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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Coarse mode mineral dust size distributions, composition and optical properties from AER-D aircraft measurements over the Tropical Eastern Atlantic" *by* Claire L. Ryder et al.

Anonymous Referee #4

Received and published: 8 September 2018

This manuscript presented a study of Saharan dust based on airborne observations made over the Eastern Tropical Atlantic near the western African coast. The measurements were targeted to characterize dust microphysical, chemical and optical properties, including size distribution, particle shape, mass loading, composition, refractive indices, and SSA. This study contrasted the dust properties in Saharan Air Layer and the marine boundary layer. The authors highlighted several important findings which will advance the current understanding and benefit later modeling studies. The manuscript is logically organized and well written. It is noted that the authors provided meticulous

details about the instrument, data reduction, and uncertainty analysis. This reviewer believes that this manuscript shall be published after the authors considering a few suggested minor changes, which will not alter the major finds of this study.

Minor Comments:

Page 4, Line 4: Please clarify that while light shadowing techniques are not impacted aerosol composition or Mie theory conversion issues, they still can be impacted by non-spherical particles.

Page 5, Line 7: Change "Table 1" to "Table 2"

Page 5, Line 8, please describe the AOD and clarify if the AOD is calculated over the dust layers. Please also make changes to the table caption so that it will be consistent with the text

Page 5, Line 26: Change "Figure 1b" to "Figure 1"

Page 6, Lines 18-19: The authors note that visually identifying and tracking dust plumes is subjective, difficult, and potentially error-prone. Would it be possible to instead obtain the underlying satellite data and apply an objective threshold?

Page 7, Line 5, please add a brief discussion on the choice using PSAP correction by Turnbull (2010) and difference between this correction and that by Virkkula, AS&T, 44:706-712, 2010

Page 11, line 31, please provide a more quantitative criteria to define the word "dominant"

Page 13, Line 1: Figure 8b is unrelated to SSAs; perhaps Figure 13b was intended?

Page 13, Line 8: Please restate the rationale to hold the real part of the refractive index at 1.53, in the context that in Section 3.5, the real part is found to be 1.47-1.49 based on the filter sample composition.

Page 13, Lines 14-20: This information might be better suited to a table, which could also include the actual refractive index used for each substance.

Page 14, Line 4: Change “Table 3” to “Table 4”

Page 16, line 25. Please provide a brief discussion on how the “best-fit” compare to observed volume size distribution and number size distribution and Change “Table 4” to “Table 5”

Page 18, Line 2: Change “Table 5” to “Table 6”

Page 18, Lines 8 and 11: These two statements regarding a potential decrease in dmax with height seem contradictory. Please clarify to make them consistent.

Page 18, Line 14: There is no Figure 8c

Page 19, Line 14: Please supply a reference for the dust density value.

Page 21, Line 15: Change “Table 6” to “Table 7”

Page 23, Line 26 (and Figure 13b): Some readers may wonder if finding a good agreement between the imaginary part of the refractive index and the SSA is expected, given the relationship between k, absorption, and SSA. The authors should consider the significance of confirming that the relationship exists in this case.

Page 24, Line 20: Change “Table 5” to “Table 6”

Figure 4: This figure suggests the flight b924 and b934 did not have extensive sampling in MBL, please make changes in text accordingly

Figure 6: The blue shading was very faint on my screen. Perhaps a darker shade, or even hatching, could be used instead. Also, as there are no other parts to this figure, “Figure 6(a)” should be changed to “Figure 6” (as well as in the associated text).

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