Atmos. Chem. Phys. Discuss., 14, C2444–C2446, 2014
www.atmos-chem-phys-discuss.net/14/C2444/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Microphysical properties of synoptic scale polar stratospheric clouds: in situ measurements of unexpectedly large HNO_3 containing particles in the Arctic vortex" *by* S. Molleker et al.

P. Achtert

peggy@misu.su.se

Received and published: 16 May 2014

The authors present a comprehensive characterization of PSC particles based on in-situ measurements. These measurements were accompanied by lidar observations. The paper is of interest to the scientific community as combined studies of lidar and in-situ measurements are scarce. This is why I believe that the lidar observations deserve more attention in the manuscript. In that context, more details in the discussion of the observed optical properties would be desirable. A comparison between the PSC type

classification from lidar (based on optical properties) and in-situ instruments (based on the observed size distribution) would increase the impact of the manuscript:

- The observations on 25 January 2010 show only MIX2 and MIX2 enhanced but no STS in the lidar observations. The in-situ measurements show a size-distribution that is shifted towards larger particles compared to the other measurements of that year.

- NAT rock is identified in the in-situ measurements of 11 December 2011. This particle type is rarely observed with lidar and your measurements could be useful to check the reliability of the lidar-based classification schemes. Is NAT rock also classified in the airborne lidar data of that day?

Lidar is a common source for long-term statistics on the occurrence frequencies of the different PSC types. These types were originally defined based on the optical properties as observed with lidar. I have several comments regarding the part of the manuscript that deals with the lidar observations aboard Geophysica:

1. More details on the instruments (lidar and backscatter sonde), their calibration, and the derived parameters should be provided. Lidar-based PSC classification crucially depends on the quality of the particle depolarization ratio measurements, i.e. the cross-talk in the polarization channels. Yet no information is provided on how this parameter has been determined. It is also of interest to know how the backscatter ratio has been calculated for the two optical instruments. What is plotted in Figure 11 and 13: the total backscatter ratio, the parallel backscatter ratio, or the perpendicular backscatter ratio? Figure 13 shows backscatter ratios between 2 and 5 only. This looks like an artifact to me.

2. Why do you not use the PSC classification scheme of Pitts et al. (2009) or a comparable one (see Achtert et al. 2014 for a review of lidar-based PSC classification schemes) to determine the PSC type from the lidar measurements?

3. Also, why are the lidar-derived results on PSC only shown for selected days?

ACPD
14, C2444–C2446, 2014

Achtert, P., and M. Tesche (2014), Assessing lidar-based classification schemes for polar stratospheric clouds based on 16 years of measurements at Esrange, Sweden, J. Geophys. Res. Atmos., 119, 1386–1405, doi:10.1002/2013JD020355.

Pitts M. C., L. R. Poole, and L. W. Thomason (2009), CALIPSO polar stratospheric cloud observations: second-generation detection algorithm and composition discrimination, Atmos. Chem. Phys., 9, 7577-7589, 2009.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 12071, 2014.