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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Partitioning between the inorganic chlorine reservoirs HCl and $ClONO_2$ during the Arctic winter 2005 from the ACE-FTS" *by* G. Dufour et al.

Anonymous Referee #1

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The authors present interesting new simultaneous measurements of the time evolution of HCl, ClONO2, and ClO over the Arctic during the winter of 2005 from the ACE-FTS. Their findings generally confirm the current understanding of chlorine activation during the Arctic winter. The paper is clear and well-written, and the data is novel and appropriate for publication in ACP. However, the presentation of the analysis, particularly of the photochemical box model used to aid in the interpretation of the data, is not as strong as the rest of the paper. I recommend that the following issues be addressed before publication:

1) Please provide a more detailed description of the modified box model, in particular the effort to include heterogeneous chemistry. Since the authors use the output of this model along with their measurements to conclude that 'the picture that emerges is consistent with our understanding of PSC processing' (p.1261, Lines 20-22), they should give more detail about how that understanding was reflected in their model. What model of PSC formation was used, or what assumptions were made regarding the PSC population? Why was NAT chemistry not included in the model, when the authors state in Section 3 that NAT PSCs were likely to have formed, and in Section 5 state that NAT processing contributed significantly to the ClO profile?

2) More detail should be given regarding the information available to the authors regarding observations of the PSC population during these measurements. Since the authors reference an unpublished work regarding this issue (i.e. one that cannot actually be looked up by the reader), it would be helpful if more information were provided in the paper.

The following are suggestions for minor changes to improve readability:

- In the discussion in the text the authors refer only to calendar days, but Figures 4, 5, 6, and 7 are labeled with 'Day of the year' only. Please either add a secondary 'Calendar day' x-axis as in Fig. 1, or change to a single unit throughout the paper.

- The altitude unit 'K' is not readily recognized by a general audience, and 'K' is already being used as a unit of temperature in Kelvin. Please either define this unit and then use a distinguishing font/symbol from the one used for temperature, or use 'km' throughout.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 1249, 2006.