**Atmospheric
Chemistry
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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.

Anonymous Referee #2

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The authors have systematically investigated the validity of the Anttila (2006) model for predicting the reduction of N2O5 uptake to ammonium bisulfate caused by organic components. They have tuned the model to the results of new experimental datasets by adjusting the rate coefficient of N2O5 reaction and its diffusion rate coefficient in the organic phase, as well as a scaling factor for relative solubility/diffusion in the organic layer and aqueous core. Finally they make predictions for the suppression of the uptake coefficient of N2O5 for various O:C ratios and organic mass fractions in atmospheric particles. The presence of certain organics (low O:C ratio) significantly changes the

response of N2O5 uptake to changes in RH.

This is an interesting study, which advances or knowledge of N2O5 heterogeneous kinetics in the troposphere and may in the future lead to an improved approach to modelling this very important parameter. The authors may wish to consider the following points in revising their manuscript.

Please reduce the unnecessary use of acronyms. Ammonium bisulfate has a chemical formula not much longer than the acronym ABS. Also the structural formula of PEG should be given at one point.

P32059 L5. The surface areas are derived from mobility diameters. Pleae state the accuracy of the areas thus derived.

P32059 L24. Laminar flow. Please give the Re number.

P32060 Eq1. This assumes exponential dependence between "top" and "bottom". Was this observed ? What was the fractional loss of N2O5 ? Please show raw data, at the very least least as supporting information if not in the manuscript.

P32061 L5. Please list the corresponding RH values for each uptake coefficient.

P32062 L24. Please move the description of F to the manuscript. The reader should have optimal access to important features of the data analysis.

P32065 L22. This observation(s)

P32065 L28. . . .possibilities exist for why. . .. There are several possible ways to explain why..?

P32072 L5. . .potentially. . ...

The dataset presented in Figure 7 looks convincing, with 1:1 agreement. However, if I have correctly understood the procedure used, this agreement has been achieved by the tuning of the model parameters such as korg for each individual condition. The

model does not, a priori, predict these uptake coefficients. Perhaps the use of the word predict in the y-axis is inappropriate here. The authors should clarify this.