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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Wind tunnel experiments on the retention of trace gases during riming: nitric acid, hydrochloric acid, and hydrogen peroxide" *by* N. von Blohn et al.

Anonymous Referee #2

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Review of von Blohn et al. "Wind tunnel experiments on the retention of trace gases during riming: nitric acid, hydrochloric acid, and hydrogen peroxide"

General Comments:

In the submitted manuscript, von Blohn et al., explore the retention of nitric acid, hydrochloric acid, and hydrogen peroxide during riming through a series of controlled experiments in a vertical wind tunnel. The experiments were designed to probe for the dependence of temperature and gas solubility on the retention of trace gases under conditions that are broadly representative of the ambient atmosphere. At present there is strong agreement in the literature that nitric and hydrochloric acid (both highly sol-

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uble acids) are retailed with near unit efficiency during the riming process. However, there is strong disagreement in the literature on the retention coefficient for hydrogen peroxide, with measurements ranging from 5 – 100%. It has been hypothesized that the variability in the literature values was due to unrealistic/non-representative experimental conditions. The new dataset generated in this study adds significantly to the existing set of antiquated measurements. The experimental methods are sound, the paper is well designed, and the topic well suited for publication in ACP. I have only a handful of questions/comments for the authors:

1) The introduction lacks sufficient discussion of the importance of accurate representation of the retention coefficient in model simulations. The addition of 2-3 sentences discussing (for example) the sensitivity of the upper tropospheric HOx and O3 budgets to assumptions made regarding the retention coefficients would provide nice context and motivation for why (or if) a 5-100% difference in the retention of H2O2 is important.

2) The discussion of the stability of H2O2 in super-cooled droplets is a bit confusing and needs more quantification (page 17455). What is the magnitude of this correction? What level of confidence do the authors have in the corrected concentrations?

3) Error analysis: In all three investigations (HNO3, HCl, and H2O2), the mean and standard deviation of the ensemble of observations is reported. In table 2, the authors also include a “Gaussian error computation” that is based on a select number of known sources of experimental error. It would be helpful if the authors could elaborate on the specific calculation that was conducted, and how the errorbars (y-axis) in the respective figures were derived. Further, in the case of H2O2 (figure 5, and 6), what do the error bars in each individual measurement represent? For example in Figure 5, at -13C there are points with a measured retention coefficient of <0.4 and points close to 0.9, with non-overlapping errorbars.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 17447, 2011.