

***Interactive comment on “Impact of the new
 HNO_3 -forming channel of the HO_2+NO reaction on
tropospheric HNO_3 , NO_x , HO_x and ozone” by
D. Cariolle et al.***

Anonymous Referee #2

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This is a very focussed and pleasantly brief modelling paper on the impact of HNO_3 formation in the $HO_2 + NO$ reaction on various atmospheric trace gas families. The effects of the minor product channel to form HNO_3 is great, with e.g. OH decreased significantly especially in the tropical UT and important changes in the NO_x / NO_y ratio. This reaction operates in the wrong direction to help explain long-standing model / observation differences in HNO_3 / NO_x .

In summary, this work nicely highlights the continued need for high quality laboratory data on critical atmospheric gas-phase reactions and also the need for closely linking the model and laboratory disciplines of atmospheric science.

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It should be noted that the formation of HNO₃ in the HO₂ + NO reaction remains to be confirmed by other laboratory groups, which should have high priority.

Some minor corrections are listed below:

Page 2696 Line 1 I am not sure that the word "established" is appropriate. The laboratory work was conducted by an excellent group, yet for a reaction to be established I would argue that independent confirmation is needed.

Page 2698 Line 20 Please add the concentrations of CO and O₂. See also line 24 in which HNO₃ formation from OH + NO₂ is simply stated to be prevented. The authors should be more precise here and calculate the flux through OH + NO₂ versus OH + CO for different pressures in their set-up. This is really a critical issue, as any HNO₃ formation channel other than HO₂ + NO has to be completely ruled out for the branching ratio to be correct. Have the authors conducted numerical simulations of the reactor ?

Page 2699 Line 3 "straightlines"...one word ?

Page 2699 Line 14 The authors cite the NASA evaluation panel's recommended value. Does this deviate from that of IUPAC. If there are differences, mention why NASA is preferred. If there are no differences cite both.

Page 2699 Line 16 .."the potential impact"..Why potential impact. If the lab study is accurate and the model works these are real impacts and not just potential impacts. The same applies to Page 2704 Line 17.

Page 2700 Line 5 ..the latest compilation for the reaction rates.. What is the latest compilation and from what year does it stem ?

Page 2700 Lines 10 and 23 ..reference simulation or control run.. Better to stick to one terminology.

Page 2701 Lines 1-5 and Figure 2a The results show that the rate of HNO₃ formation from the two reactions discussed depends on altitude. This presumably reflects the

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different altitude profiles of NO and NO₂, as well as temperature dependencies in the rate coefficients. It would be worthwhile to discuss this point in more detail rather than just stating the fact.

Page 2701 Line 9 delete "in the upper atmosphere". (redundant text)

Page 2701 Line 9 delete "by those levels". (redundant text)

Figure Captions In Figure 2 the X-axis title needs superscripts. The axis labelling in Figures 5 and 6 is too small.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 2695, 2008.

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