

11.11 DROPLET FALLING VELOCITIES, WINDSPEEDS, AND KA-BAND ATTENUATION DEDUCED FROM PPI AND RHI SCANS

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The droplet falling velocity can be deduced easiest in vertical stare mode. But if the radar is running dome scans as frequently done in case of cloud radars there is often not much time for vertical stare mode. Detecting the droplet falling velocities is important for distinguishing between fog and drizzling shallow low clouds. The drizzle or fog is often within the blind spot of the radar when the beam is pointing vertically. For this reason, an algorithm for deducing the droplet falling velocities from RHI scans was developed.

The algorithm first splits all range gates and time steps of a complete RHI scan into height slices. Assuming a homogeneous distribution of the vertical component w and the horizontal component u of the wind parallel to the RHI plane the two parameters w and u are fitted to all radial velocities measured in the height slice. Compared to measuring the droplet falling speeds in vertical stare mode this algorithm has the advantage of averaging over a larger volume and therefore turbulent variations of the vertical wind are cancelled out.

The same algorithm with minor modifications was also used for the Doppler broadening (= peak width). The drop size distribution DSD contributes to the peak width most in the vertical beam whereas turbulence contributes at all elevations and the wind shear contributes depending on the dimensions of the radar volume and therefore on range and elevation. Therefore, it is possible to separate the DSD contribution to the peak width from the others.

With another modifications the algorithm was applied to the reflectivity. In case of very stratiform clouds or fog it is often observed that the reflectivity in one height slice goes down at both sides of the RHI scan where the radiation must propagate a longer way due to the lower elevation and therefore experiences more attenuation. The accuracy of the method for deducing the attenuation of the Ka-band waves in presence of high LWC is not very good. But when looking at larger statistics it may help to validate Z-LWC relations.
