Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05583, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05583
EGU General Assembly 2008

Modelling particle formation from biogenic precursors measured in the Juelich plant chamber

JPAC 07 Team

(1) Institut für Chemie und Dynamik der Geosphaere (ICG), Forschungszentrum Juelich, Germany, (2) Johannes Gutenberg Universitaet, Mainz, Germany , (3) Centre de Recerca Ecologica i Aplicacions Forestals (CREAF), Barcelona, Catalunya

Biogenic volatile organic compounds (BVOC) are major participants in atmospheric chemistry, both due to their large emissions and their influence on O3 and OH radical budgets. In addition, their chemical degradation leads to the formation of semi- or non-volatile compounds that are considered to be a major source of tropospheric aerosol mass, and to play an important part in growing recently formed particles to sizes where they can act as cloud condensation nuclei, CCN. A series of experiments in the Juelich plant chamber which was coupled to a reaction chamber have been carried out. Various plants were placed in the plant chamber under controlled conditions. The VOC mixture emitted from these plants was taken to the stirred reaction chamber which was continuously flushed with O3 and water vapor. In the reaction chamber UV light was switched on and off to initiate photolysis of O3 to produce OH. This led to a short, rapid increase in particle number. After the nucleation peak, no new particles were produced and the vapors condensed on the existing particle surface. The setup as a stirred tank reactor leads to dilution of the aerosol concentration over time, with an aerosol lifetime of about 70 min. As the particle concentration decreases, also the available condensation surface decreases and a new, weaker burst of nucleation can be observed. To understand the processes leading to formation and growth of particles, we have developed a model for the plant chamber. The model assumed perfect mixing inside the tank volume. Aerosol dynamic equations are solved simultaneously with the gas phase chemistry. The model can be used to investigate the condensation sink threshold of new particle formation, as well as the e.g. the timescale needed to achieve

steady state in the reactor chamber. It is also a valuable tool in estimating the effect of condensing vapor properties on the nucleation and growth rates during nucleation events.