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Oxygenated products of sesquiterpenes in secondary organic aerosol

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Secondary organic aerosol (SOA) has a huge impact on air quality and climate change. It influences the Earth radiative budget through absorbing, scattering and reflecting radiation as well as the formation of clouds because the particulates can act as cloud condensation nuclei (CCN). Furthermore, it plays an important role for human health. SOA is formed from gaseous precursors which get oxidized by ozone, OH- and NO_3-radicals in the atmosphere. Due to their low vapor pressure these degradation products can nucleate to form new particles or they can condense on existing aerosol particles. Despite the major progress in research during the last few years the actual chemical composition as well as the contribution of various volatile organic compounds (VOCs) to the formation of secondary organic aerosol is still partially unknown.

Recent studies indicate that sesquiterpenes play an important role in the formation of SOA because of the low volatility of their oxygenated products (Lee *et al*., 2006). Their emission is estimated to be about 14,8 Tg per year (Henze *et al*., 2008), however, these emission rates remain highly uncertain due to the lack of quantitative emission rate measurements. In addition, the knowledge about the actual atmospheric degradation mechanism and the main oxidation products of sesquiterpenes is quite limited. β-Caryophyllene, α-humulene, α-farnesene and β-farnesene are the most abundant sequiterpenes in many sesquiterpene emission profiles. But also aromadendren, α-bergamotene and δ-cadinene and germacrene-D can contribute significantly to some emission profiles (Duhl *et al*., 2008).

To determine the major oxygenated products of sesquiterpenes in SOA, reaction chamber experiments with different sesquiterpenes and ozone were performed in a 100 L reaction chamber. To measure the time dependent formation of initial oxidation products, an APCI-IT-MS was directly connected to the reaction chamber. After 2 hours the APCI-IT-MS was replaced by a filter holder and the generated aerosol was collected for 20 hours. In case of β-caryophyllene five different acidic oxidation products were synthesized and these acids were used for quantification. Atmospheric air samples taken during the HUMPPA campaign summer 2010 in Finland were analyzed for sesquiterpene oxygenated products. The major sesquiterpene oxidation products in the ambient air samples were quantified and the correlation with temperature was analyzed.

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