

Interactive comment on “Widespread persistent polar stratospheric ice clouds in the Arctic” by Christiane Voigt et al.

Anonymous Referee #2

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The authors thoroughly analyze the observation of ice PSCs in the Arctic winter 2015/2016. Ice PSC occurrence in the Arctic has so far been found related to mesoscale processes (e.g. gravity waves), but never on the larger synoptic scale. Both the spatial scale and the temporal persistence of the ice PSCs described in the manuscript have a new dimension, and the presented new observation data by lidar both from the CALIPSO satellite and the HALO research aircraft are a significant contribution to the description and understanding of the Arctic stratosphere. The manuscript is well written and structured, and covers most arguments related to the described ice PSC occurrence, such as potential formation pathways, observations from different sensors and platforms, and implications arising from the presence of persistent ice PSCs. I recommend publication in ACP after the following minor points have been addressed.

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SPECIFIC COMMENTS

- Does the newly defined threshold of the lidar backscatter ratio for ice PSCs affect the results of earlier Arctic PSC studies based on lidar measurements ?
- While denitrification and its implications are discussed, there is no mentioning of dehydration which alters the formation conditions for PSC particles occurring later during winter. Has denitrification actually been observed during winter 2015/2016 ? Are there indications for dehydration ? Could this information been drawn from Figure 1 ?
- Although persistent ice PSCs and temperatures below the frost point were observed on the synoptic scale for the first time, the later dynamics of the polar vortex (as described in lines 87 – 92) prevented from extreme ozone depletion. The actual timing of ice PSC occurrence and the observed ozone depletion in springtime 2016 thus need to be set into context at the end of section 8.
- While I agree that Arctic ice PSCs may serve as indicator for low Arctic stratospheric winter temperatures, the relation between the occurrence of ice PSCs and ozone trends is more complex. With the final statement in section 9, this complexity needs to be discussed in more detail.

Generally, I suggest merging sections 8 and 9 to an “Implications” section.

TECHNICAL CORRECTIONS

Line 40: “more alternated” instead of “stronger”

Line 158: ...regions which correspond...

Line 170: Has the descending movement of the NAT particles been observed ? Otherwise I suggest “...a layer of larger potentially sedimenting NAT particles...”

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-1082, 2016.