**Atmospheric
Measurement
Techniques
Discussions**

# *Interactive comment on* "Improved information about the vertical location and extent of cloud layers from POLDER3 measurements in the oxygen A band" *by* M. Desmons et al.

**Anonymous Referee #1**

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General comments

This paper presents an extensive global statistical analysis of cloud top height and cloud vertical extent retrievals from POLDER O2 A-band passive remote sensing measurements. The POLDER retrievals are correlated with Cloudsat/CALIPSO active cloud profiling data. Since the data set under study is large, the comparison between oxygen pressure and actual cloud profile has a strong statistical significance, and the dependence of several parameters is being studied. This paper is a very useful follow-up of the earlier paper by Ferlay et al. (JAMC, 2010) in which the method of determining cloud vertical extent using the multi-view observations of oxygen absorption pressure

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Interactive Discussion

Discussion Paper

by POLDER was proposed.

The main problem with this paper is its very poor presentation quality, which makes the paper difficult to read. The used English language is poor, and must be improved. The many spelling and syntax errors should be corrected. The text should be more compactly written; in this way the paper can be shortened. Furthermore, there are too many figures; the authors should be more selective in presenting their results. Suggestions are given below. The figure captions should be clearer. Some specific textual comments are given below, but are not extensive. The English style should be improved by the help of the senior co-authors of the paper.

Specific comments

p. 2533: title: vertical location and extent > cloud top and cloud vertical extent from POLDER3 . . .

p. 2534:

- l. 4: . . .from a better account . . .: unclear, please rephrase

- l. 15: . . .the most numerous ISCCP cases. . .: unclear, please rephrase

- l. 21-23: For liquid and ice clouds . . .: unclear sentence, please clarify

p. 2535:

- l. 4: (-12 m): what does that mean?

- l. 6: error of 20 percent . . .: error in what?

p. 2538:

- l. 15: the POLDER3 sensor. . .; plateform> platform

- l. 17: The PARASOL orbit. . .; for the first time . . .

- l. 18: such that. . .? Please rephrase

p. 2540:

- l. 6: noted > denoted by (this occurs several times)

- l. 21: It has been observed several times with . . . > This has been observed with . . .

p. 2541:

- l. 4: . . . hangs on with. . .: what do you mean?

- l. 11: ie > i.e.

- l. 16: more > moreover

p. 2542: a 345 long vector?: rephrase

p. 2544:

- l. 3: New POLDER Oxygen pressures: unclear title

- l. 4: analyze > analysis

p. 2545:

- l. 13-15: unclear, please rephrase

- l. 25 (Sect. 4.2): Please clarify the principle of getting unbiased cloud top pressure from POLDER. Which new information from POLDER observations is being used that was not used before?

- The first paragraph of Sect. 4.2 is very unclear.

p. 2547, l. 3-5: text on scores is unclear.

p. 2549, l. 2: . . . and H: is H from POLDER or CloudSat/Calipso?

p. 2551, l. 12: several values of H . . .

Sect. 6:

- It is appreciated that a synthesis of the results is given here; this is necessary, since the paper is quite long.

- Why is H given in meters and not in pressure units, like cloud top pressure and cloud midpressure?

p. 2552:

- l. 11: the POLDER retrieved H for clouds . . .

- l. 12: is H here from CloudSat/Calipso?

- l. 21: much away from . . . > more deviating from . . .

- l. 25: in front of . . .?: as compared to . . .

p. 2553, l. 17-18: this type of clouds . . ..: unclear, please correct this sentence

p. 2559, l. 4: reference should be to: Koelemeijer, R. B. A., P. Stammes, J. W. Hovenier, and J. F. de Haan (2001), A fast method for retrieval of cloud parameters using oxygen A band measurements from the Global Ozone Monitoring Experiment, J. Geophys. Res., 106(D4), 3475–3490, doi:10.1029/2000JD900657.

p. 2564: caption:

- Statistics of the retrieval of cloud vertical extent H for liquid . . .

- MD, SD and DeltaH should be explained

Fig. 2:

- indicate in the graph the mean P_O2 with a horizontal line

- in fact, P_O2 was defined in Sect. 2.1 as the mean oxygen pressure over all viewing directions, so it is not consistent to say in this caption that P_O2 varies with the viewing direction.

- what does the negative viewing zenith angle mean? Please indicate the azimuth.

Fig. 3: which product is shown here? Which satellite instrument? Which algorithm?

Fig. 4:

- Why is there a gap for clouds with H < 200 – 300 m in the lower plots (b)? Marine Sc clouds can be 100-200 m thick.

- A color bar is missing.

- Please give the two rows and columns of the plots the appropriate titles: ocean. land, ice, liquid.

Caption: - Climatology of cloud top pressure versus cloud vertical extent of monolayer . . .

- Global data?

Fig. 5: Caption: mention that P_O2 is the oxygen pressure averaged over all viewing directions (cf. comment on Fig. 2). Standard deviations are indicated by error bars.

Fig. 6: in figure titles: make red text black. Please explain in caption the black and red line fits.

Fig. 7: Caption: explain what P_O2 – CTP is, and what sigma_O2 is. Global data?

Fig. 8: please explain the rows and columns of plots with titles. Explain the strange stripes in plots (c-d) in the caption. Caption: what do you mean with historical pressure?

Fig. 9: Briefly explain what scores are in the caption. The curve "Histogram of CTP" is very confusing - please add a right-hand-side y-axis to the plots for this quantity.

Fig. 10: please remove this figure. It does not contain relevant information which cannot be summarized in the text.

Fig. 11: please consider removing this figure; at least (b) can be easily removed and summarized in the text.

Fig. 12: please consider removing this figure. It is very complicated for the reader. If kept, the curves should be numbered in the plot.

Fig. 13: explain the symbols in the caption. Please use a different symbol for the retrieved H by POLDER and the H determined from CloudSat/Calipso. This holds for other figures as well (and in fact the entire manuscript).

Fig. 14: please make clearer lines in this figure. Caption: H_DP > H_sigma. Retrieved H: from POLDER. Please note a possibly decreasing trend in (b) for ocean.

Fig. 15: Which satellite (etc.)? Standard deviation: of what?

Fig. 16: Which satellite (etc.)? Please consider removing this figure.

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