

I am happy to accept the manuscript with a few very minor corrections. I will be fine with not seeing the next revised version.

All line numbers refer to the "tracked changes" manuscript.

Comments to your replies (no action required except for 1.15)

- 1.4 I acknowledge your decision not to use MLS data, but I think your argumentation in your reply is not valid. You are either showing vortex means (new Fig. 1), pdfs or a scatter plot based on the profiles inside the vortex (new Figs. 2, 3, 4, 5). That means that the statistical error (precision) of MLS or MIPAS data is negligible in your "final product", either because of the average of many profiles (Fig. 1) or because these errors cancel out in a pdf (or scatter plot) and don't change the pdf significantly (except maybe at the tails). That leaves the systematic error (accuracy). For HCl, this is for instance 0.2 ppb in the considered altitude range in the version 5 data, which is reasonably low (similar for other species). Consequently, MLS has been used in many studies for comparison to model data (I hope I don't have to give citations, you probably can easily come up with a list).
- 1.9: I am happy about the changes. I think Figures 1 and 2 are very valuable additions to the manuscript.
- 1.12: Fine with your reply. But a little bit surprised that there is no further reasoning behind choosing these winters.
- 1.15: Do I interpret you correctly that you would like to say that some of the chlorine originally in HCl at the start of the winter shows up in ClONO₂ at the end of the winter? It might help to phrase it like this in the manuscript. In the moment, the formulation is not really to the point.
- 1.16 I am very happy that this was a simple conversion error.
- 1.17 Agreed and I acknowledge your decision not to show MIPAS data. But nevertheless, this would have been easy to add.

Specific comments

- 96–97, comment of other reviewer: I think the main reason why this reaction should be kept is that it also happens on the background aerosol and not only on PSCs, and is important for the NO_x partitioning. Without this reaction, the chemistry in the model would be completely unrealistic. This is partly stated in your sentence, but could be made clearer.
- 166–168: If this sentence is meant to serve as a justification for using the pdfs, you can only argue with the years here and not with the pressure range. The pressure range stays the same in Fig. 2 and Fig. 3.

Technical corrections

- 46: "solid HNO₃ of NAT" : "HNO₃ contained in NAT particles"
- 48: "stadard" : "standard"
- 71: I would write "NAT threshold temperature", because this is not necessarily the formation temperature in reality (supersaturation).
- 90: Is "decrease" the right word? "shrink", "evaporate" etc.
- 125: "sigificant" : "significant"
- 134: "illustration" : "discussion"
- Fig. 1 font size could be a little larger. Very hard to read. For the labels on the y axis (pressure), I would prefer 40, 60 and 100 hPa instead of the exponential notation.
- 148: "deactivated through this mentioned reaction" sounds a little odd. "deactivated by the reaction into ClONO₂" or something like this.
- 152: "decreasing" : Maybe "HNO₃ VMR decreasing with time"?
- 155: Logic: "...do not get large enough for the simulated HNO₃ to compare well..."
- Fig. 2 caption "corresonds" : "corresponds"
- 163: "concise correlation" : "compact correlation"
- 164: "show a larger spread" : "show a larger scatter"?
- 164-165: Formulation: Suggestion: "The simulation HetAll.1e-2 shows HNO₃ VMRs that are too large compared to the observations because of NAT particles that are too small."
- 165: Split sentence: Start new sentence: "As already suggested by Fig. 1..."
- 165: Rephrase the sentence starting in 165 in a way similar to my suggestion 164-165.
- Fig. 7 : Font sizes are a bit small.