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Classification and correction of the radar bright band with polarimetric radar

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The annular region of enhanced radar reflectivity, known as the Bright Band (BB), occurs when the radar beam intersects a layer of melting hydrometeors. Radar reflectivity is related to rainfall through a power law equation and so this enhanced region can lead to overestimations of rainfall by a factor of up to 5, so it is important to correct for this.

The BB region can be identified by using several techniques including hydrometeor classification and freezing level forecasts from mesoscale meteorological models. Advances in dual-polarisation radar measurements and continued research in the field has led to increased accuracy in the ability to identify the melting snow region.

A method proposed by Kitchen et al (1994), a form of which is currently used operationally in the UK, utilises idealised Vertical Profiles of Reflectivity (VPR) to correct for the BB enhancement. A simpler and more computationally efficient method involves the formation of an average VPR from multiple elevations for correction that can still cause a significant decrease in error (Vignal 2000).

The purpose of this research is to evaluate a method that relies only on analysis of measurements from an operational C-band polarimetric radar without the need for computationally expensive models. Initial results show that LDR is a strong classifier of melting snow with a high Critical Success Index of 97% when compared to the other variables. An algorithm based on idealised VPRs resulted in the largest decrease in error when BB corrected scans are compared to rain gauges and to lower level scans with a reduction in RMSE of 61% for rain-rate measurements.

References

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