

## ***Interactive comment on “Chlorine activation on stratospheric aerosols: uncertainties in parameterizations and surface area” by T. Wegner et al.***

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We thank the anonymous reviewer for his comments and suggestions. Please find a line by line response printed in bold below.

1. I think the title is not completely in agreement with the results. I would suggest something like: “Chlorine activation in the Arctic stratosphere: the role of different aerosols”

**changed to: “Heterogeneous chlorine activation on stratospheric aerosols and clouds in the Arctic polar vortex”**

C9317

2. I suggest some discussion on the role of N<sub>2</sub>O<sub>5</sub> hydrolysis. I think this reaction could also play a role in chlorine activation.

**We have added a section discussing heterogeneous reactions of N<sub>2</sub>O<sub>5</sub> (N<sub>2</sub>O<sub>5</sub>+H<sub>2</sub>O/HCl). However, their importance for chlorine activation is limited since the hydrolysis of N<sub>2</sub>O<sub>5</sub> occurs at higher temperatures than its reaction with HCl.**

Minor comments and technical corrections 1. Page 20563, Line 3: “. . . in late in winter . . .” should be “. . . in late winter . . .”

**corrected**

2. Page 20565, Lines 18-19: There are other sources of NO<sub>x</sub>. Depending on the altitude the influx from the thermosphere, electron precipitation or galactic cosmic rays could contribute.

**A section discussing the impact of galactic cosmic rays and energetic particle precipitation on the NO<sub>x</sub> budget of the lower stratosphere has been added. Their contribution to overall NO<sub>x</sub> is small compared to photo-dissociation of HNO<sub>3</sub>.**

3. I would change “every Kelvin cooling” to “every 1 K cooling”, otherwise it reads like a process “Kelvin cooling”

**corrected**

4. Page 20574, line 8: Does formation of NAT necessarily means irreversible denitrification?

C9318

**This has been clarified. While the formation of NAT is a prerequisite for subsequent irreversible denitrification, observations of decreasing gas-phase HNO<sub>3</sub> cannot be unequivocally attributed to the formation of PSCs or denitrification. It only indicates that PSCs have been present at some point in the observed air masses.**

5. Page 20580: If the authors refer to CCMVal-2 report than the correct reference is: SPARC Report on the Evaluation of Chemistry-Climate Models, edited by: Eyring, V. Shepherd, T. G., and Waugh, D. W., SPARC Report No. 5, WCRP-132, WMO/TD-No. 1526, 2010.

**corrected**

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