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Sub-10 nm aerosol nanoparticle characterization: From mobility standards to ambient new particle formation

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Abstract:

New particle formation is ubiquitous in the global atmosphere and is identified as the major source of nucleation mode particles. Nanoparticles largely contribute to the global number concentration and may grow to larger sizes and directly and indirectly influence the global climate. The investigation of atmospheric nanoparticles at sizes below 10 nm requires detailed characterization of the instrumentation measuring down to the smallest detectable sizes.

A laboratory experiment including a bipolar electrospray source and an Atmospheric Pressure interface Time-of-Flight mass spectrometer is demonstrated to be a powerful tool to generate mobility standards to study heterogeneous nucleation of molecular clusters of precisely known size and composition. Further, the detection efficiency of condensation particle counters (CPCs) was studied at varying humidity levels and seed types under controlled laboratory conditions. CPCs are the detectors in a DMA-train, which captured the dynamics of newly formed particles in the atmosphere during the A-LIFE field experiment.