Atmospheric
Chemistry
and Physics
Discussions

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.

Anonymous Referee #1

Received and published: 25 June 2013

The authors compare ground-based measurements of PM2.5 with the space-borne observations of aerosol optical depth (AOD) from the MODIS instrument, the latter generated in two ways, using the MAIAC algorithm (1 km spatial resolution) and the conventional MYD04 (10 km). The comparison is conducted for the New England region in 2002-2008. The PM2.5/AOD comparisons are used to analyze the spatial variability of MAIAC/MYD04. The authors have conducted a rather comprehensive multi-year analysis and report results (regressions) by season (spring, summer, fall, winter). The authors' results are complete in its current form, and the manuscript is suitable for publication.

To my knowledge, this is the first comparison of the (high resolution) MAIAC AOD product and MYD04 for air quality monitoring in a metropolitan area. The manuscript is well written and the

results of this paper are promising and relevant for future environmental/air quality applications (e.g. population exposure assessment studies). Considering the general air pollution and environmental problems in many large cities around the world, this MAIAC product offers great practical as well as scientific potential.

Overall, this is a very valuable contribution to the scientific literature and a very interesting study and I certainly recommend for publication in ACP. However, I do have minor comments that should be addressed by the authors while revising the manuscript (see below).

General comments

1. Mention the main sources of error for AOD retrieval and give estimate of uncertainties of AOD and of PM2.5 measurements. There are many factors hampering AOD and PM estimation, e.g. aerosol model used in the retrieval, etc.

2. Discuss the impact of meteorological conditions on the AOD-PM regressions.

Specific comments

Introduction:

Line 11: I find similar sentences in the Introduction and Concluding remarks section (section 4), 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.

Materials and Methods

1. Please supply uncertainty figures of MAIAC AOD.

Results

- 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.

- 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.

- Lines 4-9, page 14590: Please rephrase the paragraph, avoiding the use of "significantly outperforms". Be precise here.

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

- 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".

- 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.

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

- 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.

_____

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 14581, 2013.

C4178