

Interactive comment on “Retrieval of aerosol microphysical and optical properties above liquid clouds from POLDER/PARASOL polarization measurements” by F. Waquet et al.

Anonymous Referee #2

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The paper "Retrieval of microphysical and optical properties above liquid clouds from POLDER/PARASOL polarization measurements" by Waquet et al. deals about an interesting and important subject, as presently there are hardly aerosol measurements over clouds. The authors present 2 retrieval methods, 1 for "hyper-pixel" processing and one for operational processing of smaller pixels. The paper shows several interesting aspects concerning aerosol retrieval over clouds from polarization measurements. However, I find that the paper is more a collection of (interesting) intermediate results than a finished piece of work. Also, the structure of the paper is rather confusing with theory and result sections appearing at several places in the paper. My first recom-

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mentation is to better structure the paper and to better point out what the added value is compared to a previous paper from the first author. My second recommendation is to formulate some clear conclusions on the work, and what implications they have for aerosol remote sensing above clouds. This will require some extra work from the authors.

General comments:

- It seems that the polarization measurements do not contain sufficient information to retrieve all aerosol parameters over clouds. The authors conclude that from the fact that 5 retrieval options fit the data equally good. This should be motivated in more detail. For example by doing retrievals from simulated measurements to see what parameters can and what cannot be retrieved. As the paper is now, it could be possible that there is an option 6 that fits the data much better. On the other hand, it is not convincing that the retrieved parameters are reliable as they are now. A synthetic study would make clear the possibilities and limitations. If a method does not work for synthetic data it will neither work for real data. Especially since the retrievals cannot be really validated, such a synthetic study is even more important.

-Why are there 2 (or even 3) retrieval methods. This needs some more motivation. Is it only computation time. Or is the 1st retrieval method only for a sensitivity study to design a simpler method with less parameters that can be retrieved?

- It is stated that 3D effects are important, but what would be the effect on the retrieved aerosol and cloud properties? Maybe the errors only affect the retrieved cloud properties. Also, this can be investigated with a synthetic retrieval.

- The phase function truncation method seems not to be suitable to model polarized radiances. What exact procedure is followed in the phase function truncation? To my knowledge the quoted methods are only designed to work for radiance, not for polarization.

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