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Atmospheric Measurement Techniques Discussions

Interactive comment on "A surface reflectance scheme for retrieving aerosol optical depth over urban surfaces in MODIS dark target retrieval algorithm" *by* P. Gupta et al.

Anonymous Referee #1

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This manuscript describes substantial improvements of the AOD retrieval over urban areas based on MODIS measurements. While the latest Collection 6 shows a significant positive bias compared to concurrent AERONET measurements, the authors could eliminate this positive bias for several urban areas in the US by modifying the surface reflection assumptions in the standard retrieval code depending on urban percentage.

The manuscript is well-written and organized. The manuscript is highly recommended for publication in AMT. But I have a few minor comments that should be addressed first.

General comments:

The authors did not mentioned which years have been used for the new surface reflectance scheme. Did the land use or urban percentage change within the considered time range?

The authors have shown improvements of the AOD at 500 nm using C6U. The standalone code S-MDT provides also AODs at other wavelengths. Did you also considered other wavelengths than 500 nm for comparisons with AERONET?

The distribution of AODs may be quite inhomogeneous over urban areas for areas with different sources of pollution. The standard resolution of the AOD product is 10 x 10 km. In particular for urban areas it might be interesting to give AODs with higher spatial resolution. Did you apply the new assumptions also for reflectance measurements with other resolutions? The MxD04_3K product for example gives AODs with 3 x 3 km resolution. It could help to improve agreements with AERONET data in particular for cities with complex terrain (Chapter 5.3).

The assumptions in the new surface reflectance scheme are based on land use data and MODIS measurements at low AODs. Finally the authors came up with linear regressions. As stated on page 7 in line "These pixels are selected for low view angle, the absence of clouds or cloud shadow, and low aerosol loading." the authors have filtered the data. For low Sun I would expect kind of showing effects caused by buildings in urban areas, when the BRDF is quite anisotropic. Is there any dependence on SZA or sensor angle on the regression lines? Can you estimate the effects in the distribution of reflectance pairs when using all sensor geometries?

Specific comments:

P14 L5: Please introduce the QAF in more detail. What does QAF=2,1 mean. The authors use all quality flags later on. The reader might be interested what the differences are.

P17 L14 – p18 L13: "We would expect these AOD maps to represent the seasonal

aerosol distribution over the region" The authors discuss here the spatial distribution of AODs for Washington DC and Baltimore. This paragraph should be motivated more clearly. What does seasonal aerosol distribution mean? It is not clear to me what you want to show with this paragraph. There is only low statistics of measurements to generalize the results. How does other years compare? Again, for studies of the AOD's spatial distribution over urban areas it would be beneficial to use at least 3 km resolution reflectances.

Technical comment:

P18L11/L12 Wrong figure number.

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