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Observations on the Freezing of Supercooled Pollen Washing Water by a New Electrodynamic Balance

Haijie Tong (1), Francis D. Pope (2), and Markus Kalberer (1)

(1) University of Cambridge, Lensfield Road, Cambridge, CB2 1EW, UK. (ht326@cam.ac.uk), (2) School of Geography, Earth and Environmental Sciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK.

Primary biological particles can act as efficient ice nuclei (IN) by initiating freezing events at temperatures warmer than the homogenous freezing temperature [1, 2]. For example, pollen grain particles can trigger freezing events at temperatures as warm as -5 ˚C in the contact freezing mode [3]. More recently pollen residues, which are released by washing pollen grains in water, were also observed to act as efficient IN in the immersion mode [4, 5].
In this study we developed a new cold electrodynamic balance (CEDB) system and investigated the freezing properties of single particles of supercooled pollen washing water (SPWW). The EDB technique allows for a contact free measurement of freezing events. The phase of the particle (liquid or frozen solid) can be distinguished via measuring the Mie scattering signal from the particle. Furthermore the size of liquid (spherical) particles can be determined. The freezing events are characterized through the loss of the regular Mie scattering signal from the levitated droplet as it changes state from liquid to a frozen solid. The statistical freezing probabilities of SPWW were obtained in the temperature range: -15 to -40 ˚C. Each temperature measurement point consists of the analysis of 30-100 droplets. Preliminary conclusions are that SPWW is IN active in the immersion mode. Further discussion will focus on the temperature range of the IN activity, the important variables (other than temperature) for IN activity, other likely modes of IN activity, and the implications of these results in terms of the atmospheric relevance of SPWW.

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References:

[1] Möhler, O., et al. (2007) Biogeosciences, 4, 1059-1071.
[2] Prenni, A. J., et al. (2009) Nat. Geosci., 2, 401-404.
[3] Diehl, K., et al. (2002) Atmos. Res., 61, 125-133.
[4] Pummer, B. G., et al. (2012) Atmos. Chem. Phys., 12, 2541-2550.
[5] Augustin, S., et al. (2013) Atmos. Chem. Phys., 13, 10989-11003.