



Monoterpene oxidation products and organosulfates in aerosols during BEARPEX 2007 and 2009

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Organosulfate esters of oxidation products of monoterpenes and isoprene have been identified in aerosols from both laboratory and field studies. While the exact route of formation of organosulfates is still ambiguous, these compounds pose an interesting coupling between anthropogenic emissions and biogenic oxidation products in secondary organic aerosols (SOA). We present measurements of monoterpene oxidation products, organosulfates and nitroxy organosulfates in aerosols collected during the Biosphere Effects on Aerosols and Photochemistry Experiment (BEARPEX) in California during late summer 2007 and summer 2009. The study site was located in a Ponderosa pine plantation affected by regional transport of air pollutants. Particles ($PM_{2.5}$) were collected as one night-time and two daytime samples per day using a high volume sampler. After extraction of filters, polar organic compounds were analysed by HPLC coupled through an electrospray inlet to a quadrupole time-of-flight mass spectrometer (qTOF-MS). Standards of adipic, *cis*-pinic and pinonic acids were used for quantification, while camphor sulphonic acid was used as a surrogate standard for organosulfate compounds. Organosulfate esters can be identified from their MS-fragments (HSO_4^- and SO_3^-) and the isotopic pattern of sulphur. Concentrations of adipic acid and the terpene oxidation products *cis*-pinic acid and pinonic acid (from α - and β -pinene) were quantified. The relative concentrations between samples of terpenyllic acid, diterpenyllic acid and 2-hydroxyterpenyllic acid were also investigated. Organosulfate esters and nitroxy organosulfate esters of α -pinene, β -pinene, limonene and isoprene, as well as their oxidation products, were identified based on their molecular mass and fragmentation patterns. Concentrations of some nitroxy organosulfate esters generally increased during night compared to day-time. Their formation thus seems to be related to reactions involving nitrate radicals at night-time.