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Cloud condensation and ice nucleation activity of bacteria isolated from cloud water

A minor fraction of insoluble atmospheric aerosol compounds acts as so-called heterogeneous ice nuclei and thereby influences cloud formation. In particular mineral dust and biological particles are considered as active ice nuclei. Ice nucleation active (INA) bacteria found in cloud water and snow fall are suspected to influence the ice formation in clouds.

Different strains of living bacteria isolated from cloud water, glacier melt water and phyllosphere were tested for their ice nucleation activity using the cloud simulation chamber AIDA at the Karlsruhe Institute of Technology. At the AIDA facility, microphysical cloud processes can be investigated at realistic atmospheric cloud conditions.

The bacteria have been dispersed in nanopure or artificial cloud water, and afterwards sprayed into the AIDA chamber with a dispersion nozzle. After injection, the water droplets evaporate in the chamber and the suspended bacterial cells are transformed into the aerosol phase.

The droplet and ice particle formation was monitored with several instruments including the PINC instrument from ETH Zurich and a Cloud Condensation Nuclei (CCN) counter from Droplet Measurement Technologies. All bacteria were observed to act as CCN, but only a minor fraction was ice active. The ice active number fraction of bacterial cells varied from 0,0001 to 0,01. The most efficient INA species was *Pseudomonas fluorescens* Antartica1. For all cells, the ice nucleation occurred in the relatively narrow temperature range between -6 and -8 degree Celsius.

Further experiments with bacterial cells will be conducted during May 2011 and those results will also be presented.