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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Above Cloud Aerosol Optical Depth from airborne observations in the South-East Atlantic" *by* Samuel E. LeBlanc et al.

Anonymous Referee #3

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The paper "Above Cloud Aerosol Optical Depth from airborne observations in the South-East Atlantic" by LeBlanc et al., presents observations of aerosol above the cloud in a region characterized by the presence of biomass burning emitted aerosol. Many interesting results are reported in the paper, but in my opinion the presentation is confusing in some points and this makes the paper a difficult reading. Some points can be substantially improved in clearness allowing to reach more large audience.

Here some suggestions about things to be improved for making it a very good paper:

1) in the introduction authors correctly underlined the importance of the vertical clean air between aerosol and clouds and how this is important for radiation budget issues: because of this one would expect an analysis of the results in this respect . I would suggest authors to include this into the discussion otherwise (not suggested) please

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Discussion paper

remove this from the introduction

2) in the introduction is stated that active technique can provide a very good insight about the aerosol/cloud gaps, but then authors used ORACLES dataset without explaining why and which are the added value in doing that. Reading the introduction one has the impression that the in depth analysis is elsewhere reported e.g. in the lidar papers.

3) assumption about fine mode as representative of the ACAOD has to be discussed. This could aslo lead to the differences observed between the ACAOD here presented and the MODIS data

4) discussion about figures 6: these indicates also that the Angstrom exponent changes a lot when the total column is considered even if the difference in AOD is not so relevant. Please comment on that and provide explanation of this aspect

5) fig 9 (and 12) these profiles of AOD would like to simulate the AOD as observed from space? It seems to me the integration of extinction is made from the above to the ground. Typically profiles are reported for extinction and not for AOD which is columnar quantity and not range resolved. This is misleading for the reader.

6) not clear why there is a big difference in AE above 2 km for above the cloud and total column cases (fig10). Please analyze and explain this

More detailed comments are reported as comments into the attached pdf

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2019-43/acp-2019-43-RC3-supplement.pdf

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