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Ozonolysis of β-pinene: temperature dependence of secondary organic aerosol yield

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Biogenic volatile organic compounds (BVOCs) such as monoterpenes are emitted in significant amounts (500 – 1500 Tg C yr^{-1}) by vegetation, especially in forests. β-Pinene accounts for 16 % (8.8 – 26 Tg C yr^{-1}) of the monoterpenes (Kanakidou *et al*., 2005 and references therein). They are oxidized in the atmosphere by O_3, OH and NO_3 radicals, producing condensable organic compounds that form secondary organic aerosol (SOA). SOA from ozonolysis of monoterpenes can act as cloud condensation nuclei thereby affecting optical properties and lifetimes of clouds (VanReken *et al*., 2005). Thus the understanding of SOA formation and fate is important for the estimation of the aerosol indirect effect on the climate. A large organic aerosol source is apparently missing in current global chemical transport models (Heald *et al*., 2005). This discrepancy may be due to the neglect of the temperature dependence of the SOA yields in the models.

We have investigated the yield of SOA from ozonolysis of β-pinene in a temperature controlled flow reactor. The temperature interval investigated was: 263 K – 303 K ($\pm$ 1.5 K) and the concentration range was for O_3: 325 – 1300 ppb and for β-pinene: 1.2 – 7 ppm. Freshly nucleated particles were generated using a reaction time of 40 s. The particle size distributions were measured with a temperature controlled scanning mobility particle sizer (SMPS) system. The SOA yield from ozonolysis of βtpinene is found to be anticorrelated with temperature. A doubling of the yield is found with a decrease in temperature of 20 K. This indicates that temperature is a very important parameter for prediction of SOA concentrations.

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Kanakidou, M., *et al*. 2005. Atmospheric Chemistry and Physics (5) 1053-1123

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