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# Contact freezing observed with a high speed video camera

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Freezing of supercooled cloud droplets on collision with ice nucleating particle (INP) has been considered as one of the most effective heterogeneous freezing mechanisms. Potentially, it could play an important role in rapid glaciation of a mixed phase cloud especially if coupled with ice multiplication mechanism active at moderate subzero temperatures. The necessary condition for such coupling would be, among others, the presence of very efficient INPs capable of inducing ice nucleation of the supercooled drizzle droplets in the temperature range of -5°C to -20°C. Some mineral dust particles (K-feldspar) and biogenic INPs (pseudomonas bacteria, birch pollen) have been recently identified as such very efficient INPs.
However, if observed with a high speed video (HSV) camera, the contact nucleation induced by these two classes of INPs exhibits a very different behavior. Whereas bacterial INPs can induce freezing within a millisecond after initial contact with supercooled water, birch pollen need much more time to initiate freezing. The mineral dust particles seem to induce ice nucleation faster than birch pollen but slower than bacterial INPs. In this contribution we show the HSV records of individual supercooled droplets suspended in an electrodynamic balance and colliding with airborne INPs of various types. The HSV camera is coupled with a long-working-distance microscope, allowing us to observe the contact nucleation of ice at very high spatial and temporal resolution. The average time needed to initiate freezing has been measured depending on the INP species. This time do not necessarily correlate with the contact freezing efficiency of the ice nucleating particles. We discuss possible mechanisms explaining this behavior and potential implications for future ice nucleation research.