Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of Polar Stratospheric Clouds with Space-BorneLidar: CALIPSO and the 2006 Antarctic Season" *by* M. C. Pitts et al.

Anonymous Referee #2

Received and published: 21 June 2007

General comments :

This paper deals with the first PSC detections using the space-borne lidar CALIOP on board CALIPSO. The analyze focus on the 2006 Antarctic winter. After an introduction including a short but complete overview of all the available datasets on PSC, the CALIPSO mission and instruments are briefly described. Then, the algorithm for PSC detection is detailed in its different steps, to end with a discussion on the PSC detection sensitivity. The 2006 PSC season over Antarctica is studied, with seasonal, geographical and altitude distributions of the detected PSC. The last section summarizes and concludes this work.

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The PSC community was waiting on CALIPSO measurements and this first dataset is up to this expectation. The geographical coverage and the horizontal and vertical resolutions are exceptional and give rise to an unprecedented capability of accurately describing PSC at the hemispheric scale.

The structure of the paper is very good. The algorithm for PSC detection is clearly explained and discussed. The inferred characteristics of the Antarctic PSC are well suited. In particular, the comparison with previous solar occultation climatologies underlines the new and pertinent contribution of CALIPSO PSC observations. In models, PSC are accounted for using a temperature criteria and the section on PSC diagnostics is interesting because it opens the way for better PSC extent estimation.

Consequently, with the minor suggestions below, I highly recommend this paper for publication in ACP.

Specific Comments :

p. 7940, line 4 :
Data below 20.2 km is averaged to fit the resolution above 20.2 km. In fig. 3b, data above 20.2 km seems to be different than on fig. 3a. Is this feature real ? If yes is it linked to the way the averaging is done ?

p. 7940, line 17-19 :
How does this processing impact on the profiles ? I mean, many PSC present very structured layers (sometimes less than 1 km thick) that can be smooth with a 540 m vertical resolution. This is not crucial for the present study but it could be when trying to infer conclusions on PSC type and composition.

p. 7941, lines 7-11 :
I understand the backscatter coefficients used here are uncorrected from the particles

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extinction. Do you plan to make this correction in the future ?

p. 7941, line 12 :
On fig. 4, the spreading around R=1 seems to increase when temperature decreases. I can understand higher scattering ratios as aerosols dilute with decreasing temperature, but why a symmetric spreading ?

p. 7944, lines 21-23 :
This sentence "On the other hand Ě variable with time" is not clear to me. Could you clarify what you mean ?

p. 7949, lines 6-8 :
The CALIPSO features appearing on fig. 12 are consistent with what is observed with the ground-based lidar at the local scales. It clearly shows the novel contribution of CALIPSO as compared to previous satellite PSC observations.

p. 7951, lines 3-14 :
MLS is measuring HNO3 in the gas phase. The MLS observations do not take into account the weight fraction of condensed HNO3. In this way, while using observed HNO3 remaining in the gas phase, TNAT should be underestimated.
On the other hand, PSC are often not observed although temperature is below TNAT. This should be more discussed in the paper, as it is a point in favour of the contribution of CALIPSO PSC observations.

p. 7952, line 1 to p. 7953, line 7 :
To understand this section and figures 19 and 20, more details are needed on the criterias used to discriminate the different type of PSC and the way they are combined. As a companion paper is writing on this topic, this should be just mention. Here, the authors tell too much or not enough.

Summary and conclusions :
Few sentences should be added to summarize and synthesize the results concerning the observes seasonal and geographical PSC distributions over this winter.

Technical comments :

Fig. 11 to 18 :
The labels inside the plots are difficult to read. A color scale would be helpful.

Fig. 12 to 18 :
Indications of the month on the x-axis would help also to read these figures.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 7933, 2007.

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