Geophysical Research Abstracts
Vol. 18, EGU2016-16922, 2016
EGU General Assembly 2016

Formation kinetics and abundance of organic nitrates in α-pinene ozonolysis

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Formation of organic nitrates affects the total atmospheric budget of oxidized nitrogen (NO_y) and alters the total aerosol mass yield from secondary sources. We investigated the formation of organic nitrate species during ozonolysis of α-pinene and subsequent formation of secondary organic aerosols (SOA) using the short-lived radioactive tracer ^{13}N inside an aerosol flow reactor (Ammann *et al.*, 2001). The results represent direct measurements of the organic nitrate content of α-pinene secondary aerosol and give insight into the kinetics of organic nitrate formation. Organic nitrates constituted up to 40 % of aerosol mass with a pronounced influence during the initial period of particle growth. Kinetic modelling, as well as additional experiments using OH scavengers and UV irradiation, suggests that organic peroxy radicals (RO_2) from the reaction of α-pinene with secondarily produced OH are important intermediates in the organic nitrate formation process. Direct oxidation of α-pinene by NO_3 was found to be a less efficient pathway for formation of particle phase nitrate. The organic nitrate content decreased very slightly with an increase of relative humidity on the experimental time scale. The experiments show a tight correlation between organic nitrate content and SOA number concentrations, implying that organic nitrates play an important role in nucleation and growth of nanoparticles. Since present in large amounts in organic aerosol, organic nitrates deposited in the lung might have implications for human health as they release nitric acid upon hydrolysis, especially in regions influenced by urban pollution and large sources of monoterpene SOA precursors.

References

Ammann et al. (2001) *Radiochimica Acta* **89**, 831.