

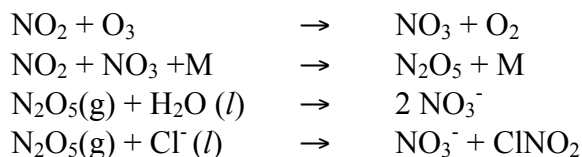
Estimating N₂O₅ uptake coefficients using ambient measurements of N₂O₅, ClNO₂ and particle properties

J. N. Crowley,^{1*} G. J. Phillips¹, J. Thieser¹, M. J. Tang¹, N. Sobanski¹, J. Fachinger¹, F. Drewnick¹, and J. Lelieveld.¹

¹ Max-Planck-Institute for Chemistry, Mainz, Germany.

* Corresponding author: john.crowley@mpic.de

The heterogeneous uptake of N₂O₅ to ambient particles is an important process affecting both the atmospheric reactive-nitrogen budget¹ and the rate of generation of nitryl chloride^{2,3} a photolabile source of chlorine atoms which impacts on tropospheric oxidation processes.⁴



Laboratory derived uptake coefficients for N₂O₅ interaction with aqueous, tropospheric particles⁵ are often incompatible with observed rates of N₂O₅ loss to ambient particles⁶ implying that laboratory surrogates are not always a realistic representation of the highly complex and variable particle composition in real aerosol. By measuring both NO₃/N₂O₅ and ClNO₂ as well as particle composition/properties during a field campaign we have derived N₂O₅ uptake coefficients on atmospheric aerosol. We investigate the environmental factors that influence the uptake coefficients obtained and compare them to parameterisations based on analysis of laboratory data.

References

- (1) F. J. Dentener, F. J. and Crutzen, P. J.; *J. Geophys. Res.-Atmos.*, 1993, 98, 7149-7163.
- (2) Thornton, J. A., Kercher, J. P., Riedel, T. P., Wagner, N. L., Cozic, J., Holloway, J. S., Dube, W. P., Wolfe, G. M., Quinn, P. K., Middlebrook, A. M., Alexander, B and Brown, S. S.; *Nature*, **2010**, 464, 271-274.
- (3) Osthoff, H. D., Roberts, J. M., Ravishankara, A. R., Williams, E. J., Lerner, B. M., Sommariva, R., Bates, T. S., Coffman, D., Quinn, P. K., Dibb, J. E., Stark, H. Burkholder, J. B., Talukdar, R. K., Meagher, J., Fehsenfeld, F. C., and Brown, S. S.; *Nature Geoscience*, **2008**, 1, 324-328.
- (4) Sarwar, G., Simon, H., Bhawe, P., and Yarwood, G.; *Atmos. Chem. Phys.*, **2012**, 12, 6455-6473.
- (5) Ammann, M., Cox, R. A., Crowley, J. N., Jenkin, M. E., Mellouki, A., Rossi, M. J., Troe, J., and Wallington, T. J.; *Atmos. Chem. Phys.*, **2013**, 13, 8045-8228.
- (6) Bertram, T. H., Thornton, J. A., Riedel, T. P., Middlebrook, A. M., Bahreini, R., Bates, T. S., Quinn, P. K., and Coffman, D. J.; *Geophys. Res. Lett.*, **2009**, 36, L19803, doi:10.1029/2009GL040248.