

Interactive comment on “A closer look at Arctic ozone loss and polar stratospheric clouds” by N. R. P. Harris et al.

Anonymous Referee #1

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This paper presents an extension of previous model studies of Arctic ozone loss and its correlation with the volume of polar stratospheric clouds. An objective of this study was to evaluate the dependence of the correlation on various chemical and photochemical parameters. The previously reported linear relationship between column ozone loss and volume of polar stratospheric clouds is updated to include data for 2005/6, 2006/7, and 2007/8 and is shown to hold at altitudes between 15 and 24 km, which is the range of the major of column ozone loss. It is shown that the extent of ozone loss is dependent on the rate of denitrification, although this is not a new concept. Further development of this work has implications for possible future use in climate chemistry models and the evaluation of climate change. This paper is well written and appropriate for publication in Atmos. Phys. Chem.

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Comments on text: * Page 6684: “The timing of the growth in ClO and ClOx coincides with the onset of PSCs.” This point is not clearly made in Figure 1 as the PSC coverage is nearly constant at early times. That is, there is no time dependence or onset evident in the PSCs.

* PSCs are assumed to be NAT but it is not clear what the overall sensitivity of this assumption is, although there is some discussion on page 6688.

* Page 6688: delete (in molec cm⁻³ km⁻² or 10(15) molec km⁻¹)

* Page 6689: sp, background

* Page 6690: The qualitative text associated with R1-R3 is rather confusing. The comments are referring to the rates of these reactions and not the actual rate constants for these reactions. That is, the text should be “Rate is fast if PSCs are present”. I recommend that R1 include “het” over the arrow to indicate that this is a heterogeneous reaction rather than the added text. Delete “so” on this line. In this discussion it would also be worth mentioning the possible role of ClONO₂ photolysis, which would counteract reaction R3.

* Figure 2: It is not clear why the 5 years not included in the figure were excluded. This represents a significant fraction of the available data and requires a more quantitative explanation.

* Figure 3: Change the scale of the y-axis for the 500 and 550 K plots to more clearly show the data points. Also, error bars on the data points should be included.

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