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Atmospheric Measurement Techniques Discussions

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 #1

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This is an interesting paper, discussing an aerosol retrieval technique over land using data from a single view satellite instruments with a suitable number of spectral bands in the visible and NIR. But I found it very difficult to understand the retrieval technique and grasp the essence of its operation. My comments concerning this point are as follows:

1) The description of the algorithm is hard to understand due to insufficient symbol identification and usage coupled with a too brief explanation of individual algorithmic steps.

Case in point: the symbol rho_sub_surf is used in Eq. (3) to describe surface direc-

tional reflectance, then used again in the text at the bottom of page 2114 to describe the two-compont (vegetation and soil) spectral properties of the surface, and used a third time in Eq. (9) to describe the surface contribution to the TOA reflectance (I think). If these three parameters represent different physical quantities, then the sybol representation should be sufficiently different.

In particular, the rho_sub_surf symbol in Eq. (9) should be replaced by the explicit representation of the surface contribution to the TOA reflectance which I assume is some form of the last term in Eq. (1). This brings up another question. In the first paragraph of section 3.3, it is stated that RT model calculations are performed using specified aerosol and surface characteristics. Is the surface characterization in the RT LUT calculations the same as represented in Eq. (2), i.e., lambertian, aand does the aerosol have any vertical distribution?

I noticed that a surface BRDF is introduced in section 3.2, and used in Eq. (3) through (6). The previous references to the BAER technique in the 2003 and 2006 papers did not include this aditional complexity. Can you give some information as to why it is now needed? Also, Eq. (6) is not understandable to me. If A_sub_surf in Eq. (6) is the same as A_sub_surf in Eq. (1), shouldn't the normalized BRDF be in the numerator in Eq. (6), instead of the denominator?

Also, the scaling factor, SF, defined in Eq. (8), would seem to include the total transmission, t_sub_tot, for the viewing and illumination geometries, but are not there. What happened to these terms?

2) In section 3.4 the iterative procedure is described. I understand the need to retrieve a smooth spectrum for the AOT, but I am confused as to what is actually being iterated in order to accomplish this. Is it strictly a modification of the k parameter in the BRDF? If so, is this the reason for introducing the BRDF into the retrieval scheme?

Upon reading sections 3.2 and 3.3 , it still isn't clear to me how the AOT is "tuned" to arrive at the accepted retrieval value. Looking at Eq. (1), the AOT result depends on

what the value of A_sub_surf is determined to be. It would seem that the scaling factor SF is the important parameter. Below Eq. (8) for SF on page 2115 it is stated that a black surface is initailly assumed. I don't understand how SF is then systematically adjusted to arrive at a surface reflectance that is not black. I would be extremely helpful if a more detailed step-by-step description of this process of separating the atmospheric and surface contributions to the TOA reflectance is made available to the reader.

3) What is PC on the top of page 2126?

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 2107, 2010.