

## ***Interactive comment on “The heterogeneous chemical kinetics of $\text{N}_2\text{O}_5$ on $\text{CaCO}_3$ and other atmospheric mineral dust surrogates” by F. Karagulian et al.***

**J. Crowley (Editor)**

[crowley@mpch-mainz.mpg.de](mailto:crowley@mpch-mainz.mpg.de)

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As is frequently the case for studies of uptake coefficients using inhomogeneous bulk substrates, the main source of uncertainty appears to be the choice of surface area to use when calculating gamma. This point was raised in detail by Reviewer 1. The authors choose not to make corrections for internal surface, the main argument being that  $\text{N}_2\text{O}_5$  does not diffuse into the interstitial space of the sample during the pulsed valve experiments. This appears however to be an assumption rather than a fact as no experiments have been carried out which directly measure rates of diffusion of  $\text{N}_2\text{O}_5$  into

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the samples used. For this reason, the values of gamma presented are to be regarded as upper limits. Perhaps this needs to be stated more clearly in this manuscript.

A major source of confusion appears to be the presentation of mass dependent values of gamma (Figure 4), which are usually taken to indicate that more than just the surface layer is interrogated by the gas-phase. The author's reply to a comment of Reviewer 1 regarding this clarifies the issue by stating that, at low mass, the sample holder is not completely covered, implying that the values of gamma presented are false (if are all calculated using the geometric surface area of the sample holder). If this is the case, the data obtained at low sample mass is misleading as gamma is not comparable to gamma at high mass. What do the linear fit lines to the data at low mass actually describe? This needs to be clarified in a revised version of the manuscript. However, once the true cause of the lower values of gamma at low mass is established, it is difficult to see how (in the absence of a measured mass dependence) the authors have been able to derive pore diffusion corrected values of gamma at the end of section 4 (broken fit lines in Figure 4). The assumptions used in this PD calculation, and the other parameters returned (usually a tortuosity factor) need to be presented. Again, this needs to be clarified in a revised version.

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 10369, 2005.

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