Classification and correction of the radar bright band with polarimetric radar

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The radar bright band occurs due to an enhancement of reflectivity returns from melting snow as the hydrometeors fall below the melting level into warmer temperatures. The reflectivity is then related to rainfall intensity through a power law equation which subsequently causes overestimation of precipitation by up to a factor of 5, so it is important to correct for this effect.

Hydrometeors can be classified based on multiple characteristics through the use of dual-polarisation radar measurements. This can subsequently allow for the identification of the bright band if the region of melting snow is accurately classified. Research has shown that melting snow has a discernible signature when the linear depolarisation ration (LDR) and the horizontal reflectivity (Zh) are compared (Rico-Ramirez 2005). A clear minimum in the cross-correlation coefficient (rho hv) and differential reflectivity (ZDR) maximum were found to coincide with localised areas along the 1oC isotherm (Ryzhkov and Zrnic 1998).

The purpose of this paper is to present an algorithm that will utilise measurements of rho hv and LDR in order to identify areas of enhanced reflectivity due to the melting layer in plan position indicator (PPI) scans. A model vertical profile of reflectivity (VPR) will be formed from the analysis of reflectivity scans from an operational C-band Polarimetric radar. Once the bright band region has been identified, an algorithm based on the modelled VPR will be used to reduce rainfall overestimation by the radar in addition to the reduction of VPR variability.

References

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