

Interactive comment on “Polar stratospheric cloud climatology based on CALIPSO spaceborne lidar measurements from 2006–2017” by Michael C. Pitts et al.

Anonymous Referee #4

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Summary

Pitts et al. develop a new version of their PSC detection algorithm (called V2) which is a comprehensive advance on their PSC algorithms developed in a series of papers by Pitts et al. stretching back to 2007. Importantly, this new V2 algorithm incorporates the effects of denitrification and dehydration (especially important in the Antarctic) during late winter with the use of near-coincident MLS gas phase data as well as incorporating the effects of uncertainties. Pitts et al. also refine the boundaries separating the different PSC classes. It is pleasing to note a much greater spatial consistency of the different classes (e.g. their Figure 9c) compared with V1 (Figure 9d) where

C1

more speckled nature is observed. Using this new PSC detection algorithm, Pitts et al. provide the Arctic and Antarctic climatologies of the PSC classes from 2006 till 2017. Finally, comparisons are made with historical SAM occultation data.

This is a well organised and well written paper and represents an important advance in the field. Consequently it should be published in ACP subject to the following minor revisions.

Minor Comments

- 1) In the text in Section 3.6 regarding Figure 9, some comment on the fact that v2 only detects ice in the lowest altitude region in the cloud at 26E is also warranted – i.e. ice in the upper troposphere merges seamlessly into ice in the lower stratosphere, rather than having low-level mixed NAT PSCs in (assumedly) the upper troposphere as in v1.
- 2) p13, line 9. It would be worth providing a citation for this comment regarding the tail of ice PSC distributions being due to wave ice events.
- 3) Section 5 p 19 line 24. There is large variability in climatological SAD in Figure 23 over ~ fortnightly intervals in July or August. Does this follow directly from the variability of the climatology of PSC ice at this time (Fig 15c, i.e. a large fraction of total PSC area is ice at the start of August)? Please clarify.
- 4) Do other Antarctic years show similar changes between v1 and v2, as shown in Figure 10 for 2009?
- 5) Figure 15c. There is a white contour enclosed in the ice PSC in May – June but your colorbar indicates purple as 0.0. Please reconcile or explain in the figure caption.

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C2