Atmos. Meas. Tech. Discuss., 5, C2375–C2378, 2012
www.atmos-meas-tech-discuss.net/5/C2375/2012/


Atmospheric Measurement Techniques Discussions

# *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 #1**

Received and published: 1 October 2012

General

The general topic of the paper, retrieval of aerosols over clouds, is being very much discussed recently. The detection and retrieval of aerosols over clouds is still in its early stages. Therefore, the use of the polarization measurement capability of POLDER to detect aerosols over clouds as described in this paper is opportune and fits well in the scope of AMT.

Polarization is in principle a powerful technique for retrieval of aerosol microphysics. This paper shows that this also holds for aerosols over clouds. Taking into account all



the multidirectional polarization measurement information from POLDER in an optimal estimation scheme is a good development for solving the retrieval problem.

Main comments

(1) The main problem with the paper is its lack of a clear structure. The current structure of the paper is: Algorithm description in Sect. 2.2, Results in Sect. 2.3; Algorithm description in Sect. 3.2, Results in Sect. 4; Algorithm description in Sect. 5.1, Results in Sect. 5.3. This chaotic structure of the paper – constantly jumping between different algorithms and retrieval results - prohibits the readability and good understanding of the paper. Are the cases selected for the three results sections the same? It seems now that the paper is a composite of three other papers. Please reorganize the paper and give it a clear structure, so that there is one section on algorithm(s), including the relationship between those algorithms, and one section on results.

(2) The paper is quite long, and should be reduced. The above reorganisation will probably lead to a reduced length. Please also reduce the amount of figures. Figure 6 seems too detailed and is unnecessary. There are also (too) many different topics in the paper. The aspect of 3-D radiative transfer modelling is a side-step, and seems not essential for the aim of the paper.

Specific comments:

(3) Abstract, p. 6084, l. 7ff: why are here only dust particles mentioned and not smoke particles over clouds? Biomass burning aerosols are missing from the abstract while they are included in the main text.

(4) The introduction is quite complete and well written, but a few recent papers on the topic of aerosols over clouds are missing. In De Graaf et al. (JGR, 2012) the radiative effect of aerosols over clouds is determined directly from satellite spectrometry measurements. The height detection of absorbing aerosol plumes over clouds is discussed in the paper by Wang et al. in ACP (2012).

(5) When using the words: clouds, aerosols, droplets, or particles (etc.) as an adjective, please use the singular. For example, aerosols transport events > aerosol transport events (title sect. 2.3); this occurs often in the paper.

(6) p. 6093, l. 18: the symbol phi is already in use as the symbol of azimuth; please use another symbol for the phase.

(7) Quotes should not be used if the term between quotes has been introduced already. For example, on p. 6095, l. 3, the quotes (2x) can be removed, because these retrieval methods were explained on p. 6093. This holds throughout the paper.

(8) Sect. 3.1: what is the aim of this algorithm? Was the previous algorithm not good enough?

(9) Sect. 3.3: which elements are in the state vector of this OE method?

(10) p. 6100, l. 17ff: the mean of a quantity should be indicated by an overline or brackets like <x>, not by an underline. This holds throughout the paper.

(11) Sect. 4, p. 6107: Which of the five OE options, or inversion schemes, listed in Tables 2 and 3, is the best one? Did you test these options using simulations where you knew the aerosol properties? Please conclude clearly with option is being preferred.

(12) Sect. 5.1: is this description about an OE algorithm? What is the state vector?

(13) p. 6121, l. 8: viewing directions and number of channels are interchanged.

(14) Table 1: some symbols have a minus before the subscript; please remove the minus-signs; to separate two subscripts use a comma. This also holds for symbols in the main text.

(15) Table 3: what does 1* etc. mean ?

(16) The figures are not clear: (a) Much larger fonts are needed for the axis labels, legends, etc.. (b) In the captions, first the subplot letter (a, b, . . .) should be given and



then the text (now it is the other way round).

(17) Figures 1, 2 and 3: please indicate in the legend of the profile figures which data are from CALIOP.

(18) Fig. 4: give a legend for the three subplots: pristine, BBA, DDA.

(19) Fig. 8: which cases or events are these?

(20) Fig. 9: Is this a single pixel or a hyper pixel algorithm?

(21) Please improve the lay-out of Figure 12, and give lat/lon grid. Give a subdivision in the color bars of Figures 12 and 13.

---

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 6083, 2012.