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Interactive comment on "Improvement of aerosol optical depth retrieval from MODIS spectral reflectance over the global ocean using new aerosol models archived from AERONET inversion data and tri-axial ellipsoidal dust database data" *by* J. Lee et al.

Anonymous Referee #1

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The paper contains a new input database for MODIS aerosol retrieval algorithm over the ocean. Although observed aerosol properties such as size distribution, single scattering albedo, and phase function are primary parameters in satellite remote sensing of aerosol, they are assumed to be simplified values in satellite data retrieval. This study tried to overcome or minimize the error caused by such assumption. However, revisions as stated below are needed.

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1) The error analysis proved that authors' new approach has less error than NASA's operational method. Such result can be expected since NASA's aerosol model does not consider highly absorbing aerosols over ocean except for dust-like model. Authors should prove whether the improvement is mainly caused by use of tri-axial dust model or not. I strongly suggest that sensitivity study or error analysis is included for the estimation of AOD retrieval accuracy (especially for aerosol absorption).

2) This specific consideration is a valuable part of the new retrieval algorithm study and need to be addressed in the manuscript. The organization of the paper needs to be also improved. For example, it would be better to include more detail explanations of the suggested algorithm and aerosol models. Most importantly detailed description of the retrieval procedures outlined in Figure 1 should be added since it is critical for the readers to better understand the algorithm.

3) AERONET inversion products provide only for 4 wavelengths, how such limited spectral information was transported to MODIS 7 bands?

4) More information on the characteristics of 23 aerosol models is needed. Readers can only find the number of models with FMF and SSA ranges.

5) What kind of RTM used to calculate LUT? What are pros and cons of using that RTM?

More minor comments and suggestions are proved below.

1) Page 33327, line 5: What is the range of 'high AOD cases'? 2) Page 33327, line 10: How can FMF be wavelength dependent? 3) Page 33327, lines 22~24: In Fig 6, absolute error for AE<0.8 and theta>130 seems to be similar values? 4) Page 33332, line 3: Provide 4 wavelength values. More explanation on Meng et al.(2010)'s model is needed. Does it contain only dust model? 5) I'm not sure Fig.3 is required to explain aerosol model from AERONET. Instead, aerosol models with AOP would be more appropriate. 6) Page 33334, lines 8 ∼ 9: How to merge these information into RTM

for LUT calculation? 7) Page 33336, line 5-10: These are confusing. 8) Reference: Remer et al (2006) is cited but not listed.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 33325, 2011.

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