

Interactive comment on “Chlorine partitioning near the polar vortex boundary observed with ground-based FTIR and satellites at Syowa Station, Antarctica in 2007 and 2011” by Hideaki Nakajima et al.

Anonymous Referee #2

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Chlorine partitioning near the polar vortex boundary observed with ground-based FTIR and satellites at Syowa Station, Antarctica in 2007 and 2011.

The authors use a ground-based FTIR spectrometer in Antarctica as well as the satellite-based MIPAS instrument to observe ozone depletion chemistry during 2011 and 2007. The observed relationships between the chlorine reservoir and active species are investigated using a chemistry model, which reproduces the changes in abundances of ClONO₂, HCl, ClO, HNO₃, and O₃.

C1

General comments:

The manuscript is well-written and organized. The introduction does a good job of providing an overview. However, I'm curious to know how the study's results compare to other results, e.g., was the amount of depletion typical? Also, the FTIR was installed in March 2007, so why weren't results included from years other than 2007 and 2011? What is the current state of the instrument? Perhaps a comment about ongoing work could be added to the conclusions.

In terms of the FTIR retrieval method, why is SFIT2 used, rather than the up-to-date SFIT4? Also, it was helpful to see an example of the averaging kernel, but I'm curious to know what the DOFS were, especially near the altitude of interest.

For the validation, it is hard to draw firm conclusions from the ozone validation using only 14 coincidences. Indeed, these comparisons had notable scatter (e.g., P6L20-28). Why not also add MLS comparisons, especially since MLS is used for HNO₃ and HCl measurement validation. Indeed, later in the manuscript, MLS O₃ is shown (Fig. 11) with comparisons to the chemistry model.

Specific comments:

P2L12: Suggest removing “month” or reword “only in the month of September”.

P2L22-25: The sentence grammar should be revised, e.g. the semi-colon.

P5L34: The list of tangent point altitudes is incomplete in the middle.

P6L18: Could you elaborate on “slit function”?

P7L10: Were the Livesey results covering the same latitudinal range as this study? Was this bias between MLS and HALOE only seen in HCl?

P7L10: Livesey et al. (2013) not in references. Couldn't locate the study. Please update.

C2

P9L30: Remove “later” after Figure 10. Define EL when mentioning equivalent latitude in the Figure 10 caption since it’s used in the figure colorbar label.

P10L32: Can the satellite coincidences be filtered to ensure similar equivalent latitude to Syowa Station, in addition to the distance/temporal criteria applied?

P11L1: It’s preferable to spell the term and then put the acronym in brackets, e.g., “Reduced Major Axis (RMA)”, which has been done elsewhere in this manuscript.

P13L27-31: Nice result about the ClONO₂ transport.

P18L29: Misspelled “Livesey” as “Liversey”.

Table 3: Suggest adding number of coincidences contributing to the altitudes of interest

Fig. 4: Between day 310 and 320, the time spent outside the vortex is a nice illustration of how significant the boundary is for ozone chemistry. Clear support for the criteria used to define these boundaries.

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