The project “Climate model PArameterizations informed by RAdar” (PARA) is a collaboration between the University of Leipzig (PI Johannes Quaas, ICON climate modelling) and the University of Bonn (PIs Silke Trömel and Clemens Simmer, polarimetric radar observations) that aims at improving the representation of clouds and precipitation in the ICON general circulation model with the help of innovative radar observations.

It is a project in the context of the DFG Priority Programme SPP 2115 “Fusion of Radar Polarimetry and Numerical Atmospheric Modelling Towards an Improved Understanding of Cloud and Precipitation Processes” (PROM).

An adequate representation of moist diabatic processes in clouds and precipitation in climate models is challenging, because these spatially unresolved processes are subject to sub-grid parameterizations, which must be informed by observations and/or models resolving these processes. Radar polarimetry provides most suitable observations on cloud and precipitation microphysics via microphysical retrievals and process fingerprints. PARA will focus in Phase I of PROM on ice water content heterogeneity and precipitation generation via the ice phase and concentrate on mixed-phase processes including riming and the role of particle number concentration variability in Phase II.

PARA will investigate four processes both by polarimetric radar retrievals and the evaluation and revision of their representation in the ICON general circulation model: (i) ice generation and spatial heteorogeneity of ice water content at ICON-GCM sub-grid scales, (ii) the role of both in snow formation like aggregation, (iii) melting of snow falling through the 0°C isotherm, and (iv) evaporation of rain below the melting layer.

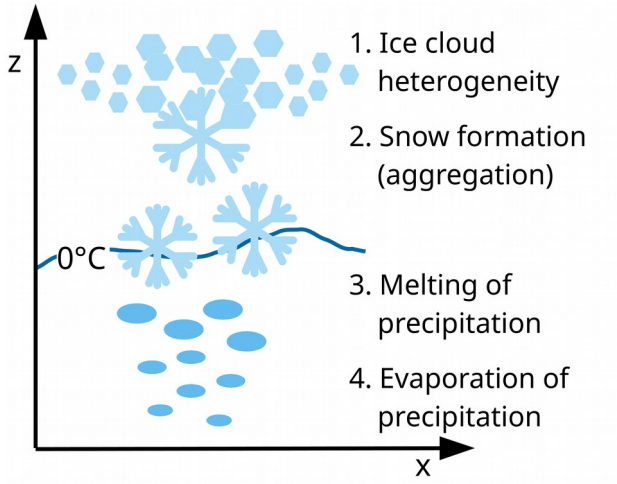

Fig. 1: Illustration of the four relevant processes of surface rain originating from the ice phase, to be investigated by polarimetric radar and climate model parameterisations in four work packages. Note that in this project, we propose to focus on cases where mixed-phase processes (including riming) are not relevant; a second phase is proposed where these effects are targeted.