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Ice nucleation properties of atmospheric aerosol particles collected during a field campaign in Cyprus

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Atmospheric aerosol particles, including desert and soil dust as well as marine aerosols, are well known to act as ice nuclei (IN) and thus have been investigated in numerous ice nucleation studies. Based on their cloud condensation nuclei potential and their impacts on radiative properties of clouds (via scattering and absorption of solar radiation), aerosol particles may significantly affect the cloud and precipitation development. Atmospheric aerosols of the Eastern Mediterranean have been described to be dominated by desert dust, but only little is known on their composition and ice nucleating properties.

In this study we investigated the ice nucleating ability of total suspended particles (TSP), collected at the remote site Agia Marina Xyliatou on Cyprus during a field campaign in April 2016. Airborne TSP samples containing air masses of various types such as African (Saharan) and Arabian dust and European and Middle Eastern pollution were collected on glass fiber filters at 24 h intervals. Sampling was performed ∼5 m above ground level and ∼521 m above sea level. During the sampling period, two major dust storms (PM 10max 118 μg/m^3 and 66 μg/m^3) and a rain event (rainfall amount: 3.4 mm) were documented.

Chemical and physical characterizations of the particles were analyzed experimentally through filtration, thermal, chemical and enzyme treatments. Immersion freezing experiments were performed at relatively high subzero temperatures (-1 to -15˚C) using the mono ice nucleation array. Preliminary results indicate that highest IN particle numbers (INPs) occurred during the second dust storm event with lower particle concentrations. Treatments at 60˚C lead to a gradual IN deactivation, indicating the presence of biological INPs, which were observed to be larger than 300 kDa. Additional results originating from this study will be shown.

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