The authors would like to thank the reviewer for his/her valuable comments and suggestions. We have modified the manuscript with the proposed changes along with step by step answers to the suggestions. Please note that changes have been highlighted (in bold or 'track changes') in the manuscript and the corresponding answers to the reviewer by text below. The original comments are presented in bold letters.

Comment_1: There are some issues related to the analysis of the atmospheric vertical structure. Thus, the results on Free Troposphere, FT, and Boundary Layer, BL, are a little bit surprising. The depth of the FT is according to figure 4 is usually rather low, around 1km, similar to that of BL, something that it is not coherent with the definition of FT. On the other hand, the authors must explain the procedure concerning the computation of the center of mass of FT and BL, justifying if they consider this as a geometrical variable or if it is computed having in mind the variability of density with height, other-wise the results can't be interpreted.

To rule out the possibility of misunderstanding we clarify here that Figure 4 and the related text discusses about FT aerosol layer and BL aerosol layer depths and other related properties, not the FT or BL depths even though BL aerosol layer gives an indication of the BL depth. This has been clarified in the updated manuscript to avoid further misunderstanding.

Figure 4 shows monthly mean nighttime variations of FT aerosol layers and BL aerosol layers regarding their a) altitude b) geometrical depth c) optical depth and d) their contribution to the total layer AOD. The mean nighttime height of the FT aerosol layers is presented in Fig 4a and corresponds to 2.8 ± 1.4 km for the whole period where monthly variations can be seen in the figure itself. The mean monthly variation of the aerosol layers are reported through their center of mass which accounts for the variability of the density within each layer. The geometrical thickness of these aerosol layers is shown in Fig. 4b. This depth is computed from the boundary of the top/bottom height of the aerosol layer. The top/bottom height of the aerosol layers is detected using the second derivative of the backscatter profiles. We aimed to report here the real aerosol geometrical boundaries and not weight the reported depth values by accounting the variability of density with height. The latter case is already accounted as the geometrical depth is larger than the variation of the height of center of mass.

We have modified the text and labels referring to Figure 4 where possible to clarify that we refer to Free-tropospheric aerosol layers and not the properties of free troposphere itself.

"The geometrical depth is calculated from the aerosol layer boundaries (top/bottom) in which the subtraction of these boundaries result to the actual geometrical thickness of the corresponding aerosol layers."

Comment_2: Concerning the nighttime results for BL height it is rather surprising the range of values obtained, too high for representing the top of the stable boundary layer. So this part requires some discussion and explanation of the procedures applied.

The BL top height was retrieved using the methodology described by Baars et al. (2008) in which the wavelet covariance transform method (wct) shows a local maximum at BL top. For the BL during nighttime, the residual layer and the stable BL are located below that height. Above the transition zone, FT layers may be present. In this sense, the reported nighttime BL height range (0.35 to 1.2 km) depict not necessarily the stable BL but include the residual layer(s) as well. Nevertheless, a previous study in the coastal area near the site show the formation of a stable marine BL at 500-800 m in altitude (Reid et al., 2008).

"It should be noted that the observed lidar PBL height is expected to depict, apart from any mechanically driven layer during the stable and transition periods, the top of the residual layer from the previous day."

Reid, J. S., et al. (2008), An overview of UAE^2 flight operations: Observations of summertime atmospheric thermodynamic and aerosol profiles of the southern Arabian Gulf, *J. Geophys. Res.*, 113, D14213, doi:10.1029/2007JD009435.

Comment 3: Figure 5 describes the evolution of extensive and intensive aerosol variables. The problem is that the authors do not clarify the meaning of the backscatter and extinction coefficient presented in figure a and b. Are they average values? in such case more info like standard deviation would be necessary. Are they representative values: max? This requires additional information.

