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Atmospheric Measurement Techniques Discussions

Interactive comment on "Synergistic angular and spectral estimation of aerosol properties using CHRIS/PROBA-1 and simulated Sentinel-3 data" *by* W. H. Davies and P. R. J. North

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The paper describes a synergistic approach to retrieve aerosol from simulated Sentinel-3 data. The algorithm is tested using simulated TOA radiance with Lambertian surface, as well as using 4 different scenes of CHRIS/PROBA. After reading this paper twice, I can only make a recommendation of major revision. As it stands now, this paper is unreadable. The style of presentation is eclectic, it contains many disjoint pieces without any unifying explanation.

1. A better unifying explanation will be written.

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Interactive Discussion

Discussion Paper

Authors assume that the reader must know the details of different models and be well familiar with different publications.

2. This is a reasonable assumption. A comprehensive re-publishing of previous research is inefficient and summaries have already been provided. However, more detail has been added as specified in points 5 and 8 below.

The re- sults are presented through a piece of text that seems to be copied 5 or 6 times with slight variation of numbers (e.g., for r2 and rmse).

3. This description of results has been re-written using Tables 6 and 7.

There is no physical insight into the results and no clear indication of what this method provides in addition to the cur- rent state of the art.

4. A better indication of what this method provides in addition to the current state of the art will be written.

I suggest that authors explain their model in detail. For instance, the model of surface reflectance (Eq. 1) is not explained at all. As I understood, it contains at least one unknown parameter for each incidence-view angle (P(theta)) and one unknown parameter for each wavelength (w(lambda)). This means that just this model contains more unknowns than the number of measurements. I may not have understood it correctly, but this is how it is described in the paper. In addition, there are weighting factors for different components of “spectral” model etc. Please, provide an explicit description of all unknowns in the model you are minimizing.

5. An expanded description is provided in section 3.2

Since this is 2014, it would be nice if authors showed the capability of Eqs. (1-2, 14) to model real surface BRDF, or at least some comparison to well known RPV or RTLS BRDF mod- els, which depend just on 3 parameters per wavelength. It is not enough to present the atmospheric correction problem through Eqs. (5-6). The terms x_a – x_c have a direct physical meaning, so please re-write that with relevant notations.

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6. This will be clarified.

Also, using the Lambertian surface model for atmospheric correction (given by Eqs. 5-6), the angular error is introduced which will affect aerosol retrievals but this is not discussed. I never saw a decomposition of spectral surface BRDF into a linear combination of spectral Lambertian and angular components (Eqs. 1, 2 and 14), and I doubt it will work as a generic model. Please, elaborate on that.

7. The reviewer doesn't understand the model though "more unknowns than measurements" is just not true, as the first is num_views+num_wavelenghts, and second is num_views x num_wavelengths. And of course it has been used before as we discuss in the paper!

Also, I would like to see at least some dis- cussion on the limitations of this model, for example of its spectral part which consists of 5 fixed spectra, and which obviously is not generic to work over different land cover types.

8. See the additions to section 3.3.

Finally, the results of processing CHRIS/PROBA data (Figs. 15-16) show no skills in retrieving FMF and SSA, which is not very surprising. However, the abstract and other parts of paper present this method as capable of retrieving the whole suite in addition to AOD. I suggest the authors adjust the text properly.

9. The abstract and the introduction have been adjusted accordingly.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 5381, 2014.