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Closure study between hygroscopic growth and cloud condensation nuclei activity of secondary organic aerosol

M. Gysel (1), Z. Juranyi (1), J. Duplissy (1), T. Tritscher (1), S. Henning (2), M. Ziese (2), F. Stratmann (2), I. George (3), U. Baltensperger (1), and the PSI/IFT TEAM

(1) Laboratory of Atmospheric Chemistry, Paul Scherrer Institut, Villigen, Switzerland, (2) Institute for Tropospheric Research, Leipzig, Germany, (3) Dept. of Chemistry , University of Toronto, Toronto, Canada

(martin.gysel@psi.ch / Fax: +41 56 310 4525 / Phone: +41 56 310 4168)

We have simulated the photo-chemical formation of secondary organic aerosol (SOA) – often a major constituent of atmospheric aerosols – from a biogenic precursor (α-pinene). Even though SOA is to a great extent water soluble, its contribution to cloud formation is still largely unknown. We have investigated hygroscopic diameter growth factors (GF) at RH=90-98% and RH=97-99% of SOA particles using a hygroscopicity Tandem Differential Mobility Analyzer (HTDMA) and the Leipzig Aerosol Cloud Interaction Simulator (LACIS-field), respectively. A cloud condensation nuclei counters (CCNC) were used to measure their CCN properties of the SOA.

The HTDMA derived GFs are systematically lower at high precursor concentrations compared to low precursor concentrations, which may be caused by different partitioning between particle and gas phase. Contrary to the HTDMA data no concentration dependence of the CCN properties was observed. The concentration dependence of the water activity largely determines the GFs at subsaturated RH, while the CCN properties are also very sensitive to the surface tension (Kelvin term). Different Köhler models will be used in order to investigate whether the observed different trends in GFs and CCN properties with changing precursor concentration can be explained by

changes in the concentration dependence of water activity and surface tension.