

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2021-73

Anonymous Referee #1

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Referee comment on "Observation and modeling of the historic "Godzilla" African dust intrusion into the Caribbean Basin and the southern US in June 2020" by Hongbin Yu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-73-RC1>, 2021

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Trans-Atlantic African Dust transports are of great scientific interests to satellite observations and model simulations over the past 50 years. The remarkable June 2020 African dust outbreak was historical in many ways, and thus a better understanding of the event from different viewpoints is particularly valuable to improving not only our satellite observations and retrievals, but also our model skills in simulating extreme events like this. This paper therefore makes significant contributions in at least the following three perspectives: 1) evaluated how well different observations (satellite and in-situ) are consistent to each other in observing extreme dust events; 2) proposed the plausible synoptic scale weather conditions that facilitated the dust transport, and 3) evaluated how well model simulations are consistent to observations that are crucial for improving our model capabilities in future.

The paper is well constructed with very organized structure. The discussions in the paper are very thoughtful with very solid scientific evidence based on observations and comparisons. The profound experience of the coauthors in both observations and model simulations is highly reflected in the writing of the paper and very impressive. Their understanding on the African dust origination, transportation, and modulation, as evidenced in the paper, shed valuable light on future African dust related scientific investigations.

It is highly recommended that the paper is accepted as is in its current format.

I have the following two general comments that are for discussions and future work, not for any changes to the current paper. And I don't really anticipate any responses from the authors to answer these questions for the publication of the current paper. I hope the discussions between the authors and the audience can foster any future research interests, collaborations, and scientific explorations:

1) How geostationary satellites (ie. GOES-R) may observe the event with much higher temporal resolution?

2) How well the data synergy of the Aqua/Terra MODIS + S-NPP/N20 VIIRS may help improve African dust event observations with increased temporal sampling?

3) The paper has very valuable and thoughtful discussions on how model should improve to better capture the characteristics of such synoptic scale events. How about satellite observations or event future satellite designs? What are the additional information we want to know about these events that are currently lacking in the observations from space?

4) I found the discussions on AOD and PM10 of the same event very intriguing. I know it is out of the scope of this paper, but for future work, it would be very interesting to see how the optical measurements or observations can track (or match) the density measurements or observations, for such extreme events.

5) With AI/ML experts in the authorships of this paper, it is worthwhile to explore how AI/ML may help the community to forecast extreme events, or at least pick up the trajectory or other SAL patterns and properties in a much better way to establish a new African dust outbreak database that are valuable for both observations and model simulations.

I also have a few very minor editorial suggestions that are only for the authors' consideration in the attachment.

I strongly believe this paper will make significant contributions to advancing our understanding on the Trans-Atlantic African Dust Events from both sides of observations and model simulations. I sincerely look forward to the full publication of this important paper at ACP.

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2021-73/acp-2021-73-RC1-supplement.pdf>