Retrieval of microphysical properties of snow using dual polarization spectral analysis

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Methodology

Assuming equal concentrations for plates and dendrites, plates and aggregates dominate spectral radar retrievals at low observed velocities.

Due to differences in shape of plates and aggregates, spectral observables contain information on drop size distribution parameters.

Retrieval of drop size distribution parameters

Obtaining parameters searching for a minimum in

$$\sum_{\text{events}} \left( r(z)_{\text{measured}} - r(z)_{\text{model}}(v, D_0^p, N_0^p, D_0^a, N_0^a, \theta_0) \right)^2$$

by changing the six dependent variables

Simulation

Retrieved drop size distributions: time series

Illustration

The data is collected on a moderate rain event on September 19th, 2001 with TARA in Cabauw, The Netherlands. The used frequency is 3 GHz and the elevation angle is 45°. The range resolution is 15 m and the Doppler resolution is 0.018 m/s.

Horizontal Reflectivity [dBZ]

Equivolumetric diameter

Particle concentration

Ice water content results

The obtained relation between estimated IWC and Z_r for plates is in good agreement with literature.

Trends in radar observables comparable above and below the melting layer.