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Heterogeneous conversion of NO_2 on secondary organic aerosol surfaces: A possible source of nitrous acid (HONO) in the atmosphere?

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Abstract. The heterogeneous conversion of NO_2 on different secondary organic aerosols (SOA) was investigated with the focus on a possible formation of nitrous acid (HONO). In one set of experiments different organic aerosols were produced in the reactions of O_3 with alpha-pinene, limonene or catechol and OH radicals with toluene or limonene, respectively. The aerosols were sampled on filters and exposed to humidified NO_2 mixtures under atmospheric conditions. The estimated upper limits for the uptake coefficients of NO_2 and the reactive uptake coefficients NO_2 -> HONO are in the range of 10^{-6} and 10^{-7}, respectively. The integrated HONO formation for 1 h reaction time was $<10^{13}$ cm^{-2} geometrical surface and $<10^{17}$ g^{-1} particle mass. In a second set of experiments the conversion of NO_2 into HONO in the presence of organic particles was carried out in an aerosol flow tube under atmospheric conditions. In this case the aerosols were produced in the reaction of O_3 with beta-pinene, limonene or catechol, respectively. The upper limits for the reactive uptake coefficients NO_2 -> HONO were in the range of 7×10^{-7} - 9×10^{-6}. The results from the present study show that heterogeneous formation of nitrous acid on secondary organic aerosols (SOA) is unimportant for the atmosphere.

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