Response to Comment 2:

My point was just that for cases where the met model used by CAMS is simulating a cloud where ISCCP is flagging as clear, then the RH in the simulation will be ~100%, which will yield an unphysically high AOD due to hygroscopic growth. Provided the model and ISCCP differences are small this won't matter too much, but I would prefer just using the cloud data from the ERA5 model to be self consistent in the OSSE. As far as I can tell the main reason for using ISCCP is to simulate realistic observability statistics. My intuition would be to opt for self-consistency above this. It is a relatively minor point (not worth redoing simulations) but I would consider doing this in future studies.

Response to Comment 5:

The introduction now includes this line about multi-band retrievals

P3, L49: *However, as is seen in most related studies (e.g. O'Dell et al. (2018)), the major drivers of biases are retrieved surface pressure as well as the retrieved CO2 profile shape, and retrieved aerosols and surface albedo contribute much less to the total bias correction (OCO-2 Science Team, 2023).*

I'm not sure you can necessarily conclude that aerosol-surface impacts do not drive changes in multi-band retrievals because surface pressure and CO2 profile shape are the main predictors in the bias correction. An alternative explanation could be that the impact of aerosol scattering may induce changes in the retrieved surface pressure and CO2 profile shape. Both are modified by aerosols - perhaps surface pressure more obviously, but changing the vertical distribution of CO2 can also be related; To first order the CO2 layer jacobians are strongly correlated but differ by scaling factor due to pressure broadening (effectively absorption becomes less efficient at higher altitudes, because the narrow lines are already saturated). In this case unphysical profile shapes could actually be a result of compensating for errors induced by not simulating the correct wavelength-dependent aerosol optical properties between the bands.

It is possibly more informative to look at the change in XCO2 as a function of albedo (e.g. Fig 5. Of Taylor et al. (2023)). In that case at least I think you still do see correlations between the bias correction and surface. I am not saying the multi-band retrievals are useless. My interpretation is that the retrievals are not perfect, aerosol-surface interactions induce some unphysical changes to the retrieved state (which only happens because of the additional light path constraints from the additional bands), and this allows an empirical correction.

Taylor, T. E., O'Dell, C. W., Baker, D., Bruegge, C., Chang, A., Chapsky, L., Chatterjee, A., Cheng, C., Chevallier, F., Crisp, D., Dang, L., Drouin, B., Eldering, A., Feng, L., Fisher, B., Fu, D., Gunson, M., Haemmerle, V., Keller, G. R., Kiel, M., Kuai, L., Kurosu, T., Lambert, A., Laughner, J., Lee, R., Liu, J., Mandrake, L., Marchetti, Y., McGarragh, G., Merrelli, A., Nelson, R. R., Osterman, G., Oyafuso, F., Palmer, P. I., Payne, V. H., Rosenberg, R., Somkuti, P.,

Spiers, G., To, C., Weir, B., Wennberg, P. O., Yu, S., and Zong, J.: Evaluating the consistency between OCO-2 and OCO-3 XCO_2 estimates derived from the NASA ACOS version 10 retrieval algorithm, Atmos. Meas. Tech., 16, 3173–3209, https://doi.org/10.5194/amt-16-3173-2023, 2023.

Response to Comment 5:

I wasn't suggesting a study of the 1.6 micron CH4 band. The paragraph currently states that with regard to aerosol-surface biases, there is "no reason to assume that the same behavior arises with retrievals from the 1.65 μm window". However the underlying mechanism for the bias is still the same, and because the band is at a shorter wavelength, aerosol and Rayleigh scattering are larger, so if anything it may be slightly worse for the single band retrieval case. I was pointing out the reason why such surface-correlated biases may be lessened is that retrievals from this band often use the CO2 proxy method.