

## ***Interactive comment on “Effects of polar stratospheric clouds in the Nimbus-7 LIMS version 6 data set” by Ellis Remsberg and V. Lynn Harvey***

### **Anonymous Referee #2**

Received and published: 28 April 2016

The paper presents the new LIMS re-processed data with the version 6 algorithm. The new algorithm allows to screen the LIMS data for PSCs and thus derive information on PSC occurrence. The locations of the LIMS PSCs were compared to PSCs observed from SAM II. The paper is well written and I only suggest some minor revisions before final publication in AMT.

Minor comments:

Page, line 36: The respective theta levels should be added.

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Page 2, line 43 and 45: The respective pressure levels should be added.

Page 5, line 114: Which models are you referring to? The models should be named in the text.

Page 5, line 122: Could you be more precise than 7+ months? How many months exactly were LIMS measuring?

Page 5, line 131: Here you mention “cirrus clouds”, but these are not mentioned in the abstract and introduction and are also not mentioned again later in the manuscript.

Page 8, line 211: “.....orbital tangent-path locations and at  $p(z)$  levels spaced about every 0.88 km”. This is a mixture of pressure and altitude levels. I would suggest to give the spacing in pressure and then adding the corresponding altitude spacing in brackets.

Page 9, line 232-233: Same here. Since the data is on pressure levels the spacing should be first given in terms of pressure and then the corresponding altitude spacing should be added.

Page 12, line 308: This paragraph is somewhat confusing. First, the formation of ice is discussed and then the formation of PSCs in general. The paragraph should be revised so that the PSC formation mechanism become clear. Note that the NAT threshold temperature is not the NAT formation temperature, it's the NAT “existence” temperature. For the formation of NAT also temperatures close to  $T_{ice}$  are required, but NAT particles can exist up to temperatures of  $T_{NAT}$ .

Page 12, line 327 and 328: instead of “lighter blue” it would be better to just give the corresponding temperatures.

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Page 16, line 438: change wording to .... “ and of temperature for 15 November through the end of February” to make clear that the second part of the sentence refers to the temperature shown in Fig. 9.

Page 19, line 520: What is SSU? What is the abbreviation standing for?

Page 20, line 544: As mentioned before the NAT threshold temperature is the existence temperature of NAT. Thus, I would suggest to generally refer here to PSC formation and not NAT formation specifically since for the formation of NAT much lower temperatures (around  $T_{ice}$ ) are required.

Page, line 548ff: Is gas phase  $\text{HNO}_3$  shown or liquid  $\text{HNO}_3$  shown? This anti-correlation is quite confusing (when thinking about gas phase  $\text{HNO}_3$ ). I would expect that  $\text{HNO}_3$  has a minimum where the cold regions and the PSCs are found since PSC particles take up  $\text{HNO}_3$  and thus deplete the gas phase.

Page 21, line 591-592: This sounds a bit contradictory and does not become clear to me. I would suggest to rephrase the sentence.

Page 23, line 628: Again I do not understand where this anti-correlation is coming from. Low temperatures should correlate with low  $\text{HNO}_3$  since PSCs take up  $\text{HNO}_3$  and deplete the gas phase.

Page 23, line 635ff: Please motivate why 6 ppmv has been chosen as threshold.

Page 23, line 644: Rephrase as follows: “The above likely uptake of  $\text{HNO}_3$  by PSCs is.....”.

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Page 23, line 645: I would suggest to replace “vapor” by “gas phase”.

Page 24, line 656ff: From my experience of lidar measurements and box model simulations of Arctic PSC, STS forms first and then NAT and ice.  $\text{HNO}_3$  is taken up by the particles as soon as temperatures drop below  $T_{\text{NAT}}$  and STS PSCs form as soon as the temperatures stay that low for several hours.

Figure 3 caption: Instead of “at right” and “at left” I would suggest to use the colors of the lines, thus to write “in black” and “in red”.

Figure 4 caption: Why is here 46 hPa shown instead of 31.6 hPa as in Fig 2 and Fig 6?

Figure 5 caption: Same as for Figure 3, I would suggest to write “in black” and “in red” rather than “at left” and “at right”.

Figure 7 caption: Same comment as above.

Figure caption 8: Mention also in the Figure caption that this is an example for the “false positives”.

Figure 10: As mentioned in one of my previous comments I am quite confused about this anti-correlation. It would only make sense to me if total or liquid  $\text{HNO}_3$  is shown.

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