Response

We would like to thank the reviewers for their time reviewing the changes we made to the manuscript.

We have addressed the below comments in Report #2 as follows:

- In Section 2.3, could you please provide explanations on how MODIS COSP Level 3 differs from standard traditional MODIS L3 data, and why it is necessary to use this specific dataset?
  We have added the following text ~L150 to describe how MODIS COSP Level 3 differs from standard Level 3:
  "… The dataset was recently produced to facilitate comparison with results from the COSP (CFMIP Observation Simulator Package) MODIS simulator that is a software tool that can be employed in climate models to produce data comparable to satellite observations. The definitions of variables within this dataset are more in line with the MODIS simulator than standard MODIS products. Therefore, the MODIS COSP dataset is particularly useful for observation-model comparison."

- In the caption of Figure 1, could you please clarify the difference between OMPS and MOPS-coarse?
  We have clarified the differences between OMPS and OMPS-coarse in Figure 1 caption:
  "Figure 1: Total column amount of SO_2 (Dobson Units) retrieved from OMPS (1.0 x 1.0 °), OMPS-coarse (OMPS regridded to UKESM1-Hol resolution) and simulated in UKESM1-Hol within the plume mask for the midweek day of the four weeks in September 2014 being analysed."

- In the caption for Table 1, "Nd" and "d" should be corrected.
  Corrected.

- Line 430: You mention Figure 8, but the paper does not contain a Figure 8.
  This should have referred to Figure 7 and has now been corrected.

- These citations are missing DOIs:

  Jones, A., Roberts, D. L., Woodage, M. J., and Johnson, C. E.: Indirect sulphate forcing in a climate model with an interactive sulphur cycle, J. Geophys. Res., 106, 20293–20310, 2001

  Khairoutdinov, M. F. and Kogan, Y. L.: A new cloud physics parameterization in a large-eddy simulation model of marine stratocumulus, Mon. Weather Rev., 128, 229–243, 2000.

The year should be at the end here:

Pincus, R., S. Platnick, S. A. Ackerman, R. S. Hemler, and R. J. Patrick Hofmann, 2012: Reconciling Simulated and Observed Views of Clouds: MODIS, ISCCP, and the Limits of Instrument Simulators. J. Climate, 25, 4699–4720, https://doi.org/10.1175/JCLI-D-11-00267.1.

A dot is missing here at the very end:

Trofimov, H., Bellouin, N., and Toll, V.: Large-scale industrial cloud perturbations confirm bidirectional cloud water responses to anthropogenic aerosols. Journal of Geophysical Research: Atmospheres, 125, e2020JD032575. https://doi.org/10.1029/2020JD032575, 2020

We have corrected the citation formatting.

- In addition to the above technical corrections, we spotted a couple more. We have corrected the following:

  At L210: model simulations are just nudged to winds not wind and temperature.

  Code and data availability: was missing L3 MODIS COSP source and we have added in the Zenodo doi that was a placeholder previously.