

Interactive comment on “The maintenance of elevated active chlorine levels in the Antarctic lower stratosphere through HCl null-cycles” by Rolf Müller et al.

Anonymous Referee #1

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The manuscript by Müller et al. represents an important process study for stratospheric chemistry in the Antarctic. The manuscript details a mechanism for the maintenance of high ClO_x through effective chemical cycles (termed HCl null-cycles) that inhibit chlorine deactivation. The authors apply state-of-the-art box model calculations to determine chemical reaction rates and chemical pathways, explore the effects of future changes in chlorine and methane levels and provide a sensitivity analysis for different initial ozone mixing ratios and HNO₃ levels.

The manuscript is well prepared, and I find it suitable for publication in ACP after a few minor additions/corrections detailed below.

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Specific Comments:

P3, L13: please provide briefly a few specifics of the radiation code applied

P3, L32: I understand why the authors use the 0% and 100% branching ratios as limit cases, but performing integrations with a small set of intermediate, more realistic, branching ratios would strengthen the manuscript.

P11, L24: please provide a little more detail on the diabatic descent and latitude variations considered

Technical Comments:

Figures 2, 3, A1, A2: readability of panel (a) would be improved by extending the axis to 0 ppb.

Figure 4: adding the results of the reference simulation (in color) to this figure would be helpful

All Figures: alternating the labels between left and right y-axis among panels would improve readability and allow for larger axis labels.

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