

## ***Interactive comment on “The interaction of N<sub>2</sub>O<sub>5</sub> with mineral dust: aerosol flow tube and Knudsen reactor studies” by C. Wagner et al.***

**C. Wagner et al.**

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We thank Sabine Seisel for her comments on this manuscript. Those comments and our replies are posted below.

**Comment:** N<sub>2</sub>O<sub>5</sub> is known to undergo hydrolysis. Have the authors measured the wall loss also under humidified conditions?

**Reply:** Yes, wall loss experiments were conducted at various humidities, with no significant variation. As we mention in the text, the loss rate to the (dirty) walls was close to the diffusion limit in these experiments, so that little sensitivity to wall reactivity (which was high) was expected or observed.

**Comment:** The authors state that the uptake coefficients determined are independent of concentration. As already mentioned in the short comment, the concentration in the

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KC experiments has only been varied by a factor of 3-4. In the AFT experiments the concentration used was roughly 3 orders of magnitude higher as in the KC experiments and has only been varied once. It may well be that the uptake is first order in  $\text{N}_2\text{O}_5$  over the whole concentration range. At the high concentration used in the AFT experiments, however, the uptake may saturate quickly and result in an apparent lower uptake coefficient. Have the authors performed KC experiments at that high concentration in order to verify that the uptake coefficients are indeed independent of concentration over this broad range?

**Reply:** First, a factor of 4 is not a small change in concentration and is usually adequate to test for any dependence of  $\gamma$  on this parameter. Second, the KC experiments do not lend themselves to experiments at high concentrations as the relatively small sample saturates on the time scale of acquisition of the first data point. i.e. the uptake coefficient is always time dependent and is always underestimated at very high  $\text{N}_2\text{O}_5$ . Third, we do not observe a significant difference in  $\gamma$  between the KC and AFT experiments despite the very large difference in initial concentration. Of course, we would have preferred to work at low  $\text{N}_2\text{O}_5$  concentrations in the AFT experiments but, as we state in the manuscript, the working range was limited by the detection method.

**Comment:** For the KC experiments, the uptake coefficients may be regarded as initial values. What is the time resolution of the AFT measurements and may the uptake coefficients determined with that time resolution and at high concentrations (see point 3) still be regarded as initial ones?

**Reply:** The AFT is a steady state experiment, the concept of time resolution is not applicable (caveat: see comment from reviewer Ammann). The fact that there was no variation in uptake coefficient with  $\text{N}_2\text{O}_5$  concentration and that the plot of  $\text{N}_2\text{O}_5$  signal versus time (or dust area) is exponential imply that there are no significant saturation effects for the given ratio of dust surface area-to- $\text{N}_2\text{O}_5$  concentration in the AFT.

**Comment:** Equations iii, v and viii contain an uptake coefficient. The first represents

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the overall uptake (uptake on dust + wall loss), the second the uptake on dust and the third the wall loss. The three values should be named differently.

**Reply:** The uptake coefficient in equation (iii) is a generic form for any total surface area; in equation (v) it refers to uptake to dust. In a revised manuscript, the uptake coefficient in equation (viii) will be changed to indicate that it refers to wall loss only.

**Comment:** The mean values for the uptake coefficients given in Table 1 are not consistent with the individual values.

**Reply:** The mean values are weighted averages of the data, hence the deviation from the simple mean of the individual values. The Table caption will be changed to mention this.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 13291, 2007.

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