Dr. Dominik Stolzenburg

How clusters grow to particles: Particle size distribution and growth rate measurements with a DMA-train

Supervisor: Prof. Paul Winkler

Abstract:

Aerosol particles can form and grow by gas-to-particle conversion and eventually act as seeds for cloud droplets, influencing global climate. The potential of new particle formation on a global scale largely depends on aerosol growth of the smallest molecular clusters towards larger particles. Particle-size-distribution measurements in that size range below 10 nm are crucial for the quantification of the microphysical processes contributing to early growth. In this thesis, a new instrument, the DMA-train, is presented, using existing particle sizing technology in a new parallel approach for high precision size-distribution measurements in this cluster-particle transition regime. This also allows for the development of new analysis methods, which are able to assess pure condensational growth rates. Due to the application of the new instrument at the CERN CLOUD experiment it can be shown how different biogenic vapors influence the growth dynamics and how temperature alters the microphysical processes of growing biogenic aerosol systems.