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Developing a new parameterization framework for the heterogeneous ice nucleation of atmospheric aerosol particles

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Aerosols of different nature induce microphysical processes of importance for the Earth's atmosphere. They affect not only directly the radiative budget, more importantly they essentially influence the formation and life cycles of clouds. Hence, aerosols and their ice nucleating ability are a fundamental input parameter for weather and climate models.
During the previous years, the AIDA (Aerosol Interactions and Dynamics in the Atmosphere) cloud chamber was used to extensively measure, under nearly realistic conditions, the ice nucleating properties of different aerosols.
Numerous experiments were performed with a broad variety of aerosol types and under different freezing conditions. A reanalysis of these experiments offers the opportunity to develop a uniform parameterization framework of ice formation for many atmospherically relevant aerosols in a broad temperature and humidity range. The analysis includes both deposition nucleation and immersion freezing.
The aim of this study is to develop this comprehensive parameterization for heterogeneous ice formation mainly by using the ice nucleation active site (INAS) approach.

Niemand et al. (2012) already developed a temperature dependent parameterization for the INAS- density for immersion freezing on desert dust particles. In addition to a reanalysis of the ice nucleation behaviour of desert dust (Niemand et al. (2012)), volcanic ash (Steinke et al. (2010)) and organic particles (Wagner et al. (2010,2011)) this contribution will also show new results for the immersion freezing and deposition nucleation of soot aerosols.

The next step will be the implementation of the parameterizations into the COSMO- ART model in order to test and demonstrate the usability of the framework.

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