

Interactive comment on “DRIFTS and Knudsen cell study of the heterogeneous reactivity of SO₂ and NO₂ on mineral dust” by M. Ullerstam, et al.

M. Ullerstam, et al.

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Page 4076, eq. 5; The equation should be written; $k_u = k_{Kc+s} - k_{Kc}$ and has now been changed in the manuscript.

We acknowledge the referees comment on the loose language and we have changed "rate" to "rate coefficient" in the text.

Page 4077, line 3; It is not necessary to know where the saturation point is in order to be certain that the experiment is performed in the linear mass regime (LMR). In this regime of trivial linear mass dependence" you avoid having to make a correction for incomplete penetration of the gas into underlying layers. In the regime of LMR, all you need is the sample mass and the BET area (see Grassian 2002).

Page 4077, line 6; To make it more clear that each pulse contained a mixture of SO₂ and NO₂ we now write "... where each pulse contained a mixture of SO₂ and NO₂

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(2.7×10^{11} and 1.7×10^{11} molecules respectively)." This is also added to the text under figure 3.

Page 4077, last paragraph; Yes, the loss of SO₂ and NO₂ are independent of flow rate/concentration as we also state at page 4078, line 2. No action taken.

Page 4078, line 9-10; "the number of reactive collisions" has been changed to "the rate of sulfate formation" as suggested by the referee. The minus-sign of the sulfate expressions should be after the number 2.

Page 4079, line 17; It is clear that water will affect the thermodynamics and kinetics of reactions involving ions. In doing DRIFTS and Knudsen, the requirements of the technique (e.g. vacuum, and range of T) limit our ability to either completely remove all water, or to work in conditions of high relative humidity. We made a good compromise, which was to remove excess water in a way that gives us a reproducible experiment, allowing us to look for the interaction of NO₂ and SO₂. The effect of water vapor is outside the scope of our work.

We have added some comments on surface water on page 4079, line 20, and page 4081, line 19.

Page 4080, line 3; We were never able to detect any products such as NO or HONO in the gas phase from the Knudsen experiments.

There were indications of inhibition of the nitrite formation during exposure to both SO₂ and NO₂ which indicates that R3 is not a source for nitrite in these experiments. A sentence about this is added to the text on page 4075, line 2.

Page 4080, line 24; We are thankful for this comment from the referee, it is now changed.

Page 4081, line 18; It has been shown in other studies of the same mineral dust sample that the dust has a capacity of neutralising acidic solutions (see Desboeufs, et al., 2003). This would enhance the solubility of SO₂ in the aqueous layer over the mineral

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dust surface. We have added a sentence about this at page 4081, line 19 and also included the new reference.

Page 4082, line 7; The referee is right, it should say λ and **not** γ .

Table 1; The number present in the table is sufficient for calculations of the k_e and the collision frequency which would be needed for re-calculations of the kinetic results. No changes have been made to the table.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 4069, 2003.

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