Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-39

Anonymous Referee #1

Referee comment on "Wintertime Saharan dust transport towards the Caribbean: an airborne lidar case study during EUREC^{4}A" by Manuel Gutleben et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-39-RC1, 2022

The authors present airborne lidar observations of Saharan mineral dust during the EUREC^{4}A campaign in the Barbados region in January and February 2020. The measured data are of interest to the readers of ACP but the work needs major revisions before it can be considered for publication:

- The biggest issue to me is that the authors seem to draw quite general conclusions from what really is a case study of an individual event. I'd therefore urge them to not overinterpret the findings and clearly state that these measurements - unique as they are - mark a limited sample that does not allow for drawing more general conclusions. This should also be expressed by re-categorization of the manuscript type as Measurement Report and a change of title to, e.g. Airborne lidar observations of a case of wintertime Saharan dust transport towards the Caribbean during EUREC^{4}A.

- Figure 1 should be omitted. The same is shown in a much better way in Figure 2.

- The methods section (maybe better data and methods?) should also include the auxiliary data use in your work, i.e. MODIS, HYSPLIT, etc. Lines 173 to 193 should be moved to that section and expanded towards a discussion of typical values.

- Figures 3 and 4 should be split into three figures each and places at positions in the text so that the reader doesn't have to go back and forth to follow their discussion. As is, the panels in Figure 3 are too small. The last sentence in the caption of Figure 3 should be moved to the methodology section. A statement regading the grey shaded areas should be mentioned.

Minor Issues:

- line 15: is there an estimate of the dust contribtution based on measurements?

- line 21: transport instead of transportation

- line 24: the Intertropical Convergence Zone is generally referred to as ITCZ

- line 44: cloud condensation nuclei

- line 50: this region instead of these regions

- line 53: What plumes?

- line 70: enable a characterization of winter-time dust transport: please clearly state that you are discussing just three research flights within four days and that those flights are likely to cover the same dust event. In that context, your aim of characterizing winter-time dust transport is quite overstates what is possible with your data set.

- Figure 2 and related text: Please : at what wavelength of AOD measurement. Caption: one station is marked by one dot.

- lines 93 - 96: You could drop the index 532 after clearly stating that all measurements have been performed at that wavelength.

- line 98: Please clarify for the non-experts that DIAL gives the water vapour profiles and that HSRL gives the aerosol profiles.

- line 114: add reference to 10.1029/2009JD011862 and 10.1111/j.1600-0889.2011.00548.x regarding the use of lidar measurements to characterize aerosol mixtures

- line 143 and 145: AT these altitudes

- Figure 5: please add the abbreviations for the different aerosol types (MA, DU, BB) in line 3 of the caption when marking their colour in the plot.

- line 211: dominates the aerosol mixture?

- Figure 6: Is it possible to apply the information from Figure 5 to this plot to get more quantitative results rather than the coarse ellipses?