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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of the MERIS aerosol product over land with AERONET" *by* J. Vidot et al.

Anonymous Referee #4

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This paper of Vidot et al., discusses MERIS aerosol product over land, and evaluates it by comparing to AERONET. The MERIS product should be useful addition to the the suite of satellite-retrieved products over land.

Soon after I wrote the review (below), I see that the author's added replies to the other reviews. My review addresses some additional points that may not have been the focus of the earlier reviews.

I find this paper easy to read (English sentence structure), but I think the overall structure needs major work. I have lots of questions regarding the algorithm and its application to the MERIS data. Some of these points may be in other papers, but some should be summarized in this paper.

General:

Most importantly, I got very confused trying to follow the different versions of the algorithm. It is not clear to me, what you mean by 1st and 2nd "processing". Is one a "new" algorithm, or are they both performed during one retrieval (e.g. paes 3725-3726). It is also hard to tell which steps are "algorithmic decisions" and which are "developer decisions". For example, page 3725, lines 22-24, suggest that the 1st MERIS processing derives alpha and tau at 865. Then lines 25- suggest that this isn't good enough, and one needs to fix the surface properties, which eventually leads to retrieval of tau at 443 nm and alpha. Are the 1st processing products "forgotten" or are they used in teh 2nd processing? Basically, the reader needs more information, and maybe a flowchart (figure) would help dramatically. I also need some help following pages 3731-3732, for some of the same reason. Again, which steps are performed "iteratively" within the broader MERIS algorithm, and which steps are corrected outside (assumptions, boundary conditions) the process?

Certain terms need to be defined. What is the equation for ARVI, and what do mean that the LARS surface reflectance has a linear dependence with ARVI? At all channels? At 443 only. I realize that I cannot find which MERIS channels are used for aerosol retrieval (there is more than one MERIS algorithm I presume).

Pages 3726-3728 are made of lengthy text, that is efficiently presented as Table 1. I would suggest reducing the text, and leaving Table 1.

As for the "conclusion", I would like to know why the combination of MERIS/MERIS algorithm is different (hopefully better) than the now dozens of other data/algorithms out there.

Specifics:

1. Which MERIS channels are used for aerosol retrieval, and what is its resolution?

2. Please define ARVI, and explain how it should be related to surface reflectance in

ACPD

8, S1574–S1577, 2008

other channels.

3. Why use Junge aerosol models, when almost every other algorithm uses lognormal assumptions?

4. How does MERIS "choose" between aerosol models?

5. Why is the "valid" alpha defined as 0-2.5, when AERONET data (Table 1) shows a larger range (at least to 3.4)?

6. Page 3729: As for the MERIS/AERONET co-location, how much real-estate does a 10x10 box of MERIS represent?

7. With only two to eleven matchups at some locations, I don't think the results should be reported in Tables 2-3.

8. Pages 3729-3730. Relating to cirrus. Since cirrus is relatively homeogenous, how does the sigma filter help screen out cirrus?

9. Table 4: are the "red" entries for 1st proc/June models and 2nd/proc Junge models, reversed (to compare with the text suggesting that 1st processing derives in the red?

10. Because I am confused by the order of 1st processing/2nd processing/Junga/IOPA/ARVI/LARS, etc, I don't understand the differences between Figs 2,3,4,5, 9, 11, 12, 13. It seems that by showing Fig 13, that this is the best case. But there are also some matchups (x=1.5, y=0.2) that were not present in the previous (worse) comparisons.

11. Also, with the same figures (comment 10.) I feel that the axes are reversed. Usually I think of AERONET as the independent variable (the truth) and the satellite retrieval as the dependent variable (as the y-axis).

12. Fig 7 is so small (in the print version) that it is unreadable. Why are the phase functions so different for small alpha (=0.0, =0.3), and also for large alpha (=2.0, 2.2). Are there "shape" (non=spherical) issues as well?

ACPD
8, S1574–S1577, 2008

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 3721, 2008.

ACPD

8, S1574–S1577, 2008

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