Atmos. Meas. Tech. Discuss., 5, C556–C558, 2012
www.atmos-meas-tech-discuss.net/5/C556/2012/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Improved cloud screening in MAIAC aerosol retrievals using spectral and spatial analysis" *by* A. Lyapustin et al.

A. Lyapustin et al.

Alexei.I.Lyapustin@nasa.gov

Received and published: 5 April 2012

Dear Reviewer, thank you for your comments. The suggested changes (Title, L14, L27, L27, L29, L44, L80) were implemented.

Below are the answer to the other questions:

L45: The uncertainty Sigma represents one standard deviation of AOT over the box of 3X3 1km pixels. Sigma is strongly affected by unresolved clouds and residual snow. Without these artifacts, Sigma is usually considerably lower than 0.05 in cloud-free homogeneous conditions. The accuracy (or error) of aerosol retrievals depends on correct selection of the aerosol model and two main systematic factors: surface brightness

and view geometry. The AOT-retrieval error grows with surface reflectance (because the uncertainty in the surface bidirectional reflectance (Rs) grows proportionally to Rs). It also grows as the atmospheric mass decreases, with the worst retrieval conditions corresponding to geometry when sun is in zenith with nadir view. The relationship between Sigma and error of aerosol retrieval may be arbitrary depending on conditions.

L51: That is correct. In those specific examples of mountainous sites with generally low AOT, the Sigma filter removed high values from residual clouds and snow, or retrieval errors. However, as we mention in the next paragraph, in more general case it would also remove inhomogeneities representing the real aerosol signal, as in case of fire smoke plumes.

L86: The definition for parameter "eta" has been added: "...characterized by parameter "eta" equal to ratio of volumetric concentrations of coarse and fine fractions."

L90. Because this technique was described in detailed in (Lyapustin et al., 2011b) and a reference in manuscript is provided, we chose not to add more text in this paper. For more explanation, see also an answer L112 below.

L93: The mentioned snow test, currently used in the operational MODIS aerosol algorithm MOD04, uses spectral snow signature, namely the decrease of snow reflectance from 0.87 mkm (Band 2) to 1.24 mkm (Band 5). The test uses a simple threshold: (R2-R5)/(R2+R5) > 0.05 which is interpreted as residual snow and the pixel is not used for aerosol retrieval. As before, we think that providing a reference to this test is sufficient.

L102: We did not present simulations for the mineral dust in this paper, but your guess is correct, the dust-cloud discrimination comes mainly from the Blue (0.47mkm) and Deep Blue (0.412mkm) channels where dust is absorbing and the clouds are not.

L111: The wavelength is provided in the text, and the benefit of the Deep Blue channels is discussed next.

L112: Indeed, we used a different droplet size (10mkm) in these simulations than

previously (5 mkm), and this is some inconsistency on our part which was overlooked. This change will have little effect on visible wavelengths where the optical thickness can be re-scaled to get quite similar results for the two cases. The difference will show up at wavelengths where water has a noticeable absorption, in our case at 2.1 mkm. However, the 10mkm droplets represent the valid and typical range of cloud droplet sizes such that the results of presented simulations are not incorrect.

L201: One quarter is an arbitrary empirical criterion which we found to be working well based on large volumes of processed MODIS data.

L237: Yes, this is true for the MODIS view geometry in the vast majority of cases. At the backscattering angles of MODIS observations, the increase of the coarse mode fraction leads to decrease of the total aerosol scattering phase function, and to a corresponding increase in AOT (and vice versa).

L247: The averaging window size is 1,3,5 and 10km as given on lines 242-244, and the time period covers years 2000-2008.

Section 4 and L292: We agree on both of Reviewer's comments. To address them, the following sentence from Conclusions (L288-L291) was modified as follows:

"Comparisons with AERONET aerosol measurements at several sites and a limited large-scale MODIS data analysis show strong suppression of aerosol optical depth outliers due to unresolved clouds and snow, although the global performance of the algorithm has not yet been evaluated."

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 1575, 2012.