Geophysical Research Abstracts
Vol. 21, EGU2019-8388, 2019
EGU General Assembly 2019

The effect of atmospheric aerosol particles on in-cloud icing

Sami Romakkaniemi, Antti Ruuskanen, Harri Kokkola, Juha Tonttila, Ari Leskinen, and Mika Komppula
Finnish Meteorological Institute, Kuopio, Finland (sami.romakkaniemi@fmi.fi)

Icing is an atmospheric process where ice accumulates on surfaces of any kind. Icing can damage structures and cause financial losses. For example, wind energy power plants might have unplanned shutdown or flights might get delayed/cancelled. With well-structured forecasting models these kinds of unplanned events could be avoided. While couple of different icing processes exists, the most interesting related to atmospheric aerosol is the in-cloud icing where either supercooled liquid drizzle drops or cloud droplets collide with a surface.

The main focus of the present study is to investigate connection between cloud microphysical properties, meteorology and icing rate. In situ observations of icing at different altitudes in cloud will be analyzed in different meteorological conditions. Beyond, cloud modelling tools with explicit description of aerosol and cloud microphysics will be employed to support the data analysis and to perform sensitivity studies. Results show interesting behaviour of cloud droplet properties before icing events: the size and number of cloud droplets have to reach a threshold level before icing is observed. The size is linked to the inertia of the particles which plays great role when considering static structures and surfaces where ice accumulates. With cloud model we study the sensitivity of icing rate on the cloud droplet size distribution, and how this distribution depends on the background aerosol size distribution, in cloud turbulence and cloud height in the conditions similar to measurements location. Special attention will be given on how the formation of larger droplets and light drizzle within the cloud affects the estimated icing rate.