

We thank the editor and reviewers for their follow-up comments. We have made the suggested modifications, changed the wording around variability and noise, and moved the two noted sections to supplementary material.

11 May 2026

Editor decision: Publish subject to minor revisions (review by editor)

by Dominik Brunner

Public justification (visible to the public if the article is accepted and published):

Dear authors,

Thank you for the comprehensive revisions. The reviewers are largely satisfied with your replies and improvements to the manuscript.

There are only a few small remaining points that need to be addressed.

One point concerns the potential influence of background variability, which in the current paper is only referred to as "instrument noise", but the problem is not instrument noise but real variability.

Another point is that the publication is quite long and some parts could be moved to the supplements to improve readability, in particular the sections about ground-level measurements and possibly also the analysis of sensitivity to random effects.

Apart from this, the reviewers raised only a few small points mainly about wording.

Best regards

Dominik Brunner

Suggestions for revision or reasons for rejection

Review of: "Optimizing Airborne Emission Rate Retrievals with Sub-Hectometre Resolution Numerical Modelling", by S. Fathi, M. Gordon & J. Hao.

By: Anonymous Reviewer

General comment:

The authors have sufficiently addressed the remarks posted in the preceding reviews. I therefore recommend to publish the study after addressing some minor (technical) comments listed below.

1. I recommend to move the analysis of ground vehicle sampling (2.5, 3.1.5.) to supplement and use the results only as indication / outlook for future studies. I agree this is an interesting and important place to look for estimation improvement – however, as the Authors state in their revised manuscript, the assumptions of performing such measurements are rather unrealistic (speed of 60km exactly below the aircraft path, at any distance, is impossible to achieve). Furthermore,

modelling near the surface gets more challenging with small-scale effects, surface parameterizations, accurate land-use playing more role.... This requires a more detailed consideration, as it stands it feels a little forced, and the study is already quite rich.

The analysis outlined in Sections 2.7 and 3.1.5 is moved to Supplementary Material, S1.

2. Similarly, sensitivity to random effects can also be moved to Supplement (or Appendix). Here, the analysis is sound, but as the results show the effect is small, perhaps it's sufficient to summarize it in a short sentence (plus reference) – mainly for brevity.

This analysis in Section 3.1.2 is moved to Supplementary Material, S2.

Other minor comments:

L22: “transect spacing” – vertical spacing of transects

Changed.

L31: “The time and spatial resolutions of” – “The temporal and spatial resolution of...”

Changed.

L187: “no indication of mass on the higher levels of the flight” – perhaps “no indication of tracer/plume reaching higher flight levels”?

Changed to “...provided there is no indication of the plume reaching higher flight levels”.

L248: “In actual flights, the screen length (...)” - I suggest to modify slightly. In some cases the screen length needs to be pre-determined before the flight and cannot be modified; this is particularly true for tighter airspaces where communication with air traffic control is critical – especially for faster moving aircraft.

Changed to “In actual flights, the screen length may be determined in real time by observing concentrations while flying through the plume, although in some cases a predetermined flight configuration may be required.” (added or modified text in bold)

L458-460: “The results demonstrate..., and it will depend on the goals of the investigation”. –effect of different meteorological conditions (PBLH, variability of wind speed and direction) should be mentioned here as well

We add the text “The results will also depend on different meteorological conditions (boundary-layer height, variability of winds), as evidenced by the differences between flight cases.”

Suggestions for revision or reasons for rejection

The authors have done a good job in addressing my comments. The additional analyses regarding the kriging, vertical transect spacing and the use of a ground vehicle all help to unpick the various factors contributing to the random and (in particular) the systematic errors. I only have a few more minor comments:

The additional discussion regarding the real-world impact of background variability is confusingly phrased. In both places the additional text refers to "noise" in the measurements, which makes this sound like an instrument issue. Of course if you have a drifting instrument that is a problem, but in most real-world studies I've come across it is real variability in the measured mole fraction (i.e. from upwind sources) that dominates the background uncertainty. I suggest rephrasing the added text to reflect that.

In section 3.1.1, we change this to “...there may be additional error due to variability in the concentration (either due to measurement noise or variability in the concentration due to turbulence)...” (added or modified text in bold).

In the Conclusions, the text is modified to “...increased relative uncertainty due to spatial and temporal variability in the concentration...”.

I like the new ground-vehicle analysis. Even though this is an idealised case, it really does support the case that for flight a) the trend in the red curve is coming from the extrapolation. It would be really nice to see this analysis repeated for the other flights though. If they all show a similar qualitative result then it would provide food for thought when planning future real-world experiments. Even in cases where a vehicle couldn't be driven beneath the lowest transect, one could imagine using a low flying drone, or even multiple drones depending on the transect width.

Given the concern from the editor about the length of the paper and the second reviewer's comments concerning the realism of the analysis, we have opted to move this to the supplementary information. We hope to explore the use of low-flying drones to sample plumes or augment aircraft studies in future work.

L522 - rephrase "maybe not be evenly distributed between below and above"

This is rewritten as “... the total plume concentration above 150 m may not be equal to the total plume concentration below 150 m”.

Fig. 11 - caption should say "area sources" not "stack sources"

Changed.