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CELLULOSE AND THEIR CHARACTERISTIC ICE NUCLEATION ACTIVITY- FREEZING ON A CHIP

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The influence of clouds on the Earth's climate system is well known (IPCC, 2013). Cloud microphysics determines for example cloud lifetime and precipitation properties. Clouds are cooling the climate system by reflecting incoming solar radiation and warm its surface by trapping outgoing infrared radiation (Baker and Peter, 2008). In all these processes, aerosol particles play a crucial role by acting as cloud condensation nuclei (CCN) for liquid droplets and as an ice nucleation particle (INP) for the formation of ice particles.

Freezing processes at higher temperatures than -38 °C occur heterogeneously (Pruppacher and Klett 1997). Therefore aerosol particles act like a catalyst, which reduces the energy barrier for nucleation. The nucleation mechanisms, especially the theory of functional sites are not entirely understood. It remains unclear which class of compound nucleates ice.

Here we present a unique technique to perform drop- freezing experiments in a more efficient way. A self-made freezing- chip will be presented. Measurements done to proof the efficiency of our setup as well as advantages compared with other setups will be discussed.

Furthermore we present a proxy for biological INPs, microcrystalline cellulose. Cellulose is the main component of herbal cell walls (about 50 wt %). It is a polysaccharide consisting of a linear chain of several hundred to many thousands of β (1→4) linked D-glucose units. Cellulose can contribute to the diverse spectrum of ice nucleation particles. We present results of the nucleation activity measurements of MCCs as well as the influence of concentration, preparation or chemical modification.