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Studies of the kinetic Isotope Effect during SOA Formation from β-Pinene Oxidation

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We investigated the stable carbon isotope ratios of selected VOCs in both the gas phase and particulate phase during β-pinene-ozone reaction. The experiments were performed in a large indoor chamber. Gas phase samples were collected in Silcosteel canisters (SilcoCan), with a time interval of 30min. Aerosol samples were collected on quartz fiber filters (whatman) at a flow rate of 25l/min for 1h. All filters were pretreated at a temperature of 600 ˚C overnight before sampling. A customized thermal desorption system combined with cryofocusing (from Gerstel) was used for desorbing the compounds. 2-D gas chromatography coupled with isotope ratio mass spectrometry (GC-IRMS) system was used for investigations of the compound specific stable carbon isotope ratios. In addition the stable carbon isotope ratio of the total carbon from the filter samples was measured.

We observed a progressing enrichment of the β-pinene as it diminishes in concentration. One of the major oxidation products of β-pinene, nopinone, on the other hand, did not show a significant change in its isotope composition both in the gas and aerosol phase. The total carbon isotope ratio from the aerosol samples showed enrichment in the heavy isotope than the initial β-pinene. The combined measurement of gas and aerosol phase isotope ratios gives additional constraints to carbon balances in SOA formation.