

Interactive comment on “A critical assessment of high resolution aerosol optical depth (AOD) retrievals for fine particulate matter (PM) predictions” by A. Chudnovsky et al.

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Authors: We would like to express our gratitude to the anonymous Referee #1 for his attentive and constructive comments. Based on this input, the paper has been changed and substantially improved. Here is a list of the referee's comments followed by our response.

General comments

Reviewer 1: Mention the main sources of error for AOD retrieval and give estimate of uncertainties of AOD and of PM_{2.5} measurements. There are many factors hampering

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AOD and PM estimation, e.g. aerosol model used in the retrieval, etc.

Authors: Done. This subject is addressed several times in the revised manuscript, and a more detailed discussion is added to the last section "Concluding Remarks".

Reviewer 1: Discuss the impact of meteorological conditions on the AOD-PM regressions.

Authors: Done. As we mentioned above, a more detailed discussion is added to the last section "Concluding Remarks".

Introduction

Reviewer 1: Line 11. I find similar sentences in the Introduction and Concluding remarks section (section4), line 20. I think you can delete the first two sentences of third paragraph, starting with review paper of Christopher and Hoff and, thus avoid the redundancies.

Authors: Done. The Introduction section was improved, the review of the current state-of-art was expanded with additional references. The "Concluding Remarks" section was also changed to avoid redundancies and provide discussion of errors and future plans.

Materials and Methods

Reviewer 1: Please supply uncertainty figures of MAIAC AOD.

Authors: The uncertainty of MAIAC AOD was investigated in Lyapustin et al., 2011b for different AERONET sites in the continental USA in comparison to the MOD04 product. The global multi-year evaluation of MAIAC similar to what was done for MOD04 is still unavailable. The main reason is the lack of computer/data storage resources for MAIAC analysis. This situation will change in early 2014 when MAIAC is scheduled to be used in the MODIS operational processing environment to re-process the entire MODIS Terra and Aqua record with products publicly available through the standard

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MODIS product portal (LAADS).

Our current validation work (in preparation), for example using spatially distributed AERONET DRAGON field campaign data, is consistent with the results published in Lyapustin et al., 2011b.

Lyapustin, A., Wang, Y., Laszlo, I., Kahn, R., Korin, S., Remer, L., Levy, R., and Reid, J. S.: Multi-Angle Implementation of Atmospheric Correction (MAIAC): Part 2. Aerosol Algorithm, *J. Geophys. Res.*, 116, D03211, doi:10.1029/2010JD014986, 2011b.

Results

Reviewer 1: Page 14589, section 3.2: In my opinion, the authors ought to be more tutorial in this section, stating clearly the goals. For example, saying that you explore the advantages/disadvantages of using the entire data set, when MAIAC was not “restricted” to the availability of MYD04. I would start asking questions, such as: do we have more AOD retrievals when using MAIAC algorithm relative to MYD04? And if you do have more data, how would it correlate to PM2.5? And if it is comparable to the previous result reported in Table 2, what advantages it would bring to the future exposure studies, what would be the consequences? Otherwise it appears as a disjoint collection of many different (although important) results.

Authors: Thank you, this is an excellent suggestion. In the revised version, we improved this and other sections by outlining the problems and clearly stating our goals upfront.

Reviewer 1: Line 12, page 14589: The rate of correlations across the sites is substantial for both retrievals. Please include “for both retrievals” in your revised version, otherwise it is not clear.

Authors: Done.

Reviewer 1: Lines 4-9, page 14590: Please rephrase the paragraph, avoiding the use of “significantly out performs”. Be precise here.

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Authors: Implemented.

Reviewer 1: Lines 12-14, page 14590 is a pure speculation as you don't present results of any model, so please delete it.

Authors: Done. The mentioned sentences were deleted.

Reviewer 1: Lines 15-20, page 14590. Please rephrase. Use something like: “Larger number of AOD retrievals provided by MAIAC comparing to MYD04 roots in its improved detection of both, cloudy and clear-sky conditions and also by better discrimination of aerosols above bright urban surfaces”.

Authors: Done.

Reviewer 1: Line 28, page 14590: Include the word “potentially” after “which”. It potentially has the ability to include more AOD/PM2.5 pairs on a given day, but not necessarily to increase the range on a given day.

Authors: Done.

Reviewer 1: Lines 5-12, page 14591. Reduce this section by removing irrelevant text as you have several conclusions here which distract the reader from the main point.

Authors: Done.

Reviewer 1: Lines 8-15, page 14592: There is a slight drop in correlation coefficient between Table 2 (1 km vs 10 km collocated pairs) and Table 3 (partially cloud data). There might be noise in the data set, especially during the winter. To render the data set more robust, one can apply some screening thresholds to avoid using noise (cloud-contaminated pixels) in future predictions of PM2.5. I like the last paragraph where you suggest some thresholds to avoid the noise. However, I would like to see more of a self-critical evaluation on this topic.

Authors: That is correct. There is more noise in the MAIAC retrievals in partly cloudy and winter conditions. We re-phrased the respective conclusions throughout the paper,

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especially in the mentioned paragraph. Also, a brief discussion of algorithm errors was added in section "Concluding Remarks".

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