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The interaction of N_2O_5 with mineral dust: aerosol flow tube and Knudsen reactor studies

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Abstract. The interaction of mineral dust with N_2O_5 was investigated using both airborne mineral aerosol (using an aerosol flow reactor with variable relative humidity) and bulk samples (using a Knudsen reactor at zero humidity). Both authentic (Saharan, SDCV) and synthetic dust samples (Arizona test dust, ATD and calcite, $CaCO_3$) were used to derive reactive uptake coefficients (γ). The aerosol experiments (Saharan dust only) indicated efficient uptake, with e.g. a value of $\gamma(SDCV)=(1.3\pm0.2)\times10^{-2}$ obtained at zero relative humidity. The values of γ obtained for bulk substrates in the Knudsen reactor studies are upper limits due to assumptions of available surface area, but were in reasonable agreement with the AFT measurements, with: $\gamma(SDCV)=(3.7\pm1.2)\times10^{-2}$, $\gamma(ATD)=(2.2\pm0.8)\times10^{-2}$ and $\gamma(CaCO_3)=(5\pm2)\times10^{-2}$. The errors quoted are statistical only. The results are compared to literature values and assessed in terms of their impact on atmospheric N_2O_5.

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