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Immersion Freezing of Clay Minerals and its Temperature Dependence

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The immersion mode ice nucleation efficiency of clay minerals was investigated using the AIDA (Aerosol Interaction and Dynamics in the Atmosphere) cloud chamber. Both monodisperse and polydisperse populations of various clay dust samples as well as hematite and Snomax were examined in the temperature range between -4 ˚C and -35 ˚C. We observed the immersion mode ice nucleation activity of clay minerals to be strongly depended on the temperature. The time dependence of ice formation inferred by the INAS (Ice Nucleation Active Surface-Site) density is investigated and discussed as a function of cooling rates and by comparing to predicted nucleation rates (i.e. classical nucleation theory with θ-probability density function nucleation scheme). Ice residuals collected through a newly developed pumped counterflow virtual impactor have also been examined by electron microscope analyses to seek the chemical and physical identity of ice nuclei in clay minerals. Brief comparisons of AIDA measurement to the measurements with mobile ice nucleation counters are also presented.