Dear Editor,

We appreciate the reviewer's suggestion to perform calculations sampling ERA5 data with AIRS averaging kernels. The topic they are concerned about, namely the effective vertical resolution of the data, is indeed important.

Reprocessing the data with the AIRS averaging kernels specifically would be burdensome, since we would have to regenerate the entire ERA5-FCST dataset and all of the paper's results. The main concerns are addressed in a new sensitivity test whose results are displayed in Supplementary Tables 2—3. In main paper Section 2.1 we added:

"The AIRS L2Sup vertical layering is also far finer resolution than the "effective" vertical resolution of the retrieval, as discussed in Irion et al. (2018). In reality, the retrieval can only capture smoother changes in profiles than reported on the L2Sup layering, but we also find that our results are likely robust to the AIRS effective vertical resolution (Supplementary Tables 2—3). For FCST the finer L2Sup layering is preferred since it provides more parcels to HYSPLIT."

The only other main text changes are corrected numbering to reference later Supplementary Tables.

We think that reprocessing the entire ERA5-FCST dataset using the AIRS averaging kernels would raise issues such as how the averaging kernels do not capture the "true" information content of the AIRS spectra in new v7 retrievals, thanks to the way in which the prior is calculated. New supplementary text discusses this point and how the true effective vertical resolution may be finer than we use in our tests. Our conclusions appear robust in our strict tests and we believe we have now fully addressed all reviewer comments.

Thank you once again for your time and consideration, and to the reviewers who provided careful and thoughtful reviews.

Dr. Mark Richardson, on behalf of all authors.