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Comment on acp-2021-343

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Referee comment on "Evaluating the Impact of Storage-and-Release on Aircraft-based Mass-Balance Methodology Using a Regional Air Quality Model" by Sepehr Fathi et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-343-RC1, 2021

This paper is a useful contribution to an important and neglected topic, the estimation of uncertainty in top-down emissions estimates. It is reasonably clear, comprehensive, and will provide an important reference for further work on the topic. I have a few suggestions for possible minor improvements, but generally find the paper suitable for publication.

General comments:

1. The analysis assumes a certain framework for the observations, that is, repeated passes ("screens") at different altitudes, at relatively short distances downwind of the source. This is one common observation strategy, particularly applicable to compact sources. The other common strategy is to fly single legs at longer downwind distances in well-mixed conditions (see for example the works by Jeff Peischl and coauthors). That strategy is better for large area sources. Some comments about the applicability (or not) of this analysis to the alternative flight strategy would be useful. In particular, how does the uncertainty found here depend on downwind distance?

2. I am somewhat skeptical of the claim that the Revised Terra Retrieval method used in the model can be replicated in the real world by duplicate flights. For that to be true, the duplicate flights would have to provide a robust estimate of the time derivative of the observed concentration. For the concentration variations shown in figure 7, for example, two randomly chosen points in time would not be likely to produce a robust estimate. Two are certainly better than one, but maybe not good enough. Please comment.

Minor comment:

1. The marker colors in all the figures should match. For example, I think the colors in figure 8 don't match figure 3.