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Ozone decomposition on Saharan dust: an experimental investigation

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Abstract. The heterogeneous reaction between O_3 and authentic Saharan dust surfaces was investigated in a Knudsen reactor at approx 296 K. O_3 was destroyed on the dust surface and O_2 was formed with conversion efficiencies of 1.0 and 1.3 molecules O_2 per O_3 molecule destroyed for unheated and heated samples, respectively. No O_3 desorbed from exposed dust samples, showing that the uptake was irreversible. The uptake coefficients for the irreversible destruction of O_3 on (unheated) Saharan dust surfaces depended on the O_3 concentration and varied between 3.5×10^{-4} and 5.5×10^{-6} for the initial uptake coefficient (γ_0 approx 3×10^{-5} at 30 ppbv O_3 STP) and between 4.8×10^{-5} and 2.2×10^{-6} for the steady-state uptake coefficient (γ_{ss} approx 7×10^{-6} at 30 ppbv O_3 STP). At very high O_3 concentrations the surface was deactivated, and O_3 uptake ceased after a certain exposure period. Sample re-activation (i.e. de-passivation) was found to occur over periods of hours, after exposure to O_3 had ceased, suggesting that re-activation processes play a role both in the laboratory and in the atmosphere.

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