

Interactive comment on “An experimental technique for the direct measurement of N₂O₅ reactivity on ambient particles” by T. H. Bertram et al.

Anonymous Referee #1

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This paper describes a new and interesting type of probe experiment in which real atmospheric aerosol particles are exposed to N₂O₅ and the uptake parameters measured. As such it is a very valuable addition to our knowledge of these reactions. The authors make quite a good job of assessing the possible uncertainties and errors that could be associated with this method. There are a few issues that need to be resolved about this paper, pending those, I think it should be accepted.

One potential problem with this method, which is common to most probe methods is that the act of adding N₂O₅ could change the particles acidity because of HNO₃ formation. I suggest the authors consider this effect. Perhaps a mass-balance analysis

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could tell you whether or not this could be a large enough effect that it will change γ ?

The authors seem to be coy about revealing the other aspects of this work such as whether or not substantial ClNO₂ formation was observed. Also did they look for direct formation of Cl₂ as described by Roberts et al., 2008. It would be nice to get a short statement on these issues.

What is the reason for the large difference in uptake between 5% RH and 50% RH is the lab study with malonic acid. It doesn't seem like the 50%RH particles would contain liquid water, so what is causing this effect?

Bertram et al., 2009 – should be referenced as unpublished results.

Section 6.ii Not sure about this, since your residence time is 8 minutes you might not see the effect of a 'pulse'. The reactor is somewhere between well mixed and plug flow. You could determine its characteristics by just turning the N₂O₅ source on and off slowly ie. a step-function. Have you tried that?

Roberts, J.M., H.D. Osthoff, S.S. Brown, and A.R. Ravishankara, N₂O₅ Oxidizes Chloride to Cl₂ in Acidic Atmospheric Aerosol, *Science*, 321, 1059, 2008.

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