

The authors would like to thank Referee #2 for their comments on our manuscript entitled, "The Impact of Improved Aerosol Priors on Near-Infrared Measurements of Carbon Dioxide." Below, we have addressed their comments and made the necessary changes in the manuscript.

p.3, l.6 "Often, a constant... aerosol setup": please give some literature references.

We have added Parker et al. (2011) and O'Dell et al. (2012) as references.

p.5, l.8 "The co-location... Fig. 2." 1 degree latitude/longitude seems to be quite coarse and this may possibly lead to differences between ground- and satellite observation that are related to spatial representativeness. Did you test a smaller region (e.g. 0.5x0.5 degree) and does this influence one of your findings? (e.g. the relatively poor correlation between AERONET AOD and OCO-2 retrieved AOD, see Fig. 3).

Because CO₂ and aerosols tend to vary slowly in space, this large co-location criteria has been shown to give similar errors to using smaller regions (e.g. 0.5 x 0.5 degrees.) However, because of OCO-2's narrow path the number of co-located measurements is greatly reduced as the distance thresholds are lowered.

Also on Fig. 3: how can the high correlation (0.74) between the AERONET AOD and the GEOS-5 AOD be understood? Does GEOS-5 rely on assimilated AOD from satellites? If so, then perhaps it is worth to mention this in the paper.

Yes, GEOS-5 ingests MODIS and MISR aerosol data. We mention this on p.7 l. 5.

p. 5, l.16 "We co-located... Basu et al., 2013): 9 global carbon models are mentioned, but only 8 references are given. Please check if one is missing.

We have added the final citation (Schuh et al., 2019). Technically it is still in review, but will likely be fully published in the next few weeks.

p.5, l.31 "These filters... (from IDP)": please specify the threshold values used for the three filters.

The filter threshold values have been added.

p.6, l.1 "Thus, all... are present.": please specify the threshold used for a thin/thick aerosol layer (e.g. below what AOD a scene is considered 'clear sky?')

An exact threshold does not exist, because we generally do not know the true AOD for each OCO-2 measurement. However, in our TCCON validation section we are also

co-located with AERONET and thus can show that our filtering techniques remove any OCO-2 measurement with a co-located AERONET AOD of greater than 0.25. We have added this information to the paper.

p.13, l.24 “So long as... other regions”: it is not clear from this sentence if the authors here refer to “large aerosols” (in size) or “large amounts of aerosols”?

We have modified the text to indicate that we are referring to large amounts of aerosols.