

Interactive comment on “Comparison of dust layer heights from active and passive satellite sensors” by Arve Kylling et al.

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Received and published: 23 April 2018

Response to interactive comments from Referee #3

The referee is thanked for the careful reading of and constructive comments to the manuscript. The referee's comments are repeated below in italic font. The responses to the comments are shown in roman font.

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Major comments

1. *I have the same feeling to the first reviewer that Figure 2-7 and their discussions are difficult to follow. I also suggest Figures 2-5 and 6-7 be merged, so that readers can easily compare the spatial distribution of heights between different algorithms. I would also recommend a legend be added to the curtain plot to indicate the meanings of each symbol.*

Figures 2-7 have been changed as suggested by referee #1. Legends have been added to indicate the meanings of each symbol.

2. *Table 3 is particularly hard to follow. I recommend, instead of using table, use bar plots to compare those statistics to different algorithms.*

We have clarified and cleaned up Table 3 as suggested by referee #1. Bar plots, as suggested, may be an alternative. However, we feel that the numbers themselves include more detailed information about the results and, as such, may have more value for possible future studies.

3. *Too much text is used to present Figures in the Appendix. Those figures should be briefly mentioned, so only the major findings from them be presented.*

We have moved the mentioned text to the appendix and points the reader to the appendix for discussion and presentation of these results.

4. *This study found that solar algorithms yield larger bias (> 1 km) for the case of dust aerosol height than the IR algorithms. However, it should be noted that some studies have shown an accuracy of about 0.5 km of dust layer height from O2-A might (studies listed below). So authors may need to compare and justify the performance of the current study to those studies:*

Kokhanovsky, A. A., and V. V. Rozanov (2010), *The determination of dust*

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cloud altitudes from a satellite using hyperspectral measurements in the gaseous absorption band, *International Journal of Remote Sensing*, 31(10), 2729-2744, doi:10.1080/01431160903085644.

Dubuisson, P., R. Frouin, D. Dessailly, L. Dufoiré, J.-F. B. L. © on, K. Voss, and D. Antoine (2009), Estimating the altitude of aerosol plumes over the ocean from reflectance ratio measurements in the O2 A-band, *Remote Sensing of Environment*, 113(9), 1899-1911, doi:10.1016/j.rse.2009.04.018.

Xu, X., J. Wang, Y. Wang, J. Zeng, O. Torres, Y. Yang, A. Marshak, J. Reid, and S. Miller (2017), Passive remote sensing of altitude and optical depth of dust plumes using the oxygen A and B bands: First results from EPIC/DSCOVR at Lagrange-1 C2point, *Geophysical Research Letters*, 44(14), 7544-7554, doi:10.1002/2017GL073939.

We thank the referee for these references. In the Discussion section we have included these references and a discussion of the results, highlighting additional differences between the retrieval setups of this work and mentioned literature.

Specific comments:

- P2, L11: I'd to bring an attention to a recent review article about passive remote sensing of aerosol height by Xu et al. 2018, which is worth to cite: Xiaoguang Xu, Jun Wang, Yi Wang and Alexander Kokhanovsky, Chapter 1 - Passive Remote Sensing of Aerosol Height, In *Remote Sensing of Aerosols, Clouds, and Precipitation*, Elsevier, 2018, Pages 1-22, ISBN 9780128104378, <https://doi.org/10.1016/B978-0-12-810437-8.00001-3>

The paper has been cited in the introduction.

- P3, L5-10: It mentioned here that these selected dust events are of Saharan C3

origin, but the studied area are also frequently affected by dust emitted from Middle East, India, and Western China. Please be accurate.

We have rephrased the sentences on P3, L5-12, to also include dust emitted from Middle East, India, and Western China.

- P14, Figure 2(bottom): Symbols are hard to follow. A legend may be added to indicate the meaning of each symbol.

This Figure and similar ones have been revised. Legends have been added.

- P15, Table 2: I don't quite understand the bracketed numbers in the third and forth rows. Please clarify in the Table caption (or using table footnote, as the caption is already very long).

We have added footnotes explaining the bracketed numbers.

- P21, Figure 8: A colorbar is needed for the density of the scatters (similarly in Figure 9-10). The definition of the density is also necessary in the figure caption.

Colorbars have been added to Figure 8 and similar Figures. The definition of the density have been added to the figure caption.