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Interactive comment on "Polar stratospheric cloud observations by MIPAS on ENVISAT: detection method, validation and analysis of the northern hemisphere winter 2002/2003" *by* R. Spang et al.

R. Spang et al.

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First we like to thank the referee for the helpful comments.

Both specific comments point out that the explanation of the vertical information about the PSC extent by the cloud-index method is missing or not well explained in the manuscript. Therefore we will include for the revised versions of the paper in section 3.1 'Cloud Detection method' following paragraph:

"Cloud effects at the tangent heights below CTH are difficult to interpret due to the mixture of emission from clouds at the actual tangent height with emission from the layers of the limb path above. Increasing CI-values below the CTH, as commonly

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observed for almost all PSC profiles in this study, provide indirect and approximate information about the optical thickness and vertical extent of the cloud since they would be consistent with an increasing thickness of PSCs if the cloud field is homogeneous. An optically thick cloud would generate a CI-value close to one. Due to the blocking effect of this layer, the CI-values would stay constant at all the tangent heights below the first optically thick layer. For an optically thin cloud, CI-values will increase for tangent heights below the altitude which contains the largest optical thickness (simply by the limb path). However, generally the CI-values do not reach cloud-free values again, because the limb path is still passing through the cloud layers even for the tangent height layers below the cloud bottom. Therefore the vertical extent suggested by the CI-profile is generally overestimated and an accurate determination is not achievable by the simple colour ratio method."

Further we will reference the lidar and POAM profile comparison to the section above.

In addition we will incorporate all technical comments by the referee in the revised version of the manuscript. Longer change notes are listed below:

Page 6285, line 2: 'What are the key questions by Toon and Tolbert?' - The reference is misleading and will be deleted. The Tolbert and Toon article is summarising the status of research inclusive recent references which we introduce to some extend in our introduction later on as well. The term 'important key question' will be replaced by 'important questions'.

Page 6291, line 19 Explain, in a sentence or two, the scheme of Browell et al. (1990). - We will follow the suggestion and incorporate a few lines above:" Ĕ allow the classification of the observations into different PSC types in the traditional manner for lidar (Browell et al., 1990). The applied classification criteria utilise the lidar backscatter ratio at 532 nm (R532) and volume depolarisation, whereby liquid STS particles show no depolarisation whereas both ice and NAT particles show depolarisation but are separated by the strong R532 $>$ 10 for ice particles. The sentence including the phrase

ACPD

4, S3108–S3110, 2004

‘well accepted’ is not longer part of the manuscript.

Page 6294, line 28 Identify the Type 1b composition type. - We will explain the acronym STS where it is mentioned first (section 3.1):”Those clouds which do not shown the spectral feature and are not optically thick are most likely to be clouds of liquid sulfuric ternary solution droplets (STS, classified as PSC type 1b), mixed clouds dominated by STS, or clouds of larger NAT particles.”

‘outlier primarily in e1022’ is also explained a bit more in detail: “In addition PSC top altitude points were classified as Type 1b if the point was only greater then med_i+3*delta_i for e1022 and not for CR1 and CR2 (an outlier primarily in e1022)”

Page 6310, Figure 2. The new version of this figure will include a mid-latitude mean profile and the caption will address more clearly the boundaries (numbers given) of the grey boxes and their relation to the cloud-detection method.

Page 6311, Figure 3. We added now in the figure caption the spacing of the colour code: “The colour code is equally spaced in 2 km steps from 6 to greater than 24 km.”

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6283, 2004.