EGU21-15328
https://doi.org/10.5194/egusphere-egu21-15328
EGU General Assembly 2021

The Life-Cycle of Cloud and Precipitation Microphysics in Radar Observation and Numerical Model

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The representation of microphysical processes in numerical weather prediction models remains a main source of uncertainty. To tackle this issue, we exploit the synergy of two polarimetric radars to provide novel observations of model microphysics parameterizations. In the framework of the IcePolCKa project (Investigation of the initiation of Convection and the Evolution of Precipitationusing simulatiOns and poLarimetric radar observations at C- and Ka-band) we use these observations to study the initiation of convection as well as the evolution of precipitation. At a distance of 23 km between the C-band PoldiRad radar of the German Aerospace Center (DLR) in Oberpfaffenhofen and the Ka-band Mira35 radar of the Ludwig-Maximilians-University of Munich (LMU), the two radar systems allow targeted observations and coordinated scan patterns. A second C-band radar located in Isen and operated by the German Weather Service (DWD) provides area coverage and larger spatial context. By tracking the precipitation movement, the dual-frequency and polarimetric radar observations allow us to characterize important microphysical parameters, such as predominant hydrometeor class or conversion rates between these classes over a significant fraction of the life time of a convective cell. A WRF (Weather Research and Forecasting Model) simulation setup has been established including a Europe-, a nested Germany- and a nested Munich- domain. The Munich domain covers the overlap area of our two radars Mira35 and Poldirad with a horizontal resolution of 400 m. For each of our measurement days we conduct a WRF hindcast simulation with differing microphysics schemes. To allow for a comparison between model world and observation space, we make use of the radar forward-simulator CR-SIM. The measurements so far include 240 coordinated scans of 36 different convective cells over 10 measurement days between end of April and mid July 2019 as well as 40 days of general dual-frequency volume scans between mid April and early October 2020. The performance of each microphysics scheme is analyzed through a comparison to our radar measurements on a statistical basis over all our measurements.