

Note to the editor

We realized that the second part of the study, using the WRF-LES modeling system, was based on a previous version of the EM27 observations which have been further calibrated for surface pressure differences. Therefore, we have updated the results using the latest version of the data to make our analysis consistent throughout the paper. The emissions estimates have changed as presented in Table 1. The Figures 10, 12, S1, and S2 were also updated. Overall, our conclusions remain similar, with a better agreement compared to previous studies. The spatial distribution of the emissions remains mainly unchanged with small changes in the magnitude of the emissions.

We wanted to draw your attention to these changes and let you decide if they require additional reviews before publication.

Best regards,

Dr. Camille Viatte, on behalf of all the co-authors.

Response to referee #2

Somewhere, maybe in Figure 4, I suggest showing what the wind direction was for these measurements. Additionally, how did the authors treat negative anomalies? I didn't see discussion of that in the text.

As seen in Figures 1 and 8, wind measurements were collected at the two local airports, not co-located with our EM27 sensors. The mean horizontal wind direction and speed vary significantly as shown by the WRF-LES model, mostly due to the local topography. This spatial variability generates non-homogeneous advection of methane across the domain. Therefore, it is not obvious what wind directions data could be used to add to Figure 4. Also negative anomalies are treated as equal as positive anomalies, which could be improved in future studies by applying a more selective approach for the background X_{CH_4} conditions. We added some discussion in the Section 5 at lines 575-583.

I'm confused by the caption in Figure 12. What are units of emission magnitude? The caption text says this graph is showing the a posteriori fluxes, but the color legend says it is relative to the prior. Does this mean the prior has been subtracted from the posterior? If this is the difference, I suggest the authors show the total a posteriori emissions.

We show the multiplicative ratios between prior and posterior emissions. Because the prior emissions were kept constant over the domain, Figure 12 can be converted directly into a net emission map by using the initial value of the prior. We chose not to show the net posterior emissions due to large emission errors of individual pixels. Instead, we have used the ratio between the prior and the posterior emissions to highlight the spatial gradients instead of the net emissions which are highly uncertain. To help the readers do the conversion, we have added the following sentence in the caption: "A multiplicative ratio of 1 is equivalent to a flux of $2150 \text{ mol.km}^{-2}.\text{hour}^{-1}$."

In line 83, I would not classify the San Juan basin as a 'point source'.

We've delated the word "point".

In line 246, do you mean dairies are not distributed randomly across Chino? Or do you mean they are within your domain?

We assumed that the cows are randomly distributed within our domain for any given day, and therefore no error correlation should be assumed in our inversion.

In line 287 says 'we used the averaged of each day'. Averaged what? Lowest measured xCH4?

We clarified in the text how we used the daily minimum to define the background.

All the following revisions have been changed as suggested by the reviewer:

In line 60-61, change to 'flux estimations ... are needed'

In line 62, change 'approach' to 'approaches'

In line 202, change to 'the effect of the most important'

In line 203, change to 'are not parameterized'

In line 286, add a significant digit to 1.830

In line 341, change to 'distance in meters'

In line 378, change to 'measurement days'

In the References section for Chen et al. (2016), there is an extra period after ACP abbreviation