Thanks for spending a lot of effort revising the manuscript following the comments and suggestions. I think most of my comments and suggestions are addressed. I just wanted to echo what the 2nd reviewer has said, that the DA gave a relatively homogeneous dust emission change across the domain (Fig. 3a and 3b-d). This makes sense because the AERONET sites are far away from the two deserts. I think partly due to this reason, in the introduction and conclusion sections the authors kind of shifted the emphasis from improving spatiotemporal variability of dust to improving dust size distribution. My only concern here is that there is little evaluation on the posterior dust size distribution by comparing simulations against observations, which makes this paper's ending not very strong. At current stage I think authors could argue DA changes size distribution, but it is less obvious that DA improves it. Of course the posterior error decreases, but it does not necessarily mean improvements in the simulations.

I think there are little in-situ size distribution data from field campaigns, so there is not much to do about it. But, I would just suggest that authors make a simple plot on the prior and posterior dust volume size distributions from WRF (e.g., Ryder et al., 2018, Figs. 5-7; Li et al. 2022, Fig. 6), for grids containing the AERONET site and the two deserts. This will be helpful if future in-situ measurements come up from Chinese field campaigns. This also helps readers more directly visualize how DA changes the prior WRF dust size distribution to the posterior. (Fig. S3 is also very helpful by breaking things down into bins.)

Optional: Authors could also do a simple comparison against AERONET inversion data for some references of size distribution (e.g., https://aeronet.gsfc.nasa.gov/cgi-bin/data_display_inv_v3?site=Dalanzadgad&nachal=0&year=2021&month=3&day=16&aero_water=0&level=2&if_day=0&if_err=0&place_code=10&DATA_TYPE=76&year_or_month=0). Doing a small cross-validation for the AERONET size distribution and the WRF size distribution will make the paper's position stronger. I think this suggestion is more optional since AERONET inversion data also has uncertainties based on inversion of remote sensing data.

Other comments:

Figure 5: I am interested in Fig. 5 in terms of why there are increases over the Taklimakan and some regions of the Gobi but decreases over the majority of the Gobi. I think a science explanation is needed in the main text, but I could not find it.

Lines 247-250: I think there needs a science explanation on why or how adding AE changes dust emissions more so in bin 1 and bin 3 than other.

Figs. 7-8: Please add site labels to figure caption so people don't need to scroll back to Fig. 1 to look for what the colors mean.

Fig. 3a-d: Please indicate the unit of dust emissions on the colorbars or in the figure caption. Same for Fig. 5.

In Fig. 1a: Please indicate what the color scale means (although we somehow can guess it).

References:

Ryder, C. L., Marenco, F., Brooke, J. K., Estelles, V., Cotton, R., Formenti, P., McQuaid, J. B., Price, H. C., Liu, D., Ausset, P., Rosenberg, P. D., Taylor, J. W., Choularton, T., Bower, K., Coe, H., Gallagher, M., Crosier, J., Lloyd, G., Highwood, E. J., and Murray, B. J.: Coarse-mode mineral dust size distributions, composition and optical properties from AER-D aircraft measurements over the tropical eastern Atlantic, Atmos. Chem. Phys., 18, 17225–17257, https://doi.org/10.5194/acp-18-17225-2018, 2018.

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