Geophysical Research Abstracts
Vol. 20, EGU2018-8189, 2018
EGU General Assembly 2018

Using ground-based triple- frequency observations to investigate strengths and limitations of two-moments ice microphysics in the new ICON model

Davide Ori (1), Stefan Kneifel (1), José Dias Neto (1), Vera Schemann (1), and Axel Seifert (2)

(1) University of Cologne, Institute for Geophysics and Meteorology, EN group OPTIMice, Germany (dori@uni-koeln.de),
(2) Deutscher Wetterdienst (DWD), Germany

Ice microphysical processes are still among the least understood topics in cloud science and a major source of uncertainty in numerical weather prediction (NWP) models. The microphysical parameterization currently employed in weather models only partially captures the complexity of the ice phase cloud processes (nucleation, depositional growth, aggregation, riming, melting, secondary ice generation). Numerous studies have demonstrated the potential of radar polarimetry and Doppler spectra analysis to infer informations about ice phase microphysics but in most cases only one frequency was available. Recent scattering computations and comparisons of ground-based triple-frequency (X, Ka, W-Band) radar observations with in-situ observations revealed that multi-frequency measurements can provide important additional information about the snow characteristics such as habit class, density and characteristics of the size distribution.

In this study we use ground-based triple-frequency observations obtained at the Research Center Jülich (Germany) during the two-months TRIple-frequency and Polarimetric radar Experiment for improving process observation of winter precipitation (TRIPEx). For a specific case study (24.11.2015) we run also several experiments with a nested high-resolution version of the new Icosahedral Nonhydrostatic model (ICON-LEM). The model output obtained by its two-moment microphysical scheme is forward simulated with the Passive and Active Microwave radiative TRAnsfer forward operator (PAMTRA) developed at the University of Cologne. PAMTRA allows us to implement various scattering datasets with different particle properties which enables us to estimate the uncertainty of the forward calculations. The synthetic radar observations cover all three frequencies and the full radar Doppler spectrum allowing us to utilize the full observational constraint for our comparisons. We will show analysis of modifying certain components of the microphysical scheme (e.g. sedimentation velocity) and will illustrate the potential of the multi-frequency view for complex ice process investigation.