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Recent progress in polarimetric radar QPE

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Significant progress has been recently made for estimation of rainfall at relatively short distances from the radar where the radar samples pure rain below the melting layer (ML). The R(A) methodology based on the use of specific attenuation A proves to be superior compared to the standard QPE algorithms utilizing radar reflectivity Z, specific differential phase KDP, and differential reflectivity ZDR (at least at S band). However, several challenges still remain including (1) the impact of the rain type variability within the radar coverage area, (2) possible hail contamination, (3) strong vertical gradients of rain rate below the ML, and (4) utilization of the R(A) approach for QPE at C band. These will be discussed in the talk.

At longer distances from the radar, contamination from the ML and overshooting of rain are the principal problems which are poorly resolved with existing methods for the vertical profile of reflectivity (VPR) correction. A novel technique, polarimetric VPR (or PVPR), is introduced. It utilizes measured radial profiles of cross-correlation coefficient CC which are coupled with the corresponding radial dependencies of the Z bias caused by the ML contamination and overshooting. The PVPR technique takes into account statistical correlations of CC and Z within the ML and explicitly treats the effects of radar beam broadening on the radial profiles of CC and Z. Multiple examples of the PVPR performance at S and C bands will be presented.

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