

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-572

Anonymous Referee #1

Referee comment on "Quantification of the dust optical depth across spatiotemporal scales with the MIDAS global dataset (2003–2017)" by Antonis Gkikas et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-572-RC1>, 2021

This manuscript presents a new but previously published data set of global, daily dust optical depth (DOD) at 0.1° spatial resolution and the resultant spatio-temporal features of dust activity over global major dust hotspots. While this is an interesting data set with a lot of potential scientific applications, and this article is well organized and well written, it looks more like a review article rather than an original research article. Indeed, this article reminds me of Ginoux et al (2012) published in Review of Geophysics, which reviewed global dust sources and their seasonal features based on a global, daily, 0.1° data set of DOD derived from MODIS measurements. My main suggestion for the current authors is thereby to decide if you want it to be a review article or a research article.

Whether you are transferring or not, I suggest making clear about the quality of your data set throughout the paper. For example when you show the annual mean DOD over certain region, please mark the questionable regions, such as Gulf of Guinea.

Talking about data quality, does MERRA2 typically assign low MDF over agricultural dust source regions? I didn't find a formal assessment of MDF over agricultural areas, such as the Great Plains, southeastern Australia, either from the current manuscript or Gkikas et al (2021).

Another general question about the dataset is that if we grid this fine-scale product to the original MERRA2 grid, do we get pretty much MERRA2 DOD? Since MERRA2 assimilates MODIS AOD and MDF is defined as the ratio between MERRA2 DOD and MERRA2 AOD.

If you decide to retain the current article as research article, it is necessary to define a clear scientific question. I do not see the scientific question or hypotheses in the current manuscript.

If you decide to transfer to review article, I would suggest to highlight what are the new findings since Ginoux et al (2012). Maybe one aspect is about the long-range transported dust, since the data set Ginoux et al (2012) analyzed only covered land.

I'll be happy to review this paper again, either in its review article form or a more scientific question-driven form.