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Annual cycle and temperature dependence of pinene oxidation products and other water-soluble organic compounds in coarse and fine aerosol samples

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Filter samples of fine and coarse particulate matter were collected over a period of one year and analyzed for water-soluble organic compounds, including the pinene oxidation products pinic acid, pinonic acid, 3-methyl-1,2,3-butanetricarboxylic acid (3-MBTCA) and a variety of dicarboxylic acids (C5-C16) and nitrophenols. Seasonal variations and other characteristic features are discussed with regard to aerosol sources and sinks and data from other studies and regions. The ratios of adipic acid (C6) and phthalic acid (Ph) to azelaic acid (C9) indicate that the investigated aerosols samples were mainly influenced by biogenic sources. An Arrhenius-type correlation was found between the 3-MBTCA concentration and inverse temperature. Model calculations suggest that the temperature dependence is largely due to enhanced emissions and OH radical concentrations at elevated temperatures, whereas the influence of gas-particle partitioning appears to play a minor role. Enhanced ratios of pinic acid to 3-MBTCA indicate strong chemical aging of the investigated aerosols in summer and spring.

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