

Interactive comment on “Aerosol Optical Depth (AOD) retrieval using simultaneous GOES-East and GOES-West reflected radiances over the Western US” by H. Zhang et al.

Anonymous Referee #2

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In this manuscript, the authors develop a new aerosol optical depth retrieval algorithm that combines both GOES-East and GOES-West visible band observations. The retrieved AOD is validated over three AERONET sites. The AOD is slightly improved based on the more accurate retrieval of surface BRDF. The hybrid algorithm increases the number of valid retrieval pixels compared to the single satellite method.

General comments:

1. The description of the strategy of the algorithm needs to be improved. E.g. what information is stored in the LUT in section 3, and how the LUT is used for the AOD re-

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trieval, only to calculate the S_e and S_w ? Since the surface BRDF are already retrieved in the process why the authors still assume Lambertian surface which will introduce errors although relatively small.

2. Page 7958 line 15, this assumption is not correct. It depends on the back scattering or forward scattering directions and also specific land types.

3. Explain more about the threshold 0.4 BRDF and 0.04 in line 10 on page 7958 and the 0.03, 30% filter in line 20.

4. The hybrid method improves at the Boulder site but gets similar results as single satellite method over the UCSB and Railroad Valley sites? It's important to explore the details because this would guide the advantage of the hybrid method.

5. Both GOES-East and West observations should be used for the BRDF retrieval in the morning and afternoon. The BRDF retrieval can be improved from more observations from different solar-view geometries.

6. The conclusion part is just the summary of the results. I would suggest to discuss some limitations of this method. And how about the performance of this method over the urban area? The equation 2 doesn't consider the non-linear multi-scattering between the surface and atmosphere which limits the application of this method over high surface reference area.

Specific comments:

Page 7948 line 5, I would suggest to add a figure of diurnal AOD from AERONET data, single satellite, hybrid and combined methods with the scattering angles as the x axis to show the accuracy of different methods.

Page 7948 line 13, should be “It should be possible, however, to add additional information from the radiances and reflectances from the two satellites, a “hybrid retrieval”, by giving additional”

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Page 7948 line 7, explain more about the “large scattering angles”.

Page 7949 line 24, what does the western “third” mean?

Page 7950 line 1, references are needed to support the statement “It is found. . .”.

Section 2.2, do the authors consider the QA quality flag of MODIS BRDF product?

Page 7952 line 22, list the latitude/longitude of the three sites (UCSB, Railroad Valley and Boulder).

Page 7956, line 12, It would be good to use the data from the three AERONET sites for the validation instead of the GSFC site.

Figures:

Fig 4, “a” should be Italic.

Fig 8. The AOD data are mainly less than 0.3. The improvement of correlation coefficient from hybrid method is mostly for the AOD larger than 0.3 over the Boulder site. Discuss more about this. While the hybrid method has the worst slope, so the accuracy of the retrieved AOD would decrease with the increase of AOD.

Fig 10, add the color bar and should also plot the combined method results.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 7945, 2012.