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Atmospheric Chemistry and Physics Discussions

Interactive comment on "CALIPSO polar stratospheric cloud observations: second-generation detection algorithm and composition discrimination" *by* M. C. Pitts et al.

Anonymous Referee #2

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GENERAL COMMMENTS: This paper reports a detailed study of the capabilities and performances of CALIOP (Cloud-Aerosol LIdar with Orthogonal Polarization) lidar system onboard the CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations) spacecraft in measuring polar stratospheric cloud (PSC) optical properties. The authors go through an extended description of an improved method for the detection of PSC, the new algorithm allows the classification of the observed PSCs in the classical scheme: Supercooled Ternary Solution (STS), ice, nitric acid trihydrate (NAT) and mixtures of STS with NAT. The CALIOP/CALIPSO PSC observations also show the peculiar differences between Antarctic and Artic PSC on global geographical scale and along multiannual periods. The authors claim that the seasonal and altitudi-

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nal variations in Antarctic PSC composition are related to changes in HNO3 and H2O observed by the Microwave Limb Sounder on the Aura satellite.

The message occurring at a “standard” reader (e.g., who is interested to the general PSC microphysical properties) is very appealing: this, very extended, classification of PSC could have a strong impact on to the (polar region) stratospheric studies, but a more clear discussion of the indetermination (systematics and statistics, paragraph 2) could improve the scientific weight of the paper.

On the other hand, a “technical” reader (for example, a lidar-oriented scientist) could find the paper of interest, if the CALIOP data significance and limitations (I am thinking to the retrieval of backscatter coefficients, the depolarization, and the estimation of their “cut-off”/threshold values) are presented in more schematic way.

In such form, the paper induces an high attention; and, (I think that) these capabilities and results of a space-lidar are worth of interest for the atmospheric scientific community.

In summary (according to the generic review rules): the study has an high degree of originality; the inferences, interpretation and mathematical analysis are correct; the presented results and material could be interesting in the field of cloud studies; the abstract is quite clear; the general policy on the issue of SI units is fulfilled.

Below, I will try to evidence few critical points in the different parts of the current form of the paper, hoping that these can be useful for the authors.

DETAILED COMMENTS: Abstract Is it possible to insert a sentence stating which impact has the evaluated increase (about 15%) in PSC areal coverage on the PSC key-role within the chemical/dynamical processes of the polar stratosphere?

2. Second-generation detection algorithm 2.1 Data preparation Does the data smoothing affect the PSC classification? 5km horizontal - 180m vertical grid could average out the very peculiar features of “mountain wave” PSCs (strong variations of perp. and

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paral. backscatter) that develop over smaller scales.

2.2 Cloud detection lines 10-22 This procedure, in some way, accentuates the “smoothing effects” cited in the previous point.

3. PSC composition discrimination A naïve question: the inherent simplicity of a Monte Carlo approach, could give a more significant picture when performing the optical calculations for PSC discrimination?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 8121, 2009.