

# ***Interactive comment on “A climatology of polar stratospheric cloud composition between 2002 and 2012 based on MIPAS/Envisat observations” by Reinhold Spang et al.***

## **Anonymous Referee #2**

Received and published: 21 December 2017

Review of ‘A climatology of polar stratospheric cloud composition between 2002 and 2012 based on MIPAS/Envisat observations’, by R. Spang et al., submitted to ACPD

### Summary:

Spang et al. have a thorough, interesting, well-written and novel manuscript describing a PSC climatology constructed from MIPAS satellite observations. Spang et al. use a recently-developed Bayesian classifier of MIPAS data to determine the composition of Polar Stratospheric Clouds (PSCs) using the decade of available MIPAS observations. The authors confirm the classification scheme’s validity through comparisons with CALIOP data and the probability of each PSC class relative to the ice formation

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threshold is consistent with our understanding. We see, through results presented in this paper, the PSC occurrences (importantly, with MIPAS observations stretching to the pole) in each hemisphere along with PSC areas each year – the latter linking in with ERA-Interim reanalysis fields as a pointer as to how GCMs and CCMs might evaluate their own performance.

I recommend its publication in ACP following their addressing of the following minor comments.

Minor Comments:

Line 59: I guess not only in the Arctic this is important. . .

Paragraph starting line 83: Your statement ‘...are so far only very limited. . .’ when discussing the current (prior to this MIPAS paper) state of PSC type observations. I would argue strongly that the previously-derived CALIOP satellite PSC climatologies render this statement incorrect. See papers by Pitts et al. (ACP, 2007, 2009 etc). I recommend you be up-front about the previous CALIOP satellite climatologies and note its achievements and strengths, but then state clearly where your new MIPAS dataset fills in gaps left by CALIOP, and the MIPAS dataset strengths. This could be done in a new paragraph following line 110.

Line 342: Provide a reference that SH winter 2010 was a warm winter. (de Laat & van Weele, Scientific Reports, 2011 , doi:10.1038/srep00038)

Figure 5: MIPAS NAT in 2009 (middle top figure) shows NAT between mid May and mid June below about 17km altitude. This is not seen in the CALIOP NAT area (middle bottom figure). This is separate from the tropopause-level NAT & ice issues which you discuss in the text. Can you explain why MIPAS sees NAT here but CALIOP doesn't?

Line 529-530: You should refer to de Laat & van Weele (Scientific Reports, 2011), doi:10.1038/srep00038 who show anomalously warm temperatures in MLS data and discuss the role of minor SSWs in 2010. Remove and replace line 530 and the personal

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communication with reference to this paper instead.

Technical Corrections:

I suggest a careful re-read of the manuscript to avoid spelling, sentence structure, and grammar errors. I picked up the following:

Line 74: ‘... type of PSCs are present...’

Line 103: Reword, it’s unclear

Line 147: ‘optically thin’

Line 177: ‘most sensitive (Spang)’

Line 232: Replace ‘whereby’ with ‘on the other hand,’ or similar phrase

Figure 1 caption ‘colour ratios’

Line 287: Reword the sentence beginning ‘Afterwards a very...’ – not clear.

Line 346: again, replace ‘whereby’ in this case with ‘whereas’

Line 350: do you mean ‘analogous’?

Line 372: seems you have cut out something here. What is ‘u, the CALIOP analysis’?

Figure 4: Suggest for NH you write 2007/2008 etc. in the titles because (a) it is clearer and readers will know instantly which winter you mean; (b) that’s what you have in the caption

Line 403: Unclear sentence. Reword

Line 615: ‘spectra is not only dominated...’

Figure 13: Make the dates the same between these figures. The top two have ‘May 1, Jul 1...’, the rest have ‘01.05.10, 01.07.10...’

Figure 14 & 15 captions: Shouldn’t this be  $A_{\text{ICEmax}}$  not, as currently written,

A\_{ICE}?

Line 799: '2011 by enhancing the aerosol...'

Line 801: 'classifier to distinguish various PSC...'

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