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In-situ measurement of Cloud Condensation Nuclei and Ice Nucleating Particles in Cyprus

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Atmospheric aerosol particles can be activated to cloud droplets at a certain super-saturation (SS) or induce ice nucleation through heterogeneous ice nucleation process. These particles are called cloud condensation nuclei (CCN) or ice nucleating particles (INP), respectively. The presence of CCN and INP in Earth's atmosphere strongly affect the properties of clouds and their impact on climate.

The measurements to be presented here were carried out at the south east coast of Paphos, Cyprus, in April 2017, and included particle number size distributions (PNSD), CCN number concentrations, and offline analysis of INP sampled on polycarbonate filters, using the Leipzig Ice Nucleation Array (LINA).

The atmospheric aerosol over Cyprus is a mixture of the Mediterranean marine aerosol, anthropogenic particle emissions from southeastern Europe as well as mineral dust from the Sahara Desert in the southwest and the Arabian Peninsula desert in the southeast. This geographical location in Cyprus causes generally a high variability of the PNSD, changing dramatically according to the particles origin. During the measurement, the total particle number concentration varied from as low as 665 up to 61300 cm-3, while the CCN number concentrations varied from 167 to 3729 cm-3 at a super-saturation of 0.3%. Hygroscopicity of particles in the CCN size range was determined from CCN measurements to be κ =0.36 on average. The κ was lower for higher SS and higher for lower SS, suggesting a larger organic fraction for smaller particles. For particle collection on the polycarbonate filters for INP analysis, we switched between two filters according to the wind direction, collecting aerosol from the Mediterranean Sea on one and from the continent on the second filter, respectively. Independent of the wind direction, the INP concentration ranged from 0.01 to 0.1 std L-1 at -18 °C during all of the campaign.

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