We thank the reviewer for the thorough review and constructive comments. Several interesting and significant changes/additions were made to the manuscript in accordance with the reviewers' suggestions. Consequently, this revision makes this paper differ from the past work in that:

(i)   MODIS AOD retrieved from both Land and Ocean algorithm are assessed separately over the same set of AEROENT stations along the coast, and it is shown that AOD retrievals over the coastal region from Land or Ocean algorithm both have larger uncertainties than their counterparts in other (e.g., over open ocean or over non-coastal land) regions;

(ii) the assessment includes characterization of the PDF (mean and standard deviation) of biases and its statistical fitness with PDF from AERONET;

(iii) the impact of sediments (pigments and suspended particulate matter) on the AOD bias are analyzed, and is shown to be important;

(iv) further evaluation of correction for wind speed and cloud impact is conducted, and the implication of such correction for the trend analysis is studied with analysis over different AERONET satiations.

Since the manuscript has gone major revision, it is recommended that please first read the revised manuscript as a whole (attached through separate entry in the interactive discussion) and then read our replies.

Response to reviewer #3:

➢ **Comment:** "Echoing what other reviewers have said, I do not think that this manuscript is publishable in its current form. The results presented are largely derivative of other works, and I do not see any point made in the paper that would cause me to cite this paper, instead of an earlier work. On that basis alone, the paper needs to be reconsidered."

Response: New analysis and results are presented in the revised manuscript. New sections are presented; one focuses on the impact that pigments and suspended particulate matter may have on retrievals (accompanied by a similar analysis on reflectance), and another focuses on the differences in trend analysis that are caused by the correction technique. Furthermore, it is believed by the authors that the statistical evaluations of the PDF of AOD bias and the fitness of PDF with those from AERONET will be beneficial to future studies. It is important to get past the OLS evaluation alone and examine the bias, and distribution of AOD uncertainty in retrievals.

➢ **Comment:** "Finally, I must comment about the introductory discussion of global trends in aerosol properties measured from space. Aerosols have a relatively short atmospheric lifetime compared to CO2 and CH4, but climate scientists seem driven to apply the same type of trend analysis used for those long-lived species to aerosols. The problem arises because while sparse sampling of well-mixed species can represent the

global atmospheric concentration, any "global" aerosol loading is simply an integrated measure of incompletely observed regional aerosols. Any "global" trend in aerosol loading is simply the observed sum of incompletely observed regional trends. And worst of all, any "global" characterization of error in satellite-retrieved AOD is composed of many different errors associated with different aerosol properties and observing conditions, and these different errors will also frequently interact with the ability of the satellite to sample the aerosols. In short, the scientific problem of characterizing atmospheric aerosols is not a global problem, but a regional one, and our understanding of this problem is not advanced by another "global" statistical calculation of the integrated sum of the diverse, often compensating, errors associated with this measurement."

Response: The authors agree that local or regional examinations of aerosols and aerosol trends are important, but it is also relevant to examine global characteristics to correct for systematic retrieval errors. In a move toward a more local focus, the new section on trend analysis in the revised paper focuses on the differences caused in the trend analysis at each AERONET site. It is interesting to see changes in the magnitudes of the aerosol trend before and after the empirical correction. Along with an extended analysis of the MODIS AOD bias frequency the updated aerosol trend information presented in the revised manuscript may be useful for future research. Finally, in the introduction, we also emphasized need to evaluate AOD over different surface types. Coastal region around the globe has some common grounds that need to be treated carefully in the retrieval algorithm, including for instance, the effect of sediments in the coastal waters. To separate this effect, the bias due to clouds and winds should in corrected be first corrected, albeit these effects are not necessarily restricted over the open ocean. The demonstration of sediment effect on the retrieval clearly shows that coastal AOD retrieval should be evaluated separately from other regions.