

Interactive comment on “Retrieval of spectral aerosol optical thickness over land using ocean color sensors MERIS and SeaWiFS” by W. von Hoyningen-Huene et al.

Anonymous Referee #2

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An interesting article describing a retrieval technique and its application. Overall a valuable scientific contribution that will probably be of interest to a significant portion of the AMT readership. However, some structural and presentation issues need to be addressed in a revision.

1 MAIN REVIEW POINTS

1. The manuscript should be thoroughly checked by someone fully proficient in English before publication. While I have pointed out some errors on the first few

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- pages, numerous mistakes are found throughout the manuscript.
2. The AERONET-based validation study presented at the end of the manuscript is not fully comprehensible to the reader. Fundamentals such as data and station selection criteria, period length and number of scenes used are left unexplained. From the information available in the manuscript it seems as if the study covers only a small data set, so that results cannot be generalized. All of these concerns should be addressed in a revision.
 3. In various parts of the manuscript, the algorithm's focus on the VIS and blue regions of the spectrum is stressed. I would like to point out that the blue is part of the VIS. The sections concerned should be clarified accordingly.
 4. The current structure of the manuscript makes it hard for a reader to fully understand the algorithm presented. I suggest presenting the general outline of the technique early on. This might be accomplished by moving section 3.5 forward.
 5. Near the beginning of the manuscript, changes in the algorithm over previous versions are mentioned as the main motivation for this publication. However, I could not find any explanations of these differences. What has changed over previous versions? Also, it would be interesting to know if these changes improved performance. A validation study therefore should ideally also include a comparison with the old version (or at least cite results of a similar study performed with an older version).
 6. All acronyms need to be explained on first use in the manuscript.

2 MINOR DETAILS

1. Abstract: A sentence on the results of the trend analysis would be useful.

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2. Section 2: The role of surface properties and the need to know them is explained several times. There is scope for shortening the manuscript here.
3. 2110-15 (page 2110, line 15): It remains unclear where the information on air pressure comes from (data source).
4. 2110-23: Here you assume a very ambitious degree of accuracy (AOT \pm 0.01, reflectance \pm 0.001). This does not seem realistic to me.
5. 2111-4: "There is no problem..." – What do you mean?
6. 2111-8ff: Why do you use the data at these resolutions? (Availability, comparability etc.)
7. 2113-7: What are the data sources for temperature and pressure information?
8. 2114-4: "The BRDF parameters to be used are still under investigation." – Can you please provide more detail?
9. 2114-14: Here you mention Germany explicitly. Is the algorithm designed/tested for use in Germany only? If so, please mention this prominently. If not, why do you mention Germany here?
10. 2115-3: NDVI is not a "vegetation fraction".
11. 2116-8: LUT is mentioned here for the first time. So far, the reader does not know of the existence and/or intended use of a look-up table (nor does he/she know the meaning of the acronym). Please restructure the chapter to help the reader better understand the algorithm.
12. 2117-18: Why polynomial fit? Why second degree?
13. 2118-9: What are your conclusions from the data shown in figures 7 and 8?

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14. 2118-16ff: I do not understand this paragraph. Please try re-wording.
15. 2121-1: There is a sign missing in the equation.
16. 2121-8f: "Since channel..." – I do not understand this sentence. Please try re-wording.
17. 2122-2: What happens to $\rho_{TOA} = 0.1$?
18. 2123: I am not quite sure I follow your cloud identification scheme. The following aspects require clarification:
- In what respect do you consider clouds as inhomogeneous? While cumulus clouds may certainly qualify as heterogeneous in terms of surface reflectance and temperature, I would consider low stratus fields as extremely homogeneous.
 - line 10: how do you increase ρ_{Clmin} ? How do you know this situation is encountered?
 - line 11: do you look at all individual RGB plots? This would make operational application of the technique extremely difficult.
 - line 14: why do you expect 'a decreased spectral slope'?
 - line 16: here you say 'scenes', whereas figure 10, to which you refer, mentions one scene only. Which is correct?
 - If you used only one scene, how do you account for effects due to changing solar geometry (time of day)?
 - end of block 2: add "for clear conditions."
19. 2124-12ff: You say there is no cloud detection technique meeting your criteria. What about the cloud screening technique used in MODIS aerosol retrieval? Wouldn't it be convenient to use that?

20. 2126-1ff: I do not understand the first paragraph. Please try re-wording.
21. 2126-5: Please explain what is seen in the figures and how it shows the algorithms skill.
22. 2127: In the validation study, please mention the following:
- What scene/s did you use for the study?
 - By what criteria did you select them?
 - By what criteria did you select the AERONET stations? Why didn't you use all stations available?
 - What AERONET level did you use?
 - Is the relationship between AERONET and your algorithm statistically significant?
23. 2128-16: Here you mention that one particular LUT yielded the best results in the validation study. However, in the validation study there is no reference to different LUTs. Please make your argumentation consistent.
24. 2129-7ff: I do not understand how degradation was removed. Please clarify.
25. 2129-14: Why do you mention the CITYZEN project here? Is there a specific relationship between your algorithm and this project?
26. 2129-16: What does the suffix 'big' stand for?
27. 2129: Are the trends presented here statistically significant?
28. 2130-24: Here you mention differences between land and ocean algorithm performance. I did not read about this earlier in the manuscript. Since this is the summary and conclusions section, I do not think you should introduce new points.

3 TECHNICAL REMARKS

1. 2108-8 (page 2107, line 8): Wide Field sensor...
2. 2109-10: need -> needs
3. 2108-24: of the AEROSOL source regions are ON land, retrieval...
4. 2109-1: ... assumed as "black"; its properties need to be ...
5. 2109-16: Since its first publication () several improvements have been made, which will be presented here.
6. 2109-21: Since the surface contribution cannot be neglected in an aerosol retrieval over land, it needs to be...
7. 2110-10: Generally, land surface reflectance...
8. 2110-13: Although Rayleigh path...
9. 2110-24: If all other influences WERE known...
10. 2111-1: considers that disturbing effects like land...
11. 2111-3: importance that the instrument DOES NOT REACH saturation...
12. 2111-5: same wavelengths AS SeaWIFS SATURATE UNDER some...
13. 2112-14: agreement with reality if ocean conditions in the red and NIR are known.
14. 2113-15: "Lambertian" should be capitalized throughout the manuscript.
15. 2115-16: sensitivity TO aerosol

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16. 2116-19: AOT determination
17. 2117: Figure 6 seems to appear before figure 5. Please re-arrange.
18. 2118-24: this -> these
19. 2119-1: CONSTRAINTS
20. 2119-13: RMSD not explained
21. 2120-3: last square -> LEAST SQUARES
22. 2121-13: sufficientLY
23. 2129-13: Not a complete sentence
24. 2130-2: increased -> improved
25. Table 1: Possibly use nm?
26. Table 3: ALBEDO
27. Table 4: BAER, not BEAR
28. Figure 10: boarder?
29. Figure 15: surrounding AREAS.

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