

Variables Degradation of Polarimetric Radar in Some Conditions

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Polarimetric variables can be measured by dual-polarization weather radar operation. They are differential reflectivity Z_{dr} , co-polar correlation coefficient ρ_{hv} (Rho_{HV}) at zero lag, and (specific) differential propagation phase Φ_{iDP} (K_{DP}). Usually linear depolarization ratio L_{DR} is not available in STSR orthogonal mode of weather radar measurements. Polarimetric variables have been used for quality control of variables measurements (QC), quantitative precipitation estimation (QPE), analysis of microphysical properties of hydrometeors, and hydrometeor classification, etc.

However, some interesting phenomena from observations may affect the accuracy of these applications. Degradation of polarimetric variables estimation appears in operations of x-band dual-polarization weather radar in some conditions, such as shown in figure 1. The first is ρ_{hv} (Rho_{HV}), it is very clear degraded by low signal to noise ratio (SNR). So some polarimetric variables applications with far distance range bins may cause fault. The second is Z_{dr} , it is degraded by convection weather system. The reason may be the precipitation drops rolling, and causes the statics shapes of drops with all attitudes are spherical. And maybe it is signal of convection. The third is Φ_{iDP} (or K_{DP}), its estimated value changes negligible and can be omitted. Because phase is not related with magnitude when SNR greater than some value. And it means that the (specific) differential propagation phase not affected by radar miscalibration, attenuation, and partial beam blockage. Some correction can be done by this property. Degradation of polarimetric variables is described and discussed by some simulations and experiments in this paper.

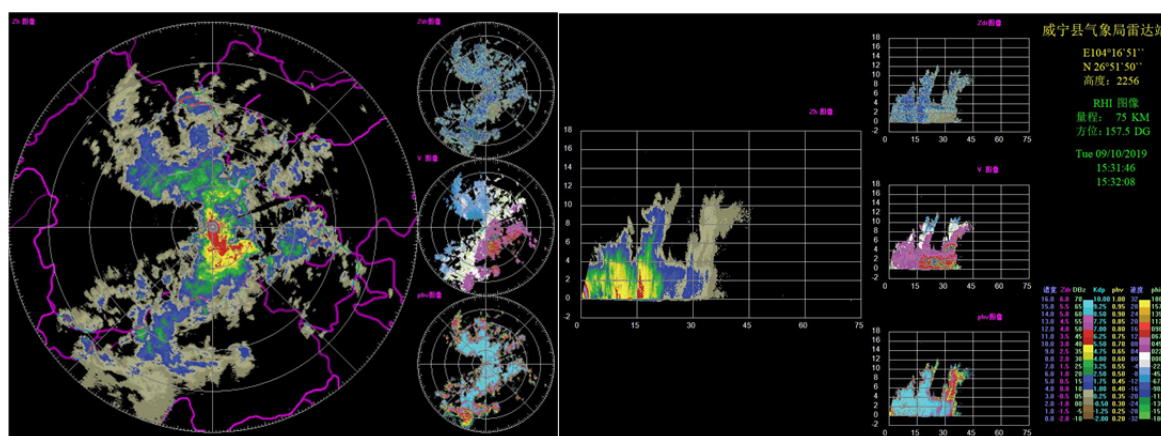


Figure 1. Maintain observation shown that the degradation of Z_{dr} and Rho_{HV} in the cases of special velocity and low SNR.

References

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