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Is there a lower size limit for mineral dust ice nuclei in the immersion mode?

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There is observational evidence that atmospheric aerosol particles which are able to trigger ice nucleation are larger than approximately 100nm (e.g. Fletcher, 1959). On the other hand observations of IN active macromolecules which have been proposed to be responsible for the enhanced ice formation in the washing water of pollen indicate no such size limit (Augustin et al., 2013).
We present measurements on the size dependent ability of feldspars and clay minerals to serve as ice nuclei. The size dependent frozen fraction of droplets containing monodisperse, single immersed particles is investigated with the IMCA/ZINC experimental setup (Lüönd et. al., 2010). To meet the requirement of a narrow particle size distribution, special care is taken to generate monodisperse particles in the lower size range, by using a two stage size selection setup including a differential mobility analyser and a centrifugal particle mass analyser.
From the analysis of the temperature at which 50% of the particles initiate ice nucleation, we find a logarithmic dependence of the median ice nucleation temperature on the particle surface area, with no discontinuous decrease in the ice nucleation ability of 100nm particles. The medium ice nucleation temperature of clay minerals however reaches homogeneous nucleation temperatures in this size range.
The logarithmic dependence of the median ice nucleation temperature on particle surface area is addressed by comparing the experimental findings to predictions using the classical nucleation theory and the active site approach.

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