

Interactive comment on “The heterogeneous chemical kinetics of N₂O₅ on CaCO₃ and other atmospheric mineral dust surrogates” by F. Karagulian et al.

F. Karagulian et al.

Received and published: 15 January 2006

Answer to anonymous Referee #2:

We would like to answer Referee 2 as follows:

P10374, L2-8: MS analysis did not reveal the presence of ozone at m/e 48. In addition, if significant amounts of ozone would have been adsorbed to N₂O₅ the sample should have been blue, instead it was snow white.

P10381, L1-13: Figure 1 clearly shows the slow surge of HNO₃ over hundred's of seconds. We have pointed out to Referee 1 in answering his question raised on P10375,

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

EGU

Interactive
Comment

L7 that the results on the formation of HNO₃ are consistent with Hanisch and Crowley. Equation (6) provides perhaps an answer to the slow surge of HNO₃ as H₂O(ads) is accumulating on the surface and increasingly enabling the heterogeneous hydrolysis pathway N₂O₅ + H₂O → 2HNO₃.

P10382: As already answered to Referee 1 N₂O₅ interacts only with the “skin” of the sample (= geometric surface area) at t = 0 whereas at steady-state, hundreds of seconds into the reaction, deeper layers of the sample are accessible through slow Knudsen (surface) diffusion owing to saturation of the first few layers. We will emphasize the role of the time scale in the revised version and dwell on the “stickiness” of N₂O₅ on mineral dust in contrast to alkali salts that makes Knudsen diffusion into the bulk very slow. Please see the opening remark to Referee 1.

P10384, Table 5: There are many examples where the initial uptake coefficient depends on concentration. There is no general rate law that says that α_0 should be independent of [N₂O₅].

P10389, L6-8: The surface area density is the surface-to-volume ratio in the atmosphere and corresponds to As/Vcell described on page 10376, L1-12. You are now free to use whatever surface for As that you deem appropriate, total internal or geometric. In the context of this work we have presented arguments in favor of the use of the geometric surface area.

P10408, caption to Figure 8: Correct. NO₃ will be replaced by N₂O₅, however, the full and empty symbols refer to two different flow reactors, namely 4 and 8 mm escape orifice.

“Throughout manuscript”: This is indeed a difficult question that we have answered in the context of a point raised by Referee 1. The case presented in Figure 7 is a clear-cut case of steady-state uptake. However, at very long time scales of hours there is probably increasing saturation of the uptake, even for such samples as Kaolinite and Saharan dust that do not show signs of saturation on the time scale of tens of minutes.

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

On this time scale we should probably talk of a pseudo steady-state situation.

ACPD

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

5, S5090–S5092, 2005

Interactive
Comment