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Chemical composition and microphysical properties of secondary organic aerosols from tree emissions

Angela Buchholz (1), Thomas Mentel (1), Astrid Kiendler-Scharr (1), Florian Rubach (1), Christian Spindler (1), Ralf Tillmann (1), Einhard Kleist (2), and Jürgen Wildt (2)

(1) Forschungszentrum Jülich GmbH, IEK-8: Troposphaere, 52428 Juelich, Germany, (2) Forschungszentrum Jülich GmbH, IBG-2: Pflanzenwissenschaften, 52428 Juelich, Germany

Plant emitted volatile organic compounds (VOCs) are a major precursor of secondary organic aerosols (SOA), an important constituent of atmospheric aerosols. We used the Juelich Plant Atmosphere Chamber (JPAC) at the Research Center Juelich to investigate the microphysical properties of aerosols. SOA particles were produced from the ozonolysis and reaction of OH radicals with the complex VOC mixture emitted from trees typical for the boreal forest. Hygroscopic growth factors (GF) were determined with a humidity tandem differential mobility analyzer (HTDMA) for different particle sizes at RH = 2 - 97%. Cloud condensation nuclei (CCN) activation was measured with a continuous flow CCN counter (DMT). The chemical composition of the particles was determined with a High Resolution ToF AMS. Additionally, the size distribution and number concentration of the particles were measured. The gas phase was monitored with GC-MS and PTR-MS.

Changing the emission pattern and strength changed the measured GF and the diameter of the dry particles that were activated (D50). However, below 80% RH the GF changes are within the range of the measurement error. The GF(RH = 90%) were between 1.03 and 1.14, and the D50(SS = 0.4%) in a range of 93 - 100nm. The average hygroscopicity parameter κ (calculated according to Petters and Kreidenweis, 2007) was 0.03 ± 0.01 at RH = 90% and 0.08 ± 0.02 at activation.

The aerosol mass spectra measured with the HR-Tof-AMS were analysed with positive matrix factorisation (PMF). The contributions of the identified factors were correlated with the detailed κ values.

Reference: Petters, M. D. and Kreidenweis, S. M. (2007). *Atmos. Chem. Phys.*, 7, 1961-1971.