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Precision measurement with a DMA-train of the initial growth of biogenic nanoparticles in CLOUD

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New particle formation is widely observed in the atmosphere (Kulmala et al., 2004) and 50 % of the global budget of cloud condensation nuclei may originate from this process (Merikanto et al., 2009). Nucleation at the critical cluster size between 1-2 nm is often followed by rapid growth to sizes larger than 50 nm. Especially fast initial growth rates between 2-10 nm are crucial for the survival of the newly formed particles, because losses to pre-existing aerosol are high. The precise quantification of the conditions which cause initial growth are key to the understanding of the influence of new particle formation on the global climate (Tröstl *et al.*, 2016).

A DMA-train (Stolzenburg *et al.*, 2016) is used for precision quantification of biogenic new particle formation in the CLOUD experiment at CERN (Kirkby et al., 2016). The DMA-train combines the precision of electrical mobility analysis with high sensitivity, by the use of six differential mobility analysers operated in parallel at distinct sizes and state-of-the-art condensation particle counters.

Under precisely controlled chamber conditions and with extremely low contaminant levels, we quantify the temperature dependence of particle growth with highly oxygenated molecules (HOMs) produced by α-pinene ozonolysis (Tröstl *et al.* (2016) reported initial measurements at a single temperature of 5^{o}C). Moreover, we report the impact of isoprene and sulfuric acid contamination on the growth rates. By combination with other state-of-the-art instruments, the size-dependence of the growth rates can be determined from cluster sizes up to 100 nm. We therefore present the most detailed growth rate measurements obtained so far by CLOUD.

Kirkby, J. *et al.*: Ion-induced nucleation of pure biogenic particles, Nature, 533, 521–526, 2016.

Kulmala, M. *et al.*: Formation and growth rates of ultrafine atmospheric particles: a review of observations, J. Aerosol Sci., 35, 143–176, 2004.

Merikanto, J. *et al.*: Impact of nucleation on global CCN, Atmos. Chem. Phys., 9, 8601–8616, 2009.

Tröstl, J. *et al.*: The role of low-volatility organic compounds in initial particle growth in the atmosphere, Nature, 533, 527–531, 2016.

Stolzenburg, D. *et al.*: A DMA-train for precision measurement of sub 10-nm aerosol dynamics, Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-346, 2016.