

Responses to comments of “Impacts of the Saharan air layer on the physical properties of the Atlantic tropical cyclone cloud systems: 2003–2019 [Preprint acp-2021-462]” to *Atmospheric Chemistry and Physics*.

Hao Luo, Yong Han

We would like to thank the editor Dr. Timothy J. Dunkerton and the reviewers for giving constructive criticisms and comments, which are very helpful in improving the quality of the manuscript. We have made the point-by-point response to the comments below and revised the manuscript accordingly. We hope that the revised version can meet the favorable approval and journal requirements. The referee’s comments are reproduced (*black, italic*) along with our replies (*blue*) and changes made to the text (*red*) in the revised manuscript. All the authors have read the revised manuscript and agreed with the submission in its revised form. Please check them.

Responses to Reviewers

Anonymous Referee #2

Review of “Impacts of the Saharan air layer on the physical properties of the Atlantic tropical cyclone cloud systems: 2003-2019” by Luo and Han.

General comments:

This is an interesting study that examines the impacts of the Saharan air layer (SAL) on the physical features of the Atlantic tropical cyclone (TC) cloud systems (TCCS) by using co-located satellite-based cloud and aerosol observations. The authors attempt to distinguish the various effects of SAL on different intensities of TCs, and further find out the probable causes of the varied feedback mechanisms. Based on the 70 TC samples during the summertime of 2003-2019, the varying impacts of SAL on different intensities of TCCS are well analyzed and concluded. They find that the various responses of TCCS to SAL are determined by the combined factors of dry air masses, the dust aerosols as ice nuclei, as well as the thermodynamic and moisture conditions. These conclusions may contribute to a better understanding of the physical mechanisms between the SAL and TCs over the Atlantic region. Overall, the manuscript is well written and the data are well analyzed and presented. Therefore, I would recommend its acceptance for publication in ACP after minor revisions.

Response: We would like to thank you for your time in reviewing this manuscript. We sincerely appreciate your positive assessment of our manuscript. We have revised the manuscript according to your suggestions, which helps us improve the quality of this paper.

Specific comments:

Comment NO.1:

Line 22: Please rephrase this sentence. “but the PDF curve becomes flatter for HU” should be “whereas the PDF curve becomes flatter for HU”.

Response: Thank you. This sentence has been rephrased.

Changes in Manuscript:

“When affected by SAL, the probability density function (PDF) curve of CER_i generally shifts to the smaller value for TD, whereas the PDF curve becomes flatter for HU.” [Page 1 Lines 22-23 (in the “Track Changes” version)]

Comment NO.2:

Line 60: Please specify what is meant by TCCS macro and micro properties. After reviewing all of the figures and the remainder of the paper, it seems that the macro properties include the cloud top temperature and the cloud ice water path, while the micro properties refer to the ice cloud effective radius. Since “cloud macro or micro properties” is a rather broad term that could be interpreted in many different ways, please state this clearly at least once.

Response: Thank you for your constructive suggestions and sorry for the unclear statements. We have provided clear definitions of TCCS macro and micro characteristics when introducing our work in the revised version.

Changes in Manuscript:

“Here, the TCCS macro characteristics include the CTT and CIWP, while the TCCS micro characteristics refer to the CER_i .” [Page 3 Lines 79-80 (in the “Track Changes” version)]

Comment NO.3:

Line 76: “characteristics” should be “variation characteristics”.

Response: Thank you. We have added “variation” before “characteristics”.

Changes in Manuscript:

“To illustrate the variation characteristics of Atlantic TCCS influenced by the SAL, we use the aerosol and cloud data from MODIS-Aqua, the TC track data from NOAA’s Tropical Prediction Center, and the meteorological data from the National Centers for Environmental Prediction-Final Operational Global Analysis (NCEP-FNL) dataset.”

[Page 3 Lines 84-86 (in the “Track Changes” version)]

Comment NO.4:

Line 224: Related to Line 22.

Response: Done.

Changes in Manuscript:

“When the SAL outbreaks, the PDF curve of CER_i generally shifts to the smaller value for TD (the peak CER_i decreases from 33.76 to 32.11 μm), whereas the curve becomes flatter for HU (the peak CER_i remains constant, while the PDF kurtosis decreases).”

[Page 14 Lines 253-256 (in the “Track Changes” version)]

Comment NO.5:

Figure 9: The units of cloud effective radius should be “ μm ” to match the units shown in Figure 11.

Response: Thank you. We have replaced the unit “micron” with “ μm ” in Figure 9 (Figure 10 in the revision).

Changes in Manuscript:

