Response to reviewer 2 - Reviewer's comments are *italicized*; response are not.

We wish to thank the reviewer of his/her comments and suggestions.

Comment 1: *This paper presents an interesting approach to improving on an existing aerosol product using an existing cloud masking scheme. Complete and up to date references to the aerosol and cloud mask products therefore represent an important facet of this research. While another reviewer has suggested improved references to the MISR retrieval algorithm(s), I would suggest correcting the reference to the thin cirrus detection from Gao et al. 2003, which focuses on water vapor retrievals, to Gao, B., Yang, P., Han, W., Li, R., and Wiscombe, W.: An algorithm using visible and 1.38 μm channels to retrieve cirrus cloud reflectances from aircraft and satellite data, IEEE T. Geosci. Remote, 40, 1659–1668, doi:10.1109/TGRS.2002.802454, 2002. More recent references to the MODIS cloud mask are Frey, R. A., S. A. Acherman, Y. Liu, K. I. Strabala, H. Zhang, J. R. Key, and X. Wang, 2008: Cloud detection with MODIS. Part I: Improvements in the MODIS cloud mask for Collection 5. J. Atmos. Oceanic Technol., 25, 1057–1072 and Acherman, S. A., R. E. Holz, R. A. Frey, E. W. Eloranta, B. C. Maddux, M. McGill 2008: Cloud detection with MODIS. Part II: Validation J. At- mos. Oceanic Technol., 25, 1073–1086.*

Answer: Thank you for the suggestions. We have updated the reference list as suggested.

Comment 2: *Finally with regard to references the recent paper on the new MODIS aerosol product has a much more detailed and nuanced discussion of the use of the MODIS cloud masking scheme in an aerosol retrieval product than is given here viz., Levy, R. C., S. Mattoo, L. A. Munchak, L. A. Remer, A. M. Sayer, and N. C. Hsu, 2013: The Collection 6 MODIS aerosol products over land and ocean, Atmos. Meas. Tech. Discuss., 6, 159–259, 2013 www.atmos-meas-tech-discuss.net/6/159/2013/ doi:10.5194/amtd-6-159-2013. In particular an approach to restoring scenes which are bright as a result of thick dust and other approaches when there is thick smoke that is falsely identified as clouds are discussed, which is germane to the loss of data off the west coast of Africa using the cloud masking that is presented here and identified as a problem in bullet 3 of Section 4 "Recommendations and Conclusions". That bullet must make reference to the published material regarding such issues that is A more comprehensive, or comprehensible, description of Tables 1 and 2 is certainly warranted since presumably the Fcd and Fuc screens change the amount of MISR data that is available, but this is not noted in the tables. Whatever the reason for this, it should be clearly stated.*

Answer: Thank you very much for the comments. We have added the reference to bullet 3 "The misidentification of thick dust and smoke scenes as cloud scenes by the MODIS cloud

mask products, however, has a lesser effect on operational MODIS aerosol retrievals. For example, Levy et al., 2013 discussed an approach to restore thick dust and smoke scenes that are misidentified as clouds by the MODIS cloud screening method."

The data loss rates are not reported for F_{uc} and F_{cd} cases simply because F_{uc} and F_{cd} are not used for cloud clearing of the MISR aerosol products. We have added discussion in the text.

"The data loss rates are not reported for F_{uc} and F_{cd} cases simply because F_{uc} and F_{cd} are not used for cloud clearing of the MISR aerosol products."

