# A wind drift correction for radar rainfall products

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The high resolution and continuous spatial coverage of radar reflectivity measurements makes them ideal for monitoring precipitating systems. Surface precipitation estimates for nowcasting and hydrological applications are derived from reflectivities measured hundreds or thousands of metres above ground level. Adjusting for this displacement is key to obtaining accurate rain rate values.

The numerical adjustment for non-homogeneous vertical profile of reflectivity (VPR) is known to be uncertain, and numerous studies have attempted to quantify this problem. Implicit in such studies is the assumption that an apparent VPR corresponds to the physical path traced by melting hydrometeors as they fall from the radar beam to ground level. In a non-zero wind field, however, such a path is not vertical, and direct extrapolation leads to errors in surface rainfall placement.

For high resolution applications, such as the Interreg-funded RAINGAIN project, wind drift errors can have significant adverse effects on the outputs of hydrological models initialised from radar rainfall fields. In this work we present the derivation, testing and implementation of a wind drift correction for high resolution rainfall products. Quality-controlled reflectivity volumes are adjusted for wind drift before VPR determination, so that each scan pixel is aligned with its projected position at ground level. PPIs in the same volume are synchronised to the next composite validity time, before being adjusted to align particle fall streaks vertically above the surface. The horizontal displacements for both synchronisation and fall-streak profile are calculated on a pixelwise basis, using mesoscale model wind and freezing level forecasts. The method is shown to have skill on kilometre-scale grids, increasing hit rate and decreasing quantitative errors when compared to rain gauge measurements.