



CCN Measurements in the Arctic and Antarctic

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Cloud Condensation Nuclei (CCN) measurements were conducted in two different campaigns. On the one hand the Radiation-Aerosol-Cloud Experiment in the Arctic Circle (RACEPAC) took place in North Canada (Inuvik and Tuktoyaktuk) during spring 2014. On the other hand measurements were done at the Princess Elisabeth Antarctica Research Station during the Antarctic summer 2013/2014. In both cases the total CCN number concentration was measured and used to estimate the hygroscopicity and activation behaviour of sub-micron arctic aerosol particles.

The total particle concentration and the CCN number concentration were measured using a CPC and a CCN counter, respectively. Size distributions were measured using a SMPS (Canada) and an LAS (Antarctic), measuring from 13.6 nm up to 736 nm and from 90 nm up to 4.9 μm , respectively. Using the κ -Köhler-Theory (Petters and Kreidenweis, 2007) the hygroscopicity parameter κ was calculated for supersaturations of 0.1-0.7%.

In the northern sub arctic region the total particle background concentration varied between 100 and 500 particles per cm^3 . The data set exhibits periods of total particle concentration up to ten thousands which can be explained by local contamination. These periods are neglected for further analyses. The κ -values for the sub-arctic aerosol in North Canada were estimated to be between 0.1 and 0.5. This large variability can be explained due to the varying origin of the air masses. A backward trajectory analysis show 3 different air masses during the measuring period, coming from the North American continent, the Arctic Ocean and the North Pacific Ocean. It can be assumed that the continental air mass has a low hygroscopicity due to organic compounds whereas the aerosol coming from the Arctic Ocean and the North Pacific Ocean tend has a higher κ .

The total particle concentration in the Antarctic is comparable with the background that was measured in Canada. Furthermore single events up to 4000 particles per cm^3 were detected. Since the CCN number concentration for the highest supersaturation of 0.7% is not affected during these events, a large number below 35 nm must be present. The κ -values of the Antarctic were found to have a mean of 0.76 and show lower variation (standard deviation of 0.17). Due to the optical detection limit of 90 nm of the LAS size spectrometer, only κ -values for a supersaturation of 0.1% could be analysed. The κ of both data sets were found to agree well with global field simulation (Pringle et al., 2010).

Petters and Kreidenweis (2007), *Atmos. Chem. Phys.*, 7, 1961–1971, 2007

Pringle et al. (2010), *Atmos. Chem. Phys.*, 10, 5241–5255, 2010