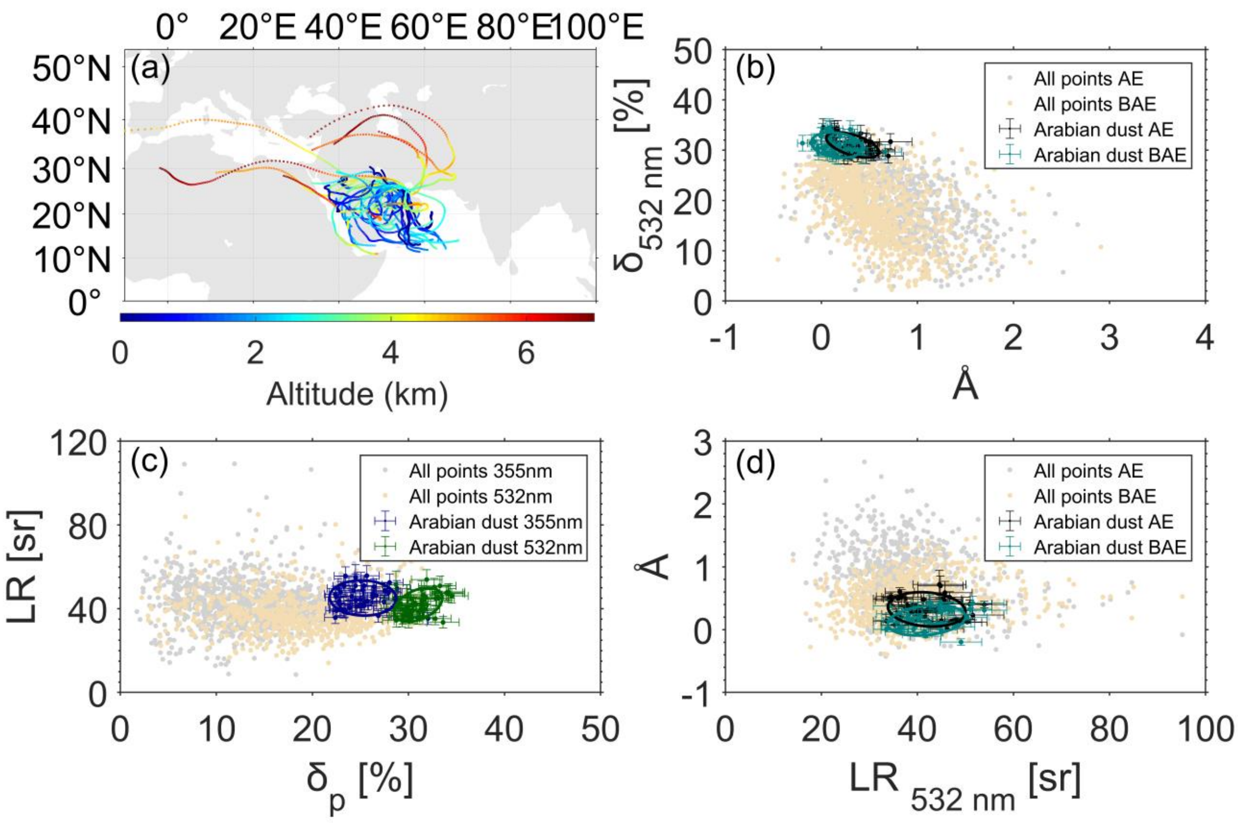
Thank you for your comment. Indeed the reported values in Figure 5 are mean values of the optical parameters for each detected aerosol layer.

We have added the standard deviation in Figure 5 and changed the text in the manuscript to indicate it so.

Commnet_4: On the other hand, Figure 5 uses rather raw scales and in order to support some of the discussions on how the different variables change and offers some typing insights it is necessary a better representation. In this sense, Figure 8 showing the relationships of pairs of intensive variables offer some insight on the typing comments offered by the authors, although the spread of data in the selected scatter plots hardly support some statements linking particle depolarization with lidar ratio or Angström exponent with lidar ratio. Only the figure with the scatter plot of depolarization ratio versus Angström exponent presents some dependence between these variables. So the authors must improve the way they present their analyses of this intensive variables.

Figures 5 to 7 report aerosol properties derived from the lidar measurements using three different approaches. Figure 5 shows the time series of the intensive and extensive aerosol properties and through this figure we intend to discuss the seasonal variation of the optical properties, if any, and connect them with meteorological conditions and anthropogenic activities in the region. This overall picture is complemented by Figures 6 and 7 which look further into the aerosol properties. In Figure 6, histograms present the most frequent values regarding the linear depolarization ratio, lidar ratio and Angstrom exponents over the site raising a climatological value for the site, while Figure 7 shows the vertical distribution and validity of these optical properties with height. We do not intend to perform a case-by-case aerosol typing as this task is rather challenging and to some extend limited due to the lack of accurate information from auxiliary observations and/or models. For example, we have seen that aerosols over the site are often a mixture of anthropogenic and/or marine aerosols. With the use of backward trajectories, satellite observations and aerosol composition derived from models we could classify these aerosol layers, to some extent, but our intention here is not this. As detail aerosol characterization at ground-level will be answered by our in-situ measurements, we focus on the retrieval of the Arabian dust properties. To this direction, Figure 8 shows the dependence of some of the optical properties for the Arabian dust particles. In Figure 8 apart from the Arabian dust layers, the rest of the dataset is also presented. This shows the great variability of the lidar-derived optical properties during the year-long campaign period hence the variability in the aerosol types found over the measurement site. By using the methodology described in the paper we were able to characterize the Arabian dust optical properties. Such was possible due to the high quality of the retrieved aerosol properties and also due to the absence of volcanic aerosols in these altitudes which enabled to connect the high linear depol. ratios with the specific aerosol type with confidence. The relationships of the optical parameters used in Figure 8 are common pairs reported in the lidar literature (e.g Groß et al., 2013 & 2015) and such relationships are currently used in aerosol typing methodologies (e.g the NATALI code, Nicolae et al., 2018). Furthermore for the various optical parameters, the reported range of values for the Arabian dust cases fall within the uncertainty of the measurement themselves (including systematic and statistical errors) presenting the best possible option at the moment.

For better clarity we didn't include the error bars in Figure 8 but we include it here in the response. We have also included a paragraph discussing about the rest of the dots in Figs 8b-d.



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