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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Sensitivity of polar stratospheric ozone loss to uncertainties in chemical reaction kinetics" *by* S. R. Kawa et al.

**S. R. Kawa et al.**

stephan.r.kawa@nasa.gov

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We thank Referee 2 for his/her careful reading of the manuscript and thoughtful comments. Most of the comments will be incorporated into the revised paper as detailed below.

1. General Comments: We do not disagree that the work could gain some by more discussion of other reactions beyond Cl2O2 photolysis and Table 1. It is simply a question of scope for the paper. We feel that we have done a reasonably complete job on reactions important for springtime polar ozone loss, which was the objective of the paper. To expand the scope would require expanding the modeling domain, methodology, and target chemical processes, which is more than we set out to do for this study.



Regarding the ClONO2 branching ratio, JPL06 does not give uncertainties for the quantum yields, but the impact would undoubtedly be small for our polar loss scenario. Varying the ClONO2 photolysis rate by a factor of 1.3 (JPL06) does not detectably change the O3 loss (occurrence of O3 less than 0.1 ppmv is < 1 hour different from base case). ClONO2 mixing ratios are less than 50 pptv along the vortex trajectory. The only leverage this reaction has on the O3 loss rate is through the subsequent photolysis of NO3 to NO + O2, and this channel is only about 1/8 of that for NO2 + O, which is essentially equivalent to the ClO + NO2 channel for ClONO2 photolysis.

2. Specific Comments: Recent publications from von Hobe et al. [2009] and Chen et al. [2009] are most relevant and will be included in the introduction of the revised paper.

The sensitivity to uncertainties in the heterogeneous reactions was tested in separate runs (discussed in Section 3), but was not included in the Monte Carlo runs because of the different formalism required for these reactions. We feel justified in this simplification because of the low sensitivity to heterogeneous rates for this case. Text will be modified to clarify this point.

The explanation of too fast ozone loss in Fig. 5 will be clarified in the revised paper.

We have plotted the ozone time series for all the sensitivity runs including R3b and decided that they were not worth including in the paper, relying on Table 1 to summarize the results. The R3b sensitivity lines simply run parallel to the baseline case (red solid line in Fig. 1, 3, 4, or 5) offset by +/- a few days near day 260. It would be simple to add this line, but we didn't think it would be worthwhile to complicate the figures. No additional figures are planned.

Expanding Table 1 to include HBr + OH -> H2O + Br covers all the reactions that have an impact greater than 0.1 days. Table and discussion will be modified accordingly.

3. Technical: Pierson et al. citation is corrected and Canty et al. deleted from reference

list. Table 1 caption is expanded and Figure 1 caption wavelength reference added. Fig. 6 re-composed and formatted properly.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 13327, 2009.