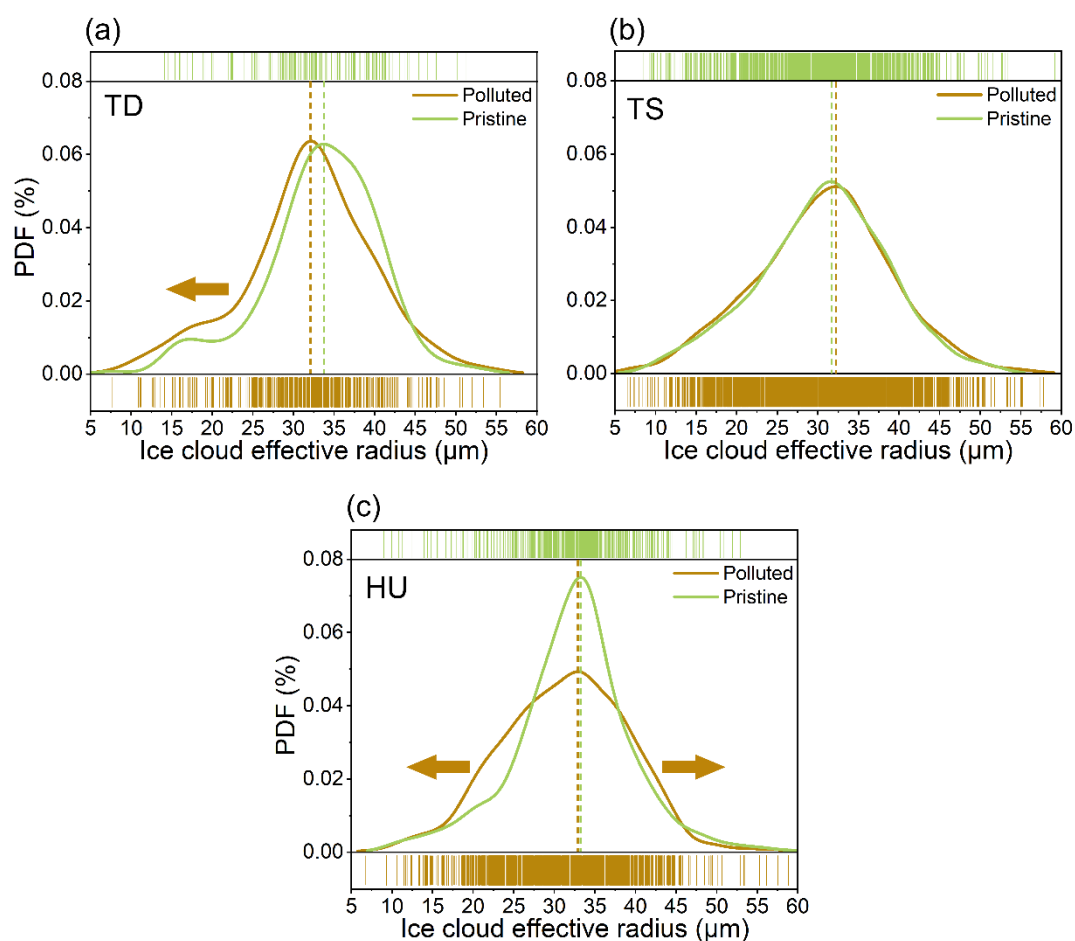


Figure 10: The PDFs of CER_i under pristine and polluted conditions by different TC intensities: (a) TD, (b) TS, and (c) HU. The dashed lines indicate the peak perpendicular lines of the PDFs. [Original Figure 9]

Comment NO.6:

Line 258: “flatten” should be “flat”.

Response: Done.

Changes in Manuscript:

“Therefore, combined with the above reasons, the PDF curve of HU presented in Fig. 8c becomes flat when the cloud is influenced by SAL.” [Page 16 Lines 291-292 (in the “Track Changes” version)]

Comment NO.7:

Line 276: The “TC nephsystems” should be “TCCS” to be consistent with the context.

Response: Thank you. We have revised it.

Changes in Manuscript:

“The macro and micro characteristics of the TCCS are analyzed in this study by the variability of CTT and CER_i, respectively.” [Page 18 Lines 309-310 (in the “Track Changes” version)]

Comment NO.8:

Line 277: Add a comma before “respectively”.

Response: Done.

Changes in Manuscript:

“The macro and micro characteristics of the TCCS are analyzed in this study by the variability of CTT and CER_i, respectively.” [Page 18 Lines 309-310 (in the “Track Changes” version)]

Comment NO.9:

Line 282: Related to Line 22.

Response: Done.

Changes in Manuscript:

“When affected by SAL, the PDF curve of CER_i generally shifts to the smaller value for TD, whereas the curve becomes flatter for HU (shifting to both smaller and larger values).” [Page 18 Lines 314-316 (in the “Track Changes” version)]

Comment NO.10:

Line 287: “various feedbacks” should be “various feedback mechanisms”. Please modify it throughout the context.

Response: Thank you. We have modified it throughout the context.

Changes in Manuscript:

“The various feedback mechanisms of TCCS to SAL are ...” [Page 19 Line 320 (in the “Track Changes” version)]

“... and further find out the probable causes of the varied feedback mechanisms.” [Page 1 Lines 15-16 (in the “Track Changes” version)]

“this study comprehensively examines the feedback mechanisms of ...” [Page 3 Lines 72-73 (in the “Track Changes” version)]

“... we further investigate the detailed feedback mechanisms of ...” [Page 11 Line 209 (in the “Track Changes” version)]

“... and their feedback mechanisms to the SAL are different ...” [Page 11 Lines 213 (in the “Track Changes” version)]

Comment NO.11:

Line 310: Please provide relevant search terms for the public data retrieval in the data availability statement.

Response: Thank you for your valuable suggestion. We have provided the relevant

search terms for the public data retrieval in the data availability statement.

Changes in Manuscript:

“All datasets used here are publicly available. The aerosol and cloud data taken from the MODIS-Aqua MYD08-D3 daily gridded products are available from <https://search.earthdata.nasa.gov>. Atlantic TC track data are obtained from the NOAA’s Tropical Prediction Center (<https://www.nhc.noaa.gov/data/#hurdat>). The meteorological data taken from the NCEP-FNL global reanalysis dataset are available from <https://rda.ucar.edu/datasets/ds083.2>. The codes that support the findings of this study are available from the corresponding author upon reasonable request.” [Page 20 Lines 344-348 (in the “Track Changes” version)]