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Retrieval of microphysical properties of snow using dual polarization spectral analysis

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Snow consists of many different types of ice particles. Typical radar measurements observe only bulk properties of different types of ice particles present in a radar volume. Due to difference in cross section, larger particles will reflect more power of the transmitted radar signal, with respect to the smaller particles. Therefore radar measurements are dominated by larger particles and it is difficult to distinguish between different types of particle in a volume.

In this work application of dual polarization spectral analysis for retrieval of microphysical properties of ice particles is presented. In the presented examples retrievals of drop size distribution parameters for two types of particles that are present in the radar volume are shown. The selection of the types of ice particles that are considered for retrievals is done based on both meteorological conditions and radar scattering properties.

The presented work is illustrated by the retrievals of drop size distribution parameters of plates and snow aggregates observed above a melting layer of stratiform precipitation. The spectral reflectivity and spectral differential reflectivity are simulated for a combination of plates and aggregates with realistic statistical properties. Based on these simulations a retrieval technique is obtained which provides the micro physical properties of plates and aggregates. It is shown that under certain assumptions the parameters of the drop size distribution can be retrieved for both types of particles.