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Comment on acp-2021-462

Anonymous Referee #1

Referee comment on "Impacts of the Saharan air layer on the physical properties of the Atlantic tropical cyclone cloud systems: 2003-2019" by Hao Luo and Yong Han, Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-462-RC1>, 2021

Luo and Han "Impacts of the Saharan air layer on the physical properties of the Atlantic tropical cyclone cloud systems: 2003-2019"

This study investigates the impacts of the Saharan air layer (SAL) on the physical properties of the Atlantic tropical cyclone cloud systems (TCCS) for the summer of 17 years. It divided the 70 TC samples into three categories, tropical depression (TD), tropical storm (TS), and hurricane (HU). It found that the SAL makes crucial impacts on the generation and evolution of Tropical cyclones (TCs). The authors have attempted to identify whether and how the effects of the SAL play a positive or negative role on the TCCS, and to draw a qualitative conclusion of how SAL affects the various intensities of the TCs. The conclusions are beneficial to better understanding of the physical processes and evolutions of TCs in the Atlantic region. In addition, the manuscript is well written. I would recommend its acceptance for publication after necessary revisions.

Considering that this article involves lots of satellite and ground-based data, such as AOD, CTT, CERi, and CIWP, Atlantic TC track data and meteorological data etc., I would suggest that the authors add more information about the data matching in part 2.

A schematic diagram in Part 3 to reflect the relationship between 3.1-3.3 might be helpful to the readers.

Line 33, I am not sure if this description is accurate or not. The North Atlantic is one of the areas with the most frequent TCs in the world, along with the west Pacific. However, I am not sure if the North Atlantic is an area with the most frequent TCs in the world. Actually, in my understanding the west Pacific have more and stronger TC activities than the North Atlantic. Anyway, please provide a reference to support your claim here.

Line 35-37, regarding these three kinds of aerosol radiative effects, three more references are recommended here, Albrecht (1989, doi: 10.1126/science.245.4923.1227), Garrett and Zhao (2006, doi: 10.1038/nature04636) and Zhao and Garrett (2015, doi: 10.1002/2014GL062015).

Line 40-45: In my understanding, mineral dust particles have weak absorption and strong

scattering, therefore, it is suggested that the author to examine the statement of this sentence "As absorbing aerosols, mineral dust particles absorb solar radiation and heat the atmosphere through the semi-direct effect, further enhancing cloud evaporation".

Line 50-58, The recent study by Sun and Zhao (2020) have done a comprehensive analysis about the dust aerosol effects on the meteorological environment, including the vorticity, temperature, wind shear, and humidity, which suggested a negative effect to TC formation. This recent study is worthy to read and mention here.

Line 62-64: Add a word "all" before the factors.

Line 94-95: Add a word "etc." at the end of this sentence.

Figure 1, it should be noted that the aerosol property (AOD) is generally averaged for time when there are no clouds (so no TC activities).

Line 113-116, The question is how accurate the meteorological variables from FNL reanalysis data are.

Line 155: Add "respectively" at the end of this sentence.

Line 168-170: Rephrase this sentence.

Line 200-201, Similar findings have also been found by a recent study of Zhao et al. (2018, doi: 10.1029/2018GL079427), which showed that aerosols can cause broader precipitation area (horizontal range of TC) and weaker maximum precipitation intensity (lower cloud thickness at the band near TC eye).

Figure 9, using " μm " might be better for the cloud effective radius unit.

Line 220-225: Adding the peak perpendicular line of the probability density function to FIG. 9, clarifying the moving value of the peak, the specific situation can be clearly marked on FIG. 9.

Line 267-269: Add "respectively" at the end of this sentence.