We thank the reviewer for his/her helpful comments and suggestions. Below we address the comments point-by-point, and the manuscript is also revised accordingly.

This is a well written paper. The methodology is well explained and the paper is easy to follow and read. However, I do agree with the previous reviewer that the largest issue with this paper is the use of the level 1.5 AERONET data. The level 2.0 AERONET data are constructed for a reason. Also, I am not very sure if the AOD> 0.4 criteria was applied for the level 1.5 data. If not, as suggested from the first reviewer, it should be applied as well.

The AOD>0.4 criterion is not applied to Level 1.5 data. The AOD>0.4 is a very high threshold. According to AOD distribution shown in Figure 1 of the original submission, AOD>0.4 only captures the tail of the distribution. Even for heavily polluted regions, this may result in more than 50% loss of data. As a result, only few stations will be left for analysis, and their representativeness of different aerosol types are quite limited. In this revised manuscript, we applied all other Level 2.0 quality control criteria to Level 1.5 data, according to the suggestion of Reviewer 1 and Dr. Tom Eck. Moreover, we also separated the discussion of Level 2.0 and Level 1.5 data. In Section 4.3 of the re-submission, we can see that with even AOD>0.2 threshold, there will be only 12 stations left, and they are all in North Africa and Asia. Therefore, we still keep the Level 1.5 stations for a global representation, but emphasizing that these data are subject to larger uncertainties.

Also, the authors showed the trend comparisons between the level 1.5 and level 2.0 AERONET data for Beijing (Figures 3 and 5). Was the AOD> 0.4 criteria applied to both AERONET data sets (level 1.5 and 2.0) or was it applied to the level 2.0 data only? Note the authors need to convince us that with and without using of the AOD> 0.4 criteria, trends are consistent. I would recommend that the authors compare the level 2.0 trends with the use of the AOD > 0.4 cutoff and the level 1.5 trends without using the AOD > 0.4 cutoff for a few AERONET sites that are heavily polluted with aerosols and a few sites that have lower averaged yearly mean AODs.

In the original submission, the Level 1.5 data used to produce Figure 5 is not screened with the AOD threshold. Also, it is not possible to compare Level 1.5 and Level 2.0 trends for sites with lower averaged AODs, because for these sites, the AOD>0.4 criteria will eliminate the bulk of the data and there will be too few data for a meaningful trend analysis. Therefore, for the majority of the stations, Level 1.5 and Level 2.0 trend comparison is not possible. Dr. Tom Eck also pointed out the inappropriateness of this comparison. Therefore, in the revised version, we removed this part from the main text. The consistency of the trend between Level 1.5 and Level 2.0 for the large AOD stations (i.e., the 7 stations that qualify for Level 2.0 trend analysis) can still be seen from the Level 2.0 and Level 1.5 trend maps (Figure 8 and Figure 11 of the revised manuscript).

. Also, even level 2.0 AERONET data may subject to thin cirrus cloud contamination (e.g. Chew et al., 2011). Would the thin cirrus cloud contamination also affect the trend analysis as presented? The authors should at least touch on this issue.

Thank you for pointing out this point. Based on Chew et al. (2011) and another study by Huang et al. (2011), cirrus cloud may cause a slight positive bias in AERONET AOD for Southeast Asia. However, it is difficult to evaluate the effect for all stations given the lack of simultaneous lidar measurements. We thus briefly analyzed trends for global cirrus fraction from MODIS. The figure is shown below. We find that the trends are mostly concentrated over the tropical Pacific regions, following the ENSO pattern, while the AERONET sites used in the study are mostly in the NH mid to high latitudes. Therefore we consider cirrus contamination an insignificant factor in the trend estimate. However, we added a discussion that "Note that AERONET Level 2.0 AOD could also be influenced by thin cirrus cloud contamination (Chew et al., 2011; Huang et al., 2011) and any trends in cirrus cloud may potential bias the AOD trends. A brief analysis of MODIS cirrus cloud fraction product only reveals significant trends over Tropical Pacific, therefore we consider it an insignificant factor on the trends at the sites used in this study."

