

Potential influence of aerosols on ice nucleation in mixed-phase clouds

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It has long been known that certain aerosol particles can serve as ice nuclei (recently, science communities start to call them ice nucleating particles (INPs)) for the formation of ice particles. Therefore, understanding the sources, compositions and abundances of INPs are important to evaluate the impact of aerosol particles on atmospheric ice nucleation. Mixed-phase clouds, composed of both ice crystals and supercooled water droplets, are typically formed above water saturation at temperatures between about -36°C and 0°C. Since homogeneous freezing cannot be activated in this temperature regime, heterogeneous ice nucleation involving INPs is required to initiate ice formation in mixed-phase clouds. Although several heterogeneous ice nucleation processes are known, immersion freezing (ice nucleation by particles immersed in supercooled water) is thought to be a dominant process for forming ice in mixed-phase clouds. In this presentation, I present an overview of the state of INP research in terms of ice nucleation under mixed-phase cloud conditions (i.e., in the immersion mode) and highlight recent advances. In addition, I will introduce recent studies on INPs in the Arctic region where mixed-phase clouds occur frequently throughout the year.

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