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Immersion freezing in concentrated solution droplets for a variety of ice nucleating particles

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The measurement campaign LINC (Leipzig Ice Nucleation counter Comparison) was conducted in September 2015, during which ice nucleation measurements as obtained with the following instruments were compared:

- LACIS (Leipzig Aerosol Cloud Interaction Simulator, see e.g. Wex et al., 2014)
- PIMCA-PINC (Portable Immersion Mode Cooling Chamber together with PINC)
- PINC (Portable Ice Nucleation Chamber, Chou et al., 2011)
- SPIN (SPectrometer for Ice Nuclei, Droplet Measurement Technologies)

While LACIS and PIMCA-PINC measured immersion freezing, PINC and SPIN varied the super-saturation during the measurements and collected data also for relative humidities below 100% RHw. A suite of different types of ice nucleating particles were examined, where particles were generated from suspensions, subsequently dried and size selected. For the following samples, data for all four instruments are available: K-feldspar, K-feldspar treated with nitric acid, Fluka-kaolinite and birch pollen.

Immersion freezing measurements by LACIS and PIMCA-PINC were in excellent agreement. Respective parameterizations from these measurement were used to model the ice nucleation behavior below water vapor saturation, assuming that the process can be described as immersion freezing in concentrated solutions. This is equivalent to simply including a concentration dependent freezing point depression in the immersion freezing parameterization, as introduced for coated kaolinite particles in Wex et al. (2014).

Overall, measurements performed below water vapor saturation were reproduced by the model, and it will be discussed in detail, why deviations were observed in some cases.

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Literature:

Chou, C., O. Stetzer, E. Weingartner, Z. Juranyi, Z. A. Kanji, and U. Lohmann (2011), Ice nuclei properties within a Saharan dust event at the Jungfraujoch in the Swiss Alps, Atmos. Chem. Phys., 11(10), 4725-4738, doi:10.5194/acp-11-4725-2011.

Wex, H., P. J. DeMott, Y. Tobo, S. Hartmann, M. Rösch, T. Clauss, L. Tomsche, D. Niedermeier, and F. Stratmann (2014), Kaolinite particles as ice nuclei: learning from the use of different kaolinite samples and different coatings, Atmos. Chem. Phys., 14, doi:10.5194/acp-14-5529-2014.