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$ClNO_2$ and nitrate (NO_3^-) formation via N_2O_5 uptake to particles: Derivation of N_2O_5 uptake coefficients from ambient datasets

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We present estimates of the uptake coefficient of N_2O_5, $\gamma(N_2O_5)$, using ambient measurements of the trace gases N_2O_5 and $ClNO_2$ and particle composition and surface area at the Kleiner Feldberg observatory, near Frankfurt, SW Germany, during the PARADE campaign (summer 2011). Three methods used to extract $\gamma(N_2O_5)$ from the datasets were found to be in reasonable agreement, generating values between 0.001 and 0.4. $\gamma(N_2O_5)$ displayed a significant dependence on relative humidity (RH), the largest values obtained, as expected, at high RH. No significant dependence of $\gamma(N_2O_5)$ on particle organic content or sulphate-to-organic ratio was observed. The variability in $\gamma(N_2O_5)$ is however large, indicating that humidity is not the sole factor determining the uptake coefficient. There is also an indication that the yield of $ClNO_2$ with respect to N_2O_5 uptake is larger with lower concentrations of PM1 total organics. Our results will be compared to existing uptake coefficients from laboratory studies and those derived from field-observations.