

## ***Interactive comment on “An analysis of the Collection 5 MODIS over-ocean aerosol optical depth product for its implication in aerosol assimilation” by Y. Shi et al.***

**Anonymous Referee #1**

Received and published: 13 October 2010

### **1 General comments**

The paper presents a thorough analysis of biases in the over-ocean MODIS Collection 5 product as derived from comparisons to aerosol optical depth data from AERONET. The methodology, based on Zhang and Reid (2006), is sound and robust, and aimed at identifying the main contributors to the observation bias. For low AODs ( $< 0.2$ ), those are surface winds and cloud-cover, while for  $AOD > 0.2$  the main bias parameters are cloud cover and, to a lesser extent in Collection 5 with respect to Collection 4, microphysical assumptions. The results demonstrate that stringent quality checks, along with empirical corrections derived from regression techniques, are very effective

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in removing the bias in the over-ocean MODIS AOD for both Terra and Aqua and improving the RMSE with respect to AERONET data.

This paper is very good, and the results obtained will be extremely useful for any type of aerosol research based on MODIS data, especially for assimilation. I find it hard to find anything to comment on. I just have one philosophical question on the dependency of the bias of MODIS AODs  $< 0.2$  on surface wind speed: since a fixed value is used in the MODIS retrieval ( $u_t = 6$  m/s), I would not expect a linear dependency of the bias on that parameter, especially an increase of AOD with increasing wind speed, which the regression results point to. In fact, considering how surface wind speed is used to parameterize sea-salt emissions (which for the sake of argument we can use as a proxy for low AODs over ocean), and how that relationship is far from linear, I would almost expect a “bimodal” relationship in which for actual surface wind speed  $> u_t$ , the MODIS product *underestimates* the actual AOD, while for (actual) surface wind  $< u_t$  the MODIS AOD *overestimates* it. Perhaps the linear behavior found by the authors has to be ascribed to the way the MODIS retrieval is set-up and the prescribed dependency on the (fixed) wind speed. Can the authors shed some light on this?

### **2 Specific comments and technical corrections**

#### Abstract:

Line 2: Remove “symbol as  $\tau$ ”, and define in the body of the article, when needed.

Line 4: Remove “data” after Aqua since it’s repeated just afterwards.

Line 5: Remove “data” before assimilation.

Line 9: To avoid repetition, replace “quality assurance and empirical correction procedures” with “these procedures”.

Line 11: Add "with respect to AERONET data" after "respectively."

Line 14-15: To improve readability replace ", and will also be useful...their projects." with ", as well as other research based on MODIS products".

Introduction:

Line 25: After "through the" add "analysis to the"

Line 8 (page 20241): use "data performance" rather than "data performances"

Line 9: remove "the" before "functions" and add "the" in front of "main"

Line 15: replace "operationally used" with "operational"

Section 3:

Line 19-20 (page 20243): Instead of "Similar excises were...", say "A similar analysis was..."

Line 27-28: Remove "Also, although" and capitalize "both". Put a period after analysis and start a new sentence with "However, ..."

Line 5 (page 20244): add "instruments" after "MODIS"

Line 7: "aerosol retrievals" instead of "aerosol retrieving processes" Line 8 (page 20245): replace "is beyond ... discussed" with "their discussion is beyond the scope of this study."

Section 4.2:

Line 3 (page 20248): remove "are"

Line 6 (page 20248): replace "As both" with "Both"

Line 7: replace with "suggested" with "suggest"

Line 14: "categorized" instead of "divided"

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Line 27: add "the" before "analysis"

Section 4.2:

Line 2 (page 20249): add "the" before "empirical corrections"

Page 20249, bottom: for readability, summarize RMSE values in a table

Line 13-14 (page 20251): rephrase from "The cloud contamination...reduced" - the sentence is missing the main verb and hard to read.

Section 5:

Line 19 (page 20252): add "oceans" after "southern".

Line 20: replace "sources" with "retrievals"

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20239, 2010.

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