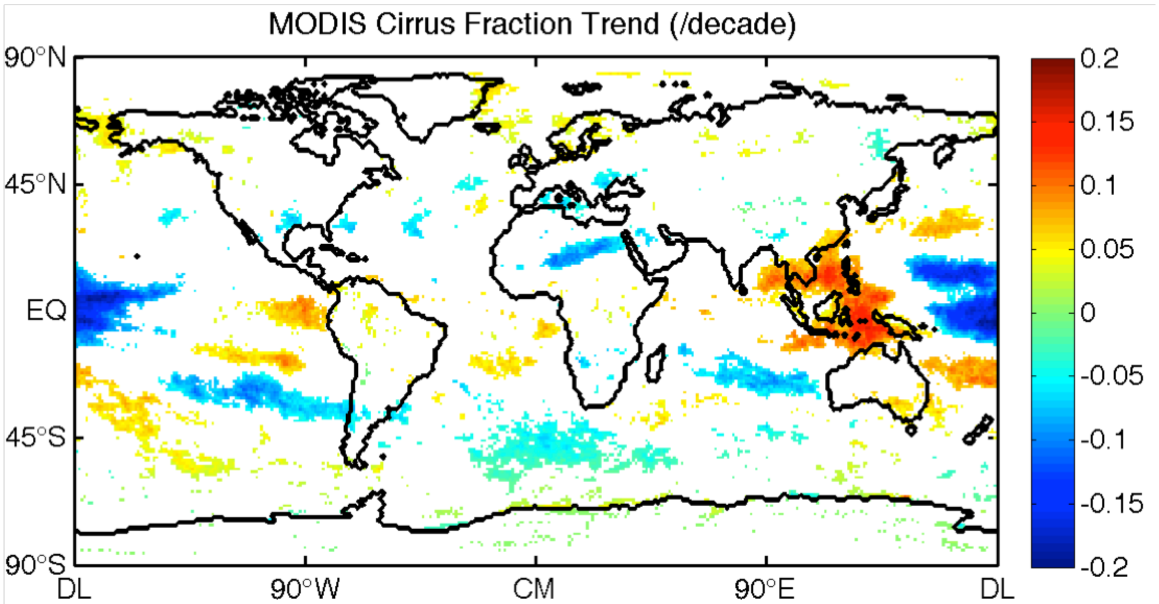

Figure. Decadal trends of cirrus fraction derived from MODIS data. Only trends above 90% significance level are shown.

Lastly, I would recommend that the authors keep their AOD and AE analysis on a global scale, while for the rest of the parameters, focus only on the four AERONET sites that have sufficient level 2.0 data.

Thank you for this suggestion. It is true that the Level 1.5 results are less reliable. Therefore, in the re-submission, we separated the analysis and presentation of the results for different product/data levels: (1) Level 2.0 direct sun measurements at 90 stations for AOD and AE; (2) Level 2.0 inversion product for the 7 stations (with the new data selection scheme after correcting the bug and including the long term stations, see reply to Reviewer 1); (3) Level 1.5 inversion product for additional 44 stations, applying the other quality control except for the AOD > 0.4 threshold. The reason of still keeping Level 1.5 analysis is that the 7 Level 2.0 stations fail to represent most important aerosol source regions and types, such as North America, South America and Europe. And the spatial coherency of the trends in Level 1.5 data, as well as agreements with other independent studies, lend more credibility to these results. Given no other dataset with comparable accuracy and coverage as AERONET, We believe Level 1.5 results are worth showing at least as a reference for future studies when better quality data becomes available. We did mention in the text that these results are subject to larger uncertainty.

References

Chew, B. N., Campbell, J. R., Reid, J. S., Giles, D. M., Welton, E. J., Salinas, S. V., and Liew, S. C. (2011). Tropical cirrus cloud contamination in sun photometer data. *Atmospheric Environment*, *45*(37), 6724-6731.

Huang, J., N. C. Hsu, S.-C. Tsay, M.-J. Jeong, B. N. Holben, T. A. Berkoff, and E. J. Welton (2011),Susceptibility of aerosol optical thickness retrievals to thin cirrus contamination during the BASE-ASIA campaign, *J. Geophys. Res.*, 116, D08214, doi:10.1029/2010JD014910.