Geophysical Research Abstracts
Vol. 14, EGU2012-11968, 2012
EGU General Assembly 2012

Ice nucleation by atmospheric mineral dusts – do a few minerals dominate?

J. D. Atkinson and B. J. Murray
School of Earth and Environment, University of Leeds, Leeds, United Kingdom (ee06jda@leeds.ac.uk)

Atmospheric mineral dust is a source of ice nuclei. This dust is made of a mixture of minerals, each with differing compositions, crystal structures and habits, which results in widely varying nucleating ability. In the immersion mode, mixed dusts such as Arizona Test Dust have been shown previously to freeze at temperatures as high as 253 K, whereas a purer sample of kaolinite only initiated freezing at lower temperatures of around 244 K. The aim of this study was to quantify the immersion mode ice nucleation behaviour of a range of common minerals. Experiments were performed using a recently developed cold stage, with freezing observed using an optical microscope. This allowed ice nucleation to be quantified as a function of time and material surface area. Surface areas of the individual mineral dusts were determined using the BET method and experiments were performed using comparable dust surface areas. We show that freezing temperatures for different minerals is highly variable, with freezing temperatures ranging from as high as 251 K to the homogeneous regime at 236 K. In conclusion, it was found that mineralogy is highly important for the prediction of ice nucleation temperature, and we suggest that the nucleation of natural atmospheric dust samples is dominated by just a few minerals. This may allow for the omission of some mineral types from computer simulations, thereby simplifying predictive analyses.