Atmos. Chem. Phys. Discuss., 13, C12928–C12930, 2014
www.atmos-chem-phys-discuss.net/13/C12928/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Reactive uptake of N_2O_5 to internally mixed inorganic and organic particles: the role of organic carbon oxidation state and inferred organic phase separations" *by* C. J. Gaston et al.

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Received and published: 18 March 2014

Interactive comment on "Reactive uptake of N2O5 to internally mixed inorganic and organic particles: the role of organic carbon oxidation state and inferred organic phase separations" by C. J. Gaston et al. Anonymous Referee #1

This is an interesting manuscript which systematisizes the effects of different organic (mixture)(s) on the uptake of N2O5 on atmospheric particles, relative to an inorganic reference state. The manuscript takes into account organic fraction, organic compo-

sition (O/C) and particles morphology (phase separation). Application of an analytical solution of the reacto-diffuse equation considering coatings (Antilla model) with modifications/ constraints derived from measurments and adjusting the free parameters gives insights into sensitivity and critical parameters. The authors derrive from the lab results and model a range of possible effects of organic aerosol components for a range of atmospheric conditions and atmospheric organic particle properties. This is showing despite the wide variety of conditions and properties of moxed organic/inorganic particles that reduction of N2O5 uptake is significant and should be considered. The manuscript is well writen, clear, and good to read and can be published as it is. However, the author may consider a few points:

Author responses follow each comment and are denoted with **.

1. I would move Figure 1S from the supplement to the manuscript. I like to see the experimental setup when dercibed in the text.

**The figure has been moved as requested.

2. Is it possible to plot the Seatlle field data into Figure 8, using the composition and conditions of the individual data points? Would the position and the spread of the Seattle data points tell something about the likely morphology/composition of the particles, which could be verified by other accompanying measurements

**Figure 8 (now Figure 9) shows the impact of organic coatings as a function of relative humidity for different types of organics. Because the range in RH sampled by the Seattle data is small and organic mass fractions spanned a different regime from the laboratory experiments, this data couldn't be represented in Figure 9. However, as shown in the manuscript, mixtures of ammonium bisulfate and polyethylene glycol were found to generally represent N2O5 uptake on ambient aerosol, which is why we showed the impact of coatings of PEG as a function of relative humidity.

3. p. 32057, line 19-21: This sentence is difficult to understand. Could you try to

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reformulate or extent a little what you refer to.

**The sentence has been clarified.

4. p. 32069, line 10ff and Figure 6: Any specific suggestions which could explain the lower N2O5 uptake for the two data points. I guess that experimental artefacts can be ruled out ? (e.g. were they taken in the same period or were other measurements in between? Were they taken with the same setup ? You mentioned the exchange of similar equipment.)

**Experimental artifacts can be ruled out for the two outlier points since measurements with ABS and other organic compounds with high O:C ratios that showed expected behavior (e.g., ABS and malonic acid) were also made during the same period and with the same equipment. As mentioned in the high O:C section (3.3), we hypothesize that citric acid and glucose are responsible for the observed behavior since both compounds are capable of forming amorphous phases. It is possible they precipitated from the solution.

Typos:

5. p. 32064, line 5: ": : :a similar finding to Antilla et al. (2006)". Turn words to ": : :a finding similar to Antilla et al. (2006)" ??!

**The sentence has been modified as suggested.

6. Figure 1: legend inside Figure misplaced

**The legend has been moved to the top of the figure. âĂČ

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 32053, 2013.