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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Assessing the capability of different satellite observing configurations to resolve the distribution of methane emissions at kilometer scales" *by* A. J. Turner et al.

Anonymous Referee #1

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This paper describes results from an observing system simulation experiment (OSSE) to assess the potential to quantify sources of methane from different satellite observing systems. The focus is on emissions at the kilometre scale, both constant in time and transient. The paper is well written, and I recommend publishing after the following minor comments are addressed.

General comments:

It is amazing to see the enormous improvement in capabilities over the past decades (and in the upcoming decade) to quantify emissions from space with ever increasing spatial (and temporal) resolution. However, one might ask, where the limit would be

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Discussion paper

e.g. in spatial resolution to retrieve useful information e.g. in the context of mitigation. Given the focus on the kilometre scale, and on temporal variations down to hourly, why not go to even smaller scales? I suggest this should be discussed in the introduction to better motivate the targeted spatial and temporal scale.

Specific comments:

Fig. 4: The methane enhancement looks somewhat patchy, with a number of white pixels with zero or near-zero enhancement next to pixels with significantly larger enhancements. Given that the atmosphere due to advection and mass conservation is expected to be continuous in those enhancements, and given that the grey-scale used for the visualization does not have any step changes, the figure is surprising.

Fig. 6, right panel: the colour regions don't follow the lines as they should (and as they do in the left panel).

L334-336: Please clarify: you state "Analysis of HˆHˆT does not yield the eigenvectors of F", but the previous sentence states otherwise.

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