Comment 3: *While I would not make it a requirement for publication, I find it unfortunate that the distance in time and space between AERONET and the retrieved aerosol optical depth is not used to generate weighted RMSE and MAE statistics to explore the contribution of heterogeneity of the aerosol field in time and space to the differences in aerosol optical depths. This might help in assessing such peculiarities as the screening threshold over land increasing from 20 to 50% with negligible effect on performance or data loss in Table 2.*

Answer: We have evaluated the RMSE values of the over land MISR AOD retrievals as functions of temporal and spatial gaps between MISR and AERONET data, as well as different cloud filtering schemes. The results are as follows:

	F_{cc} > 20% + thin cirrus cloud filter	F_{cc} > 50% + thin cirrus cloud filter	F_{cc} > 80% + thin cirrus cloud filter	Thin cirrus cloud filter
Time Gap 30 mins Lat/Lon Gap 0.3°	0.078	0.078	0.082	0.101
Time Gap 30 mins Lat/Lon Gap 0.2°	0.053	0.049	0.047	0.059
Time Gap 20 mins Lat/Lon Gap 0.3°	0.085	0.064	0.078	0.088
Time Gap 20 mins Lat/Lon Gap 0.2°	0.057	0.050	0.048	0.067
Time Gap 10 mins Lat/Lon Gap 0.3°	0.057	0.052	0.030	0.064

Time Gap 10 mins Lat/Lon Gap 0.2°	0.047	0.046	0.023	0.047

Clearly, different collocation requirements result in different RMSE values. The smaller the temporal and spatial gaps between MISR and AERONET observations, the less the RMSE values (with less data included in computing the RMSE values). However, changing F_{cc} from 20% to 50% has a negligible effect to RMSE values for most cases. For which, we suspect that it is caused by less data available at the F_{cc} range of 20%-50%. We have included the following discussion in the text.

"Negligible effects are found over land for increasing F_{cc} from 20-50%. For which, we suspect that it is caused by less data available within this F_{cc} range.

Comment 4: *The authors should provide some at least qualitative discussion of the cost/benefits of losing roughly 20% of data per 0.006 decrease in bias against AERONET over ocean.*

Answer: We have added the following discussions: "Over oceans, an approximately 0.006 decrease in bias (validated against AERONET) is observed with a 20% data loss. Still, we expect larger bias reductions regionally, which is critical to aerosol modeling studies. For aerosol forcing studies, a 0.006 decrease in bias is welcomed, as the required accuracy for aerosol forcing studies is 0.01 [CCSP, 2009].

Comment 5: *Certainly in terms of the direct radiative impact of the aerosols the value of the thin cirrus filter should be larger than the other screens since thin cirrus tends to warm the planet rather than cooling it. Comments regarding appropriateness and/or value of the different screens for assimilation or radiative assessments are highly desirable in a paper that is attempting to "improve" an existing product.*

Answer: Done. See discussions from the previous question.

Comment 6: *As regards cloud haloes, adjacency and 3D effects the authors should note for any future work that the MODIS Collection 6 includes (see Section 3.5 of Levy et. 2013*

reference introduced above) 'the algorithm also determines the distance from every pixel to the nearest "cloud" pixel. This is "Cloud Distance Land Ocean". The intention is that users concerned about aerosol retrievals affected by cloud adjacency effects (3-D effects) or by humidified aerosols and cloud fragments in cloud fields (twilight zone) can trace exactly which pixels were used in the retrieval or plot the retrievals as a function to the nearest cloud. There is also a 10 km product that offers the average distance to the nearest cloud of all the pixels within the 10 km box used by the retrieval, i.e., "Average Cloud Distance Land Ocean".' The use of this product in conjunction with the MODIS cloud mask and the MISR aerosol product would allow for a better assessment of the efficacy and quantitative impact of eliminating cloud edges with different Fcc screening criteria. This might in turn facilitate an assessment of whether such edges are dominated by humidified aerosols, side illumination from clouds or residual cloud contamination, but would at least allow the class of cloud edge pixels to be identified and separately analyzed.

Answer: We thank the reviewer for this suggestion. We have added discussions as suggested. "A closer look into the distance between the aerosol retrievals and cloud edge (Levy et al., 2013) may help users to choose the thresholds of the F_{cc} cloud filter for their applications. For example, MODIS Collection 6 Dark Target aerosol products include a parameter called "Average Cloud Distance Land Ocean" that is helpful to solve this problem. It may also facilitate further investigation over the cloud contaminations due to cloud 3-D effects, aerosol hydration over the high humidity environment, and the twilight zone issue."