

We would like to thank the referee for his review and comments. Following these comments, we have made minor modifications and point-by-point responses. Please find our responses below (in blue color).

Minor review comments and suggestions:

The addition of the new supplementary information is huge improvement and provides greater confidence in the study. The authors may have misinterpreted my comments regarding why short measurement times can be problematic. It's not so you can better average the plume, but that you have more opportunity to take measurements at optimum wind conditions and orientations relative to the source. Plumes swing around and, depending on the sampling rate and location of the measurement system, you may only catch a few optimal measurements which leads to higher quantification errors. Longer measurement times mean you have a higher chance to collect more measurements from the right wind direction and at a good wind speed. You can extend this further using Bayesian inversion analysis, using non-perturbed measurement information with wind orientation (from "bad measurements") to better constrain the width (hence shape) of the plume under different wind speeds, directions and mixing conditions. This provides more information to generate an accurate estimate, but it takes time (more than 2 hours). As highlighted in the supplementary information, unfavourable wind speeds and directions were an issue for several of the measurement techniques. A comment reflecting this would be useful.

Thank you for the comment. We added the statement "Several of the monitoring techniques would have benefited from longer release durations with longer measurement windows to yield more accurate estimates. However, some specific techniques lacked measurements or favorable measurement conditions during the 2-hour releases." to Line 444.

Ln 194 – (units in kg/h-1, node height also shown in header)

The unit (kg h⁻¹) was added to the table header.

Ln 221, table 2-please include general quantification approach for OGI1 and OGI2 for consistency.

The quantification approach description for OGI1 and OGI2 was added to Table 2.

Ln 227, Figure 3. Regression slope for Fixed 1 doesn't appear to go through zero. Please update slope and r².

The x axis and y axis were rearranged to make 1:1 line clearer.

Ln 331, Figure 5 – Mean error values in red on plot are too small to read.

Figure 5 was updated using bigger labels.

Ln 337, Figure 6 – I still suggest that this figure is unnecessary and simple comment that removal of vent stack emissions did not appreciably change the errors for the different techniques is sufficient, but I'll leave that to the editor!

Figure 6 was moved to the supplementary material.
Ln 445, removes Besides.

“Besides” was removed.

Ln 469, do you mean source-level precision or accuracy?

It is source-level precision.

Ln 527 – It appears that the tracer technique and helicopter based Lidar are the most reliable and effective techniques for accurate quantification of emissions, provided that it is possible to release the acetylene at the correct location for the tracer test (consistent with what was observed at the Ginninderra controlled release experiment). The tracer doesn't require plume modelling and the helicopter technique is not constrained by on the ground infrastructure. I suggest that this is quite an important finding from this study for this type of application.

The statement “The tracer and helicopter-based Lidar appear to be reliable and effective techniques to quantify the emissions accurately. The tracer does not require local dispersion modelling and the helicopter technique is not constrained by the ground infrastructure. However, the tracer technique could be hampered by the lack of ability to locate the tracer release appropriately to ensure that the tracer atmospheric dispersion reflects the methane one (Ars et al., 2017).” was added to Line 496.

Supplementary information comments:

Section 1, ln 1 – replace Aera with Area

It was corrected.

Section 1.1, ln 6 – Area B

It was corrected.

Section 1.6, ln 8 – Area A

It was corrected.

Section 1.7, ln 11 – athermalize is the uncorrected word. Equilibrates?

It was replaced by equilibrates.

Section 1.8 – please describe the type of measurements system for the methane detector (e.g. IR?)

“A methane detector (Huberg Laser One based on Tunable Diode LASER Absorption Spectroscopy)” was added to Section 1.8 at Line 2.

Section 1.9 and 1.10 – please describe in general terms the approach taken to quantify the emissions, e.g. inverse Gaussian plume modelling using meteorological data?

The quantification approach description and relative websites about the quantification software were provided to Section 1.9 and Section 1.10.