



Investigation of heterogeneous ice nucleation in pollen suspensions and washing water

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Biological particles such as pollen often show ice nucleation activity at temperatures higher than -20 °C. Immersion freezing experiments of pollen washing water demonstrate comparable ice nucleation behaviour as water containing the whole pollen bodies (Pummer et al., 2012). It was suggested that polysaccharide molecules leached from the grains are responsible for the ice nucleation.

Here, heterogeneous ice nucleation in birch pollen suspensions and their washing water was investigated by two different experimental methods. The optical freezing array BINARY (Bielefeld Ice Nucleation ARraY) allows the direct observation of freezing of microliter-sized droplets. The IN spectra obtained from such experiments with birch pollen suspensions over a large concentration range indicate several different ice nucleation active species, two of which are present also in the washing water. The latter was probed also in differential scanning calorimeter (DSC) experiments of emulsified sub-picoliter droplets. Due to the small droplet size in the emulsion samples and at small concentration of IN in the washing water, such DSC experiments can exhibit the ice nucleation behaviour of a single nucleus. The two heterogeneous freezing signals observed in the DSC thermograms can be assigned to two different kinds of ice nuclei, confirming the observation from the BINARY measurements, and also previous studies on Swedish birch pollen washing water (Augustin et al., 2012).

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S. Augustin, H. Wex, D. Niedermeier, B. Pummer, H. Grothe, S. Hartmann, L. Tomsche, T. Clauss, J. Voigtländer, K. Ignatius, and F. Stratmann, Immersion freezing of birch pollen washing water, *Atmos. Chem. Phys.*, 13, 10989–11003, 2013.

B. Pummer, H. Bauer, J. Bernardi, S. Bleicher, H. Grothe, Suspendable macromolecules are responsible for ice nucleation activity of birch and conifer pollen, *Atmos. Chem. Phys.*, 12, 2541-2550, 2012.