

Interactive comment on “From the Caribbean to West Africa: Four weeks of continuous dust and marine aerosol profiling with shipborne polarization/Raman lidar – a contribution to SALTRACE” by Franziska Rittmeister et al.

Anonymous Referee #3

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General comments

The authors report shipborne lidar measurements of aerosol over the Atlantic, a valuable dataset contributing to our knowledge of aerosol properties in this region downwind of the Sahara. From this dataset they are able to infer Saharan dust and marine aerosol properties (e.g. extinction, lidar ratio, depolarization ratio, and Ångström exponent) and loading. Using this information they also explore further the properties of the central Atlantic atmospheric structure, in terms of the marine boundary layer (MBL), the marine air layer (MAL), and the Saharan air layer (SAL). This is an update to work

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presented by Kanitz et al. (2014, GRL), a paper written by broadly the same team of authors, and which is well referenced here. The new paper uses the same core dataset as was used and described in the previous paper, and so of necessity there is a certain degree of repetition here.

Given that quite similar work has been presented before, it is important to note what is new here. Section 3 is an expansion of the Kanitz paper, exploring the dataset in more detail beyond what was published in that paper, but starting from the same basic information. Figures 2 and 3 appeared in that paper in a slightly different format, as did half of Figure 6. Figures 4, 5, 7 and the other half of Figure 6 are new. Figure 7 is quite an effective summary of the lidar measurements, meanwhile Figure 4 explores the vertical structure of the lidar signal and depolarization for selected case studies in a more time-resolved manner. The inclusion of HYSPLIT trajectories in Figures 5 and 10 is a useful aid to understanding the possible origins of the aerosols being measured.

Section 4 is more distinct, categorising the atmospheric structure (i.e. MBL/MAL/SAL) using the lidar observations in conjunction with a conceptual model. It is this usage of lidar measurements to inform our knowledge not just of the aerosol over the Atlantic but also of the atmospheric layering that is the newest feature of this paper.

Specific comments

p. 5, line 31: perhaps it would be worth summarising the reasons for these choices of days as case studies, perhaps here or in a table? The reasoning behind these choices is scattered in the text, or left implicit, so it seems to me that for clarity it would be best to make this explicit at an early stage.

Figure 7(e): how do the AODs derived from the lidar measurements compare with the AERONET measurements? The reader can do a visual comparison between this plot and Figure 3, but it would be useful for reference to have some quantitative information on this.

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Figure 8: I am not sure that this adds all that much to the discussion within the paper, and indeed it is only referred to very briefly in the text on p. 9, lines 26-27. This information is mostly summarised in Figure 9, perhaps instead the arrows from Figure 8 could be superimposed onto Figure 9? Otherwise I would suggest just removing Figure 8.

Figure 9: would it make sense to reverse the order of the days here? For all of the other plots the time axis went from left to right across the page with the progression of time. This also helped intuitively since the ship was itself progressing from west to east. It would also help with representing the schematic information currently contained in Figure 8, information that is quantified in Figure 9.

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