvarez et al. study also used other datasets obtained using other measurement techniques, not just the OTM 33A measurements in the four O&G basins described here.

Page 16, Figure 2. Please increase the font size for both figures (on all axis labels, legend and tick labels)

Page 25, Figure 11. It is not clear what heights (or range of heights) correspond to the height ranks shown here. What is the highest emission point? What are low, medium and high release points?

Page 27, Figure 13. It may be helpful to add a vertical line separating the dataset for actual OTM 33A measurements and OTM 33A release trials.

General comment on all figures: some figures have figure titles and others do not. Please review AMT guidelines and revise accordingly.

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