

Response to Anonymous Referee #4

We would like to again thank Referee #4 for his/her comments. We have done our best to address each of the points as detailed below.

#1. I still feel that the aspect about wind speed dependence was not addressed entirely adequately. The authors acknowledge (in their response to reviewers) that their linear fit of lidar ratio to wind speed is suspect, particularly at the extrema, but rationalize it by saying that if they delete the extrema they do not see a statistically significant relationship. Well, this sort of thing is exactly why one must be careful with the conclusions that are being drawn from a statistical analysis. Keeping in questionable data points to force a result to be statistically significant is not scientifically sound, particularly when it's clear from the data (as in this case) that the technique employed was not appropriate. The authors have de-emphasized this linear wind/lidar ratio relationship in the text of their revised manuscript. I would also suggest going further and deleting Figure S2 (the linear fit) because (as discussed) it is not statistically meaningful or useful. Presenting an unsound analysis does not help and may even help to legitimize bad statistics by other researchers.

We have removed the wind speed parameterization from both the manuscript and the supplement

#2. The PDFs in Figure 4 are sufficient for the purpose of looking at the relationship, as they reflect the shift in peak and width of the lidar ratio distribution without trying to impose a regression, and so are more honest about the underlying data.

We have revised the manuscript to use the PDFs (now Figure 5) to point out the shift in wind speed rather than the parameterization. The revised manuscript reads as follows:

“Previous studies reported a small decrease in marine aerosol lidar ratio with the increase in wind speed (Sayer et al., 2012). In general, wind speed alone is expected to be a poor predictor of marine aerosol lidar ratio, as aerosol volume size distribution and optical properties are likely to be influenced by a number of other parameters including relative humidity and marine boundary layer depth. Furthermore, errors increase exponentially approaching the lowest optical depths and could be the reason for the large spread in the lidar ratio seen in Fig. 5. Untangling systematic error from real physical effects is difficult in the low (0-4 m/s) wind speed regime and highlights the need for more accurate measurements for calm wind/low

AOD conditions. Despite these complications, a shift to lower lidar ratios with increasing wind speed can be seen from Fig. 5 and warrants further investigation. “

#3. My preference remains to move the rest of the supplement into the body text as well, because the paper is not too long, and things in supplements often get overlooked. For example the sampling aspect as shown in Figure S1 is something which deserves more prominence, as discussed in the reviews.

In regards to moving the entire supplement into the main manuscript, we feel it more appropriate to keep some of the materials separate. First, we moved the spatial maps of the SODA retrievals (previously, Fig. S1) into the main body of text as Fig. 3. Next we moved the SODA, MAN comparison from the supplement (Fig. S3b) into the main text as Fig. 8. The spatial locations of the MAN retrievals are referenced in the text but the figure is not included as it adds no value to the comparison and is difficult to really adequately see the locations and the satellite track. The SODA versus CALIPSO AOD figure in the supplement (Fig. S4a) remains as is, however we report the RMS error in the main text. Finally, the table of lidar ratio retrievals and methods (Table S1) we also feel is a bit overkill since we mention almost all of the studies reported in the table in the introduction section of the manuscript.

In summary, we have incorporated 2 out of 3 figures from the supplement into the main text. The supplementary table remains as is. It is our opinion this version of the manuscript incorporates all of the previous reviewers' comments and thoroughly addresses all of the concerns and points raised thus far.