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Atmospheric Measurement Techniques Discussions

Interactive comment on "Capability of multi-viewing-angle photo-polarimetric measurements for the simultaneous retrieval of aerosol and cloud properties" *by* O. P. Hasekamp

Anonymous Referee #1

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I have two points to raise on this paper that appear to require serious additional consideration:

1. In many cloud regimes, especially broken cloud situations, three-dimensional radiative transfer effects dominate. It is not merely a matter of changes in particle properties near clouds, but the actual scattered light field. As aerosol retrieval in cloudy regimes is the main new contribution of this paper, neglecting 3-D effects seems to be a major omission.

2. The discussion of requirements for climate study and the corresponding measurements capabilities in Sections 4.1 and 4.2 needs additional examination. For example,

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the climate study requirements seem to minimize the importance of obtaining accurate surface reflectance and aerosol vertical distribution. And then, the instrument capabilities do not mention the need for adequate pixel resolution and spatial coverage, given the variability of real-world surface and atmospheric conditions.

Details

1. P 1234, line 24. You might mention that dust particles are non-spherical, so the differences between dust and spherical cloud droplets in intensity are actually larger than those shown in Figure 1.

2. P 1236, line 13. Knowledge about particle optical properties, especially those of dust, have advanced since d'Almeda et al. (1991). Also on this line, it might be clearer to say "Relative abundances of these aerosol types. . ."

3. P 1237, line 1. As this can be quite significant in broken cloud situations, you might add: ". . . independent pixel approximation (which implicitly ignores three-dimensional effects):". Also, there are typos in the first full paragraph on this page: "cloudes" rather than "cloudy," "we" several times where it does not belong.

4. P1238, line 8. You cannot use Mie theory to simulate non-spherical dust particles when doing a multi-angle and/or polarization retrieval.

5. P 1245. The region near cloud edges is an inherently 3-D regime for radiative transfer. A cutting-edge algorithm, especially one that relies on multi-angle observations, cannot treat this regime with an independent pixel assumption.

6. P 1246. The error characteristics assumed in calculating Figures 4 and 5 do not seem to take account of typical variability across an actual instrument field-of-view.

7. P 1247. What happens to the aerosol retrieval accuracies if the cloud is not absolutely uniform?

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 1229, 2010.