General response

The authors thank the reviewer for his/her helping to improve this manuscript and the English langrage. We greatly appreciate your detail comments and creative suggestions. We revised the paper according to your suggestions. Our replies to the comments are given below.

The authors present a study of the boundary layer height and mixing layer height based on 4 years of CALIOP data using the clear sky aerosol backscatter in the eastern pacific region, with additional help from CLOUDSAT, AIRS, AMSR-E data and ECMWF model data. The use of the CALIOP data is evaluated using data from the MAGIC field campaign and SONDE data. The relation of the decoupling of the estimated boundary layer height and mixing layer height with the estimated inversion strength is explored. The study shows a promising method of studying the boundary layer structure using satellite lidar data. I am very impressed with the BL dataset the authors have made using the CALIPSO data.

Many of the major issues have already been addressed by the Anonymous referee 1, I will not add them here again.

(1) The main issue I want to mention here is that the authors need to add correlation values, and in some cases the means/rms (see below) when they are discussed. The results discussed can only be appreciated and referred to in future work when we can assess the real values/effects.

Reply: Thanks for the comments. We have added correlation values, significant level, and in some cases the means/rms in the revised manuscript.

Minor additional comments:

(1) Please use spell checker once more! Page 34065 Lines 4-11: Please rephrase the entire paragraph, each individual line is short and uses the word decoupled making it hard to read.

Reply: We put efforts on the language and the paper was proofread by the OSA Language-Editing Service. The manuscript is improved now.

Rephrased as suggested.

(2) Page 34066: line 20 bellow ! below

Reply: Corrected.

(3) Page 34068: lines 26-27. The RMS of the SST can be seen as relatively small knowing roughly the absolute mean values but in case of the winds it is hard to see if the bias and rms are high or low. Please provide the mean values for both wind and sst. Are the RMS and bias in the wind absolute or relative to the wind value, i.e. is the rms for all winds representative of the error or is it overestimated by the occurrence of a few higher wind events?

Reply: There are no mean values reported in Wentz et al. (2003). Validations of AMSR-E SST and U_{10m} with NDBC bouy SST and U_{10m} were added in to this paragraph.

Statements were changed to **'**Error in the data was estimated using the root mean square (RMS) difference between AMSR-E U_{10m} and U_{10m} coming from four other satellite microwave radiometers (three SSM/Is and TRMM TMI) and with U_{10m} from the satellite microwave scatterometer QuikScat (0.92 m/s with a bias of 0.57 m/s) (Wentz et al., 2003). This calculation gave an RMS difference between AMSR-E SST retrievals and the

Reynolds SST as 0.76 K (Wentz et al., 2003). Validation using data from a buoy (National Data Buoy Center, NDBC) U_{10m} (mean value of 6.61 m/s) gave an RMS difference with AMSR-E U_{10m} (mean value of 6.46 m/s) is 1.63 m/s with a bias of −0.15 m/s (Luo et al., 2015). Validation with NDBC buoy SST (mean value of 299.49 K) in this study showed that the RMS difference in AMSR-E SST (mean value of 299.26 K) is 0.99 K with a bias of −0.23 K. ’

The RMS and bias in the wind are absolute values.

(4) Page 34070 ; Lines 8-10. The method was not used, did you estimate the MBL on any other way or was this not possible at all. And if not, what did you do with the data of the cloud contaminated data, since you mention in 34071 line 22 that the MHL was based on the MBL structure observed in MAGIC

Reply: The CALIOP-based MBL structure identification method was only applied to the cloud-free CALIOP profiles by using the aerosol vertical distribution as the proxies of BLH and MLH. For cloudy conditions, the CALIOP cannot penetrate the thick cloud to detect the aerosol below clouds, and the stratiform cloud top was treated as the MBL top in this paper.

To evaluate the CALIOP-based MBL structure, MAGIC soundings were used to determine the MBL structure. Due to the high occurrence of the cloud along the MAGIC transect (as can be seen in figure 1), we did not apply the CALIOP-based MBL structure identification method to the ship-based HRSL observations.

Line 13: What does SONDE stand for. Do you mean Sonde or is it an abbreviation not defined.

Reply: Changed to 'radiosonde'.

(5) Page 34071: Line 23. Biased lower is not correct here. That would mean that SONDE is the truth.

Reply: Changed 'biased lower' to 'lower'.

(6) Page 34072: Line 4/5 please provide correlation values. The red dots in Figure 2 show no correlation in this presentation, a 2D histogram may show that there is a positive correlation but not as plotted here. Same holds for Lines 10/11. To strengthen your case you should provide a correlation factor (the figure does show this of course in 2d)

Reply: The correlation values were added as suggested.

Line 15 ''built in the last" ! described in the previous

Reply: Changed as suggested.

(7) Page 34073: Line 2 : correct "shows increase tendency when westwards"

Reply: Changed to 'shows westward increasing tendency'.

Line 11: results

Reply: Corrected

(8) Page 34074 Discussion on salt aerosol vs U10 in NPO and SPO. I am not

convinced by the explanation of the lack of U10 correspondence in the SPO region. Could you compare the TAB vs U10 along the two boxes. This way you may be able to see if above a MLH threshold value the NPO and SPO show the same U10-TAB[for Z< ZBLH] relationship.

Reply: We have examined the relationship between sea salt aerosol optical depth and U10. The optical depth in the lower well-mixed layer has the correlation coefficient of 0.64 at confident level of 0.01 with the U_{10m} in NPO, but the correlation coefficient is -0.08 at confident level of 0.39 in the SPO. Statements were added.

(8) Page 34076 Lines 9-13 Give values of mean/error and correlations when you mention it in the discussion

Reply: The correlations were added in the discussion. The errors were added into figure 6 and its caption.

(9) Acknowledgements: You use a lot of data sources but mention non of these in the acknowledgements. Please add those from which you downloaded the data (i.e. MAGICS/calipso/SONDE)

Reply: Changed as suggested.

Figures:

(11) Figure 1 Change Magenta to Black

Reply: Changed.

(12) Figure 3: Skip a number of latitude values, it feels crowded

Reply: Changed as suggested.

(13) Figure 4/5: Small fonts. EIS values unreadable as they overlap vertically, lower text of CTHxx in d3 and d4

Reply: The figure was re-plotted to make the text clear.

(14) Figure 6a: Provide error estimates in Figure to provide a visual estimate of what we look at and if the slope difference has significance. You can also show it in a contour lightly colored box if you are afraid that it becomes crowded

Reply: Error was added into plot and was stated in figure caption.