

Atmos. Chem. Phys. Discuss., referee comment RC1
<https://doi.org/10.5194/acp-2021-706-RC1>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on acp-2021-706

Anonymous Referee #1

Referee comment on "Mesoscale spatio-temporal variability of airborne lidar-derived aerosol properties in the Barbados region during EUREC⁴A" by Patrick Chazette et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-706-RC1>, 2021

The manuscript deals with interesting lidar observations of complex mixtures of marine, dust and smoke particles in the Caribbean. A comprehensive meteorological and aerosol-transport analysis is given as well. The carefully performed measurements were done close to Barbados within the framework of a large international field campaign in the winter of 2020. The results are in good agreement with many other studies performed within former field activities (SAMUM, SALTRACE), However, these previous activities are not mentioned. This should be improved. A paper is much more exciting when a more complex overview of forgoing work is given and how the presented work fits into the big picture and what are the new findings compared to the older ones.

Minor revisions are required and may further improve the paper.

Detailed comments and suggestions:

Abstract: The abstract should summarize observations and solid results!

Lines 21 to 25: Are these statements based on observations? or is this just your conclusions (opinion) from your observations? I mean, I do not find the respective figures in which the strong spatial heterogeneity in the aerosol fields is clearly documented. Maybe, I overlooked it! I also do not find any (correlation) study in which the impact of relative humidity on the aerosol properties is presented.

Page 2, line 19: Please have a look into the SALTRACE overview article of Weinzierl et al., BAMS, 2017 (<https://doi.org/10.1175/BAMS-D-15-00142.1>), and check the many references regarding SAMUM 2 and SALTRACE, especially Haarig et al. (2017, ACP), Rittmeister et al. (2017, ACP), Tesche et al. (2011, Tellus) and (2009, JGR). There many more papers on smoke transport over the tropical Atlantic, in addition to the papers of

Ansmann et al. and Baars et al. you mentioned already.

Page 3, line 3: After this paragraph we need a paragraph on all the SAMUM 2 and SALTRACE observations (maybe with focus on lidar only) of complex dust and smoke mixtures over the tropical Atlantic (from Africa to the Caribbean). Please have a look into the special issue of SAMUM 2 (in *Tellus*, 2011) and especially into the SALTRACE overview paper of Weinzierl et al. (2017).

The results of the SALTRACE campaign plus the ship cruise (Rittmeister et al., 2017) must be considered later on in the discussion as well.

Page 5, line 5: Please provide some information about the regression function V_0 . What do you exactly mean with this regression function?

Page 5, lines 20-24: Tesche et al. (2009, 2011) already studied complex mixtures of dust and smoke during the high winter months (January-February), but over Cabo Verde in 2008. Haarig et al. used the Caribbean SALTRACE winter campaign in February-March 2014 to study again dust-smoke mixtures coming from Africa.

A new, at least not well studied aspect you may want to stress in more detail is the following: Usually it is assumed that dust is transported towards South America in January-February, south of the Caribbean, and the tropical Atlantic towards North America is dust free, but you show that this is not (or no longer) the case. Big plumes of dust and smoke (because of the dry season or burning season in central western Africa) are transported even towards North America during winter time.

In the figures captions (or maybe in the plots), one should provide dates and also the times of observations (periods in UTC).

'Terrigenous' is a bit unspecific, you mean: dust? Or even smoke from continents? You want to say, non-marine aerosol?

I appreciate the exhausting analysis, including all the MODIS, CALIOP, and CAMS products!

Page 26: In the discussion section 5, one should integrate the SAMUM and SALTRACE findings, what was similar, what are the news points of your study (additional and complementary aspects). Such a discussion will improve significantly the visibility of this

paper later on.

All in all, a good study based on high quality observations, analysed by experienced scientists!