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Comment on acp-2021-274

Anonymous Referee #1

Referee comment on "A meteorological overview of the ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS) campaign over the southeast Atlantic during 2016-2018: Part 1 - Climatology" by Ju-Mee Ryoo et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-274-RC1>, 2021

Review of the paper "A meteorological overview of the ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS) campaign over the southeast Atlantic during 2016-2018" by Ryoo et al. 2021, submitted to Atmospheric Chemistry and Physics Discussions.

General Comments

The paper describes the atmospheric conditions during three field campaigns over southeast Atlantic in 2016-2018. The manuscript is well written and clear, figures quality is good and captions are informative. The authors provide a comprehensive picture of the climatological conditions, seasonal anomalies and synoptic evolution during the deployments, and physical mechanisms are correctly described and widely detailed. The paper appears to be specifically addressed to the community studying the physics of the atmosphere in the southeast Atlantic and provides a valuable contribution to all the teams involved in field campaigns during 2016-2018 for putting their observations into a synoptic context.

However, in my opinion the paper remains almost exclusively descriptive and does not respond to any relevant scientific question. In the main text, several interesting scientific questions are highlighted, but the authors do not investigate any of them, only speculating on possible (always plausible) explanations and requiring further investigation in future papers. For instance, I found very interesting the anomaly (almost disappearance and/or lifting) of the AEJ-S in August 2017, which would be worth to be investigated, in terms of both local and remote drivers.

This is my main and only concern. Despite the overall good quality of the paper itself, I am not sure it fits with the scope of ACP and/or the special issue. I list below a few general and specific suggestions on what I believe could be improved.

- The paper is very long, with many (25!) multi-panel figures. Figures are often the repetition of similar analysis, it is not easy for the reader to stay focused on the narrative of the paper. The authors could try select non-key information in text and

figures and move it to the Supplement.

- In the Summary and Discussion, the authors speculate on the effect of meteorological conditions on the aerosol transport but no evidence of the actual effect is provided (while the cloud-circulation relationship is well described in the paper). I believe this is a key aspect which could provide added value to the paper. ECMWF CAMS reanalysis could be used to frame the aerosol patterns at the regional scale.

Specific Comments

Abstract: in the introduction the authors state that "The goal of this study is to describe the meteorological factors that directly impact aerosols and low clouds, particularly stratocumulus decks during the ORACLES campaign". Therefore I believe that also the anomalies in the aerosol/cloud patterns originating different atmospheric conditions should be mentioned in the abstract.

Figures: anomalies should be presented along with assessment of statistical significance, qualitative assessment is not enough.

L64: does the moisture gradient also play a role in the AEJ-S dynamics?

L72: in Lamb and Pepler 1992 I cannot find an explicit reference to SST in the Benguela region as related to Sahel rainfall variability, they rather describe a basin-wide influence of North and South Atlantic. This sentence should be modified or removed.

L162: any reference for the choice of the threshold at 230K?

L178-179: how D values are determined?

Figure 2: what do histograms in a-c exactly display? Why is pressure altitude reported in km on the y-axes?

L223: the AEJ-S anomaly in August 2017 looks like a vertical shift of the jet. This is rather unusual, why not to explore possible local/remote mechanisms explaining this feature?

Figures 2 and 3: plotting individual year anomalies (with significance) would be also helpful.

L251: how did you estimate the strength of recirculation?

L254: the AEJ-S almost disappears in Aug 2017, the mechanism leading to this particular feature is worth to be further investigated.

Figure 4: plotting individual year anomalies (with significance) would be also helpful.

L278-300: in discussing Fig. 4, please specify when you discuss Aug 2017, Sep 2016 and Oct 2018.

L360-361: "correlation" word should not be used if correlation is not computed (Fig. 6 does not show correlations).

L437: no "robust correlation" is shown in Fig. 8, see comment above.

L568: in Fig. 13, I cannot see the midlatitude weather system on 8 Sep 2016.

L753: Meridional wind is not displayed in Fig. 19, so how can we see "southeasterly

winds”?

Figure 24: is the seasonal cycle removed before computing daily correlations?

Technical corrections

L81: West African monsoon.

L161: typo, brightness.

L240: magenta dashed box region is not displayed in Fig. 3.

L535: check punctuation.