

Response to reviewer 2

I'd like to thank the reviewer for their time and many useful comments. I think the paper has improved in clarity as a result of their feedback.

The reviewer suggests condensing the paper. Other reviewers have suggested this as well, pointing out the use of supplementary pages. I have decided to move part of the AOT representation discussion (e.g. variations by regions) and the entire AAOT representation discussion to a supplement. That should significantly shorten the main paper, without detracting from the main conclusions. The original AAOT analysis will be available for those with an interest in it.

[..] These seem to be potentially interesting results which are not discussed in this pa- per: representation errors also vary based on the aerosol type itself [..]

I think there is definitely room for a study on the impact of aerosol species on representation errors. Here and there in my papers I have alluded to this. E.g. in S16a the differences between black carbon, sea salt and sulfate were briefly discussed. It is not so much the species itself but the spatio-temporal distribution of its sources that is the important factor. A proper investigation would be outside the scope of the present paper which already is quite large. For the impact of dust on the G5NR evaluation (which is different from an analysis of representation errors), see e.g. Table 5.

Does Fig 17 have a different collocation protocol for the brown bars than the others?

No, it doesn't but I forgot to update the caption to bring it in line with other figures. Changed now.

p. 3 , Lines 28-29: I believe CERES "cloud fractions" are derived from their collocated MODIS instruments.

The reviewer is correct but I prefer to stick with CERES cloud fraction as this is the form used in Gelaro et al. 2015. They are cloud fractions derived from MODIS, specifically for CERES.

p. 7 Line 5: "correlation (~0.45)". To what does this ~ refer?

It means, "about". I believe this is standard usage: <https://en.wikipedia.org/wiki/Tilde#Mathematics> .

p. 7 Line 20: as the other reviewers said, this is not strictly true; the L2.0 data have a minimum AOT of 0.4 at 440nm, which here has been interpolated to ~0.25 at 550nm. I'd clarify this point.

The reviewers are of course correct and this point will be clarified.

-Figure 1: which is the solid and which is the dashed line? This should have a caption.

Thank you. Red solid is correlation, red dashed is slope, blue solid is mean, blue dashed is standard deviation. This information has been added to the caption.

Figure 21: the color bar from Fig 7 should be reproduced here; also there should be units added to the BC emissions shading.

I'll try to add a colour bar for the representation errors. The unit for bc emissions is mentioned already in the title.

-throughout the paper, I believe the singular form of "criteria" should be "criterion," not "criterium."

Changed.

-Figures 6 and 7: captions say top/bottom, but should say left/right. Also "yearly"

Changed. Actually, the top/bottom issue is due to different formats used for Discussions and Final publications.

-Figure 23: this figure could benefit from a 1:1 line to guide the eye.

Ok.

And thanks for bringing those typos and misspellings to my attention. They have been corrected.