We thank the reviewer for their suggestions and comments on the manuscript. Below, we have replied to the review and have detailed the corresponding edits that we have made to the manuscript. We have listed the reviewer comments in *black italic* and the replies in blue.

I don't feel that the authors have addressed my minor comments from the first round. I suggest Minor Revisions again.

The main point of this paper is to tell us what we can learn about OH from satellite observations of methane. That is the question posed in the title of the paper. Previous work, including from many of these same authors, have looked at a similar question but reached very different conclusions. For example Worden et al. (2015) and Zhang et al. (2018) both found benefits from including TIR measurements. The OSSE from Zhang et al. (2018) found TIR measurements to be better at separating OH changes from methane emissions than SWIR measurements (their Figs 7-8). Worden et al. (2015) found that combining SWIR and TIR measurements to be helpful for assessing lower tropospheric methane. The findings from Penn et al. seem counter to previous work from these same authors. As a reader I am left wondering why.

The justification in the updated text seems to indicate that they think using SWIR and TIR from the same instrument might help, but its not clear why. The DOFS likely wouldn't change much from what was considered here. Why does would that give them more DOFS than AIRS did?

We now better place our results in the context of Worden et al. (2015) and Zhang et al. (2018), and explain why SWIR and TIR measurements from the same instrument may do better. Specifically we have added the following text:

In Section 4.1:

"Our finding that AIRS does not add much information for optimizing methane emissions beyond GOSAT alone is not inconsistent with a previous finding by Worden et al. (2015) that TIR information from the TES satellite instrument improves the retrieval of lower tropospheric methane compared to a GOSAT-only retrieval. In our inversion, the GEOS-Chem forward model effectively provides the information to separate lower tropospheric methane from higher altitudes. An implication is that TIR observations are not necessary for enforcing that separation beyond the information from GEOS-Chem. "

In Section 4.2:

"Our finding that AIRS provides little information on $[\overline{OH}]$ beyond that provided by GOSAT contrasts with the Zhang et al. (2018) OSSE that found TIR methane observations to add significant information on emissions and $[\overline{OH}]$ relative to SWIR alone. That OSSE may have found a greater benefit from TIR because they assumed the SWIR and TIR synthetic observations to be perfectly consistent, while there are likely inconsistencies between the GOSAT and AIRS observations beyond our global correction (Figure 1) that translate into the differences between GOSAT-only and AIRS-only inversion results. Zhang et al. (2018) also gave the same weight to SWIR and TIR observations whereas we find that the weight for AIRS observations should be half of that for GOSAT based on optimization of the γ coefficients

(Section 2.5). Beyond this, comparison of our results with Zhang et al. (2018) is difficult because they emulated different satellite instruments (TROPOMI for SWIR, CrIS for TIR) and did not report their assumed observational error variances."

and in Conclusions:

"Retrievals combining SWIR and TIR information from the same instrument, such as GOSAT-2 (Kuze et al., 2022; Suto, 2022), could possibly improve the constraint by separating lower and upper tropospheric contributions to the methane column being internally consistent."