

SPECIATED ANALYSIS OF BIOGENIC VOCS DURING THE ECHO-CAMPAIGN

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The project ECHO aimed to investigate the sources and sinks of reactive trace gases in a mixed forest stand in 2002/2003. Chemical transformation processes within the forest canopy and the escape efficiency of volatile organic compounds (VOCs) to the above-canopy air masses are examined either. ECHO was part of AFO 2000.

This work accomplishes a detailed analysis of more than a hundred different VOCs. Among them are alkanes (C₂-C₁₂), alkenes, terpenes, aromatics, aldehydes, alcohols and esters. 85 air samples were taken during background measurements in January and four intensive campaigns in July. These included diurnal cycles at ground level, in the canopy and above the canopy as well as a vertical profile (2 m - 38 m above ground level). The samples were collected in Silcosteel-canisters and analyzed offline via HRGC-FID/MSD. The loss of analytes via the reaction with ozone was minimized by the use of a heated capillary, through which the air was passively sampled into the evacuated canister. The suitability of this method was thoroughly checked with a standard gas mixture.

Highest abundances showed methanol, acetone, ethanol, ethane and isoprene with average mixing ratios of 1 - 5 ppbV each. The total amount of VOCs was 23 ppbV in average. Oxygenated substances account for 13 ppbV, followed by alkanes and alkenes. The average reactivity of the observed mixes was 4.9 s⁻¹ with regard to OH-radicals, 0.64·10⁻⁶ s⁻¹ with regard to O₃ and 32·10⁻³ s⁻¹ with regard to NO₃-radicals. The total reactivity mostly depended on isoprene, which accounted for more than 50% of the total reactivity with regard to each species. The average reactivity of the mix with regard to Ozone and NO₃ was clearly dominated by alkenes. In the case of OH-radicals, oxygenated compounds as well as aromatics and alkanes had to be considered, since alkenes accounted for only 70 % of the total reactivity. Most important species besides isoprene were cyclopentadiene, butyraldehyde, methanol and ethanol.