Polarimetric VPR - a new methodology for mitigation of the bright band contamination in QPE

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In this presentation, a new methodology for mitigation of the bright band contamination in QPE is introduced –polarimetric vertical profile of reflectivity (PVPR). This technique is based on the combined use of the radial profiles of radar reflectivity Z and cross-correlation coefficient ρ_{hv} at low antenna elevation angles. Explicit treatment of the beam broadening impact on the shape of the vertical and radial profiles of Z and ρ_{hv} is at the core of the suggested method. Multiple radial profiles of Z and ρ_{hv} depending on the antenna elevation angle and the parameters of intrinsic vertical profiles of Z and ρ_{hv} are generated and stored as lookup tables. These take into account the statistics of the polarimetric radar variables and their inter-correlations in the melting layer (ML) obtained from a large climatological dataset of their quasi-vertical profiles (QVP). The depth and strength of the bright band in terms of Z are parameterized by the minimal value of ρ_{hv} in the ML.

The PVPR correction of Z includes two steps. Firstly, two robust parameters of the radial profile of ρ_{hv} are determined: (1) the distance at which the ML-related reduction of ρ_{hv} starts and (2) integrated ML-related reduction of ρ_{hv} along the radial. The first parameter defines the height of the ML and the second –its strength and depth. Secondly, these two parameters are used to select an appropriate radial profile of Z from their multitude stored in the lookup tables which is then used for removing the ML-related bias from the measurements of Z. The advantage of the method is that it does not impose constrains on the horizontal homogeneity of the melting layer.

The algorithm performance is illustrated in a number of examples for which the data collected at the two lowest antenna tilts are examined. The PVPR correction is performed at a higher tilt and the corrected radar reflectivity is compared to the one from the lower tilt at the distances where no bright band contamination exists at the lower elevation.

Keywords: Polarimetric radar, Quantitative precipitation estimation, Bright band contamination