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Aerosol and cloud condensation nuclei formation at Mt. Kleiner Feldberg, Germany

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New particle formation in number and mass is a quite ubiquous phenomenon in the atmospheric boundary layer. However, different locations provide different mechanisms for the initial particle production steps. Investigating the formation aims usually in explaining two aspects, the initial formation process and the contribution to cloud condensation nuclei production. In this study we focus on the latter. Once these particles are formed they grow further on until they reach cloud effective sizes. This is the size, where those particles can affect local climate via the indirect aerosol effect. This study deals with the processes mentioned at Mt. Kleiner Feldberg (810 m a.s.l.) about 50 km northwest of Frankfurt activation diameters. We have been determined using a CCN-counter (DMT, Boulder, U.S.) [Roberts and Nenes, 2005] and a SMPS (TSI 3936) with a long DMA (TSI 3081) and a UCPC (TSI 3025A). Particles were assumed to be equal in chemical composition since the vast majority of particles were smaller than 300 nm in diameter, i.e. secondary of nature. Therefore, measured CCN concentrations were intercompared with section wise integrated particle number concentrations starting at the largest size towards the smaller ones. The best match of integrated and CCN concentration was assumed to be the activation diameter ($D_{p,active}$). With this set-up the activation diameters were determined for five supersaturations (0.1, 0.2 0.3, 0.4 and 0.6%) during a two weeks period. This resulted in the expected detcrease in activation size with increasing supersaturation from about 130$\pm$10 nm at 0.1% to 70$\pm$5 nm at 0.6% supersaturation. The empirically fitted kappa-value [Petters and Kreidenweis, 2007] was obtained as 0.16$\pm$0.03 indicating aerosols of lower water-solubility.

Second, measurements of ice nuclei [Klein et al., 2010] were conducted once per day during the same time period, which indicate that IN concentrations, were about one per mill of the CCN. Interestingly the cross-correlation between both cloud nuclei indicated at maximum at the same time, i.e. no time shift, and it was tentatively seen that CCN concentration pattern could explain 60% of the IN pattern. However the dataset available is to short to draw final conclusions and more detailed work is needed in the future.

[1] Klein, H., Nickovic, S., Haunold, W., Bundke, U., Nillius, B., Ebert, M., Weinbruch, S., Schuetz, L., Levin, Z., Barrie, L. A., and Bingemer, H. (2010): Saharan Dust And Ice Nuclei Over Central Europe. *Atmos. Chem. Phys.*, 10, 10211–10221.

[2] Petters, M.D., and Kreidenweis, S. M. (2007): A single parameter representation of hygroscopic growth and cloud condensation nucleus activity. *Atmos. Chem. Phys.*, **7**, 1961–1971.

[3] Roberts, G. C., and Nenes, A. (2005): A continuous-flow streamwise thermal-gradient CCN chamber for atmospheric measurements. In: *Aerosol Science and Technology*,39, 206-221.