EMS Annual Meeting Abstracts
Vol. 15, EMS2018-372, 2018

Verification of atmospheric icing model against new type of ground based remote-sensing observations.

Karoliina Hämäläinen, Anne Hirsikko, Ari Leskinen, and Mika Komppula
Finnish Meteorological Institute, Meteorological Research, Helsinki, Finland (karoliina.hamalainen@fmi.fi)

Verification of atmospheric icing model against new type of ground based remote-sensing observations.

Karoliina Hämäläinen*, Anne Hirsikko, Ari Leskinen, Mika Komppula.
Finnish Meteorological Institute
P.O.Box 503, FI-00101 Helsinki, Finland
email: karoliina.hamalainen@fmi.fi

Abstract

Accumulation of atmospheric icing on structures can cause financial loss, risk of equipment failure or even health risk. Various operators such as aviation, transport and energy sectors are especially vulnerable for the phenomenon. The phenomenon itself is caused by in-cloud super-cooled liquid water droplets or precipitation over cold surface. In the first part of this study we have investigated possibility to use ceilometers to identify super-cooled liquid water layers in the atmosphere. A simple algorithm to identify icing conditions from ceilometer measurements have been developed. Comparison between ceilometer and in-situ measurements have been performed and the results suggest that ceilometers can be used for icing condition detection with certain limitations: e.g. multiple liquid water layers are impossible to identify with ceilometer.

In the second part of the project possibility to use ceilometer data to verify icing model has been evaluated. The icing model is based on ISO STANDARD 12494. The icing model gets initial values (wind, temperature, liquid water content) from separate weather prediction model HARMONIE. Icing rate is calculated for 51 levels within the lowest 8000 m. Model evaluation have been made for five Finnish stations including ceilometer measurements. The preliminary results show remarkable similarity between the model and measurements. This encourages us to investigate and develop our model system even further. Additionally, measurement of cloud particle size distribution opens a new possibility to go deeper into to the cloud microphysics of the weather model.

This work has been funded by MATINE.