**Atmospheric
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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

W. H. Davies and P. R. J. North

w.h.davies@uclmail.net

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The paper has been subject to major revision with expansion and clarification changes to all sections except sections 2, 6 and 7.

Specific points are addressed as follows:-

equation 1. what is R_ang. is it reflectance at the surface or top of atmosphere?

1. R_ang is the surface reflectance calculated by the multi-angle model. This has been clarified in the text.

P 5387, line 5. what is Lambertian scattering albedo, and aggregated single scattering phase function. how do you consider multiple scattering here? These terminologies are not common and authors should define them.

2. The Lambertian scattering albedo is the component that is independent of view angle and only dependent on wavelength. The aggregated single scattering phase function is the component that is dependent on view angle but independent of wavelength. This has been added to the text. The anisotropic singly scattered component and the isotropic multiply scattered component of the model have also been highlighted.

equation 3, what is rh_spec.

3. Well spotted. This used to be the left hand side of equ 2. It has been changed to R_spec for consistency. Equ 3 has been updated.

equation 14. what is R_spec. is it surface reflectance at the surface?

4. Yes, R_spec is the surface reflectance calculated by the spectral model. This has been clarified in the text.

equation 15. what is R_mod.

5. This is already given by equ 14. R_mod is the surface reflectance calculated by the multi-angle model or by the spectral model or by both.

equation 15, what is R_sim.

6. R_sim in not in equ 15, but equ 16. It is the simulated data used to characterise the error in R_mod. This has been clarified in the text.

Finally, the method appears to rely on the constraints of surface angular spectral variation. In otherwords, during the inversion, the solution has to fit with both radiance at TOA and the pre-defined angular and spectral variation of surface reflectance. If this understanding correct, I suggest authors to justify the latter. what is the uncertainty in the idealized surface model?

7. The reviewer's understanding is incorrect. The text has been clarified.

other minors: p 5385, line 18, where can we obtain CHRIS data?

8. Data is available from https://oa-es.eo.esa.int/ra/ . This has been added to the references and cited in the text.

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