Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., author comment AC2
https://doi.org/10.5194/acp-2021-129-AC2, 2021
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Reply on RC2

Dustin Francis Phillip Grogan et al.

Author comment on "Investigating the impact of Saharan dust aerosols on analyses and forecasts of African easterly waves by constraining aerosol effects in radiance data assimilation" by Dustin Francis Phillip Grogan et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-129-AC2, 2021

Response: We thank the reviewer for his/her very careful reading of the manuscript and for the suggestions for improving it.

General Comments: The authors perform experiments with the GFS model which includes the radiative effects of aerosoles through data assimilation (GDAS). Those runs are called aerosol-aware runs. The control runs do not include the aerosol effect. Both types of runs were performed for the whole of August and two AEWs in 2017 which resulted in Hurricanes Gert and Harvey. The authors found for the time averaged analysis over August 2017, that in the aerosol aware run the AEJ and the WAM were accelerated and the temperature in the Saharan boundary layer increased, which lead to a modification of the vorticity structure and an increase in the northern and a decrease in the southern circulation. The authors also showed that in the aerosol-aware runs the errors of forecasting the AEW out of which Hurricane Harvey formed were reduced, but no improvements were found for the AEW out of which Gert formed. The paper is very well written, the aim of the paper and the results are very clear. I think this paper will be of interest to the scientific community. I only have very minorcomments.
Minor Comments:
Grammer Comments Reponse: All minor comments pertaining to grammar have been fixed in the revision.
p. 5, l. 137: Did both storms occur in this period? Seems like this is a period for Harvey and not Gert. Maybe this is coming later but it would be good to state somewhere for which period both sets of runs where computed. **Response:** Yes, both storms occurred during our period of interest. In Fig. 2 of the revised manuscript, the tracks and the dates of the storms now overlay the figure.
p. 7, l. 187-190: Are those averages for the whole of August and based on the 34 forecast runs you mentioned earlier? So far you only spoke about the period 25-28 July 2017. Better to say which data set those averages are based on. **Response:** The time averages are for August, which is now mentioned in the body and figure captions of the revised manuscript. We have also expanded the methodology to improve clarity on the workflow for the experiments.
p. 9, l. 220: The text says "modulus" and the caption of Fig. 4 says "moduli". Why do you change between singular and plural? What exactly is a "relative vorticity amplitude modulus"? The caption says sqrt (zeta^2) is shown. **Response:** In the revised manuscript, we have removed the vorticity modulus (moduli) figure and replaced it with the 2-6 day filtered meridional variances, which is a well-established proxy for AEWs. The

results are the same.
p. 9, l. 233: Have you averaged over 700 and 850 hPa to get the streamlines shown? The caption says only streamlines at 700 hPa are shown. **Response:** No, the streamline and relative vorticity for the horizontal cross-sections occur at 700 hPa for Gert (Rev. Fig. 7) and 850 hPa for Harvey (Rev. Fig. 8). The change in elevation for Harvey is to better capture the two-circulation signal, which is now stated in the figure caption of Fig.8.
Fig. 2: You could add the times that are shown in this figure to the caption. What are the dots referring to? 6hly times? **Response:** The revised Figure 2 now has both storms on one plot and dates are shown for the storms while over West Africa.
Fig. 9: Which unit is shown on the colour bar? **Response:** the color bar refers to the colors in the circles corresponding to the BT differences. This is clarified in the figure caption of the revised manuscript.