



## **A dual-polarisation radar rainfall estimation method using a multi-parameter fuzzy logic algorithm**

Will Hall and Miguel Angel Rico-Ramirez

University of Bristol, Civil Engineering, Bristol, United Kingdom (w.hall@bristol.ac.uk)

The emergence of dual-polarisation radar has resulted in a significant enhancement of quantitative precipitation estimation (QPE). It has enabled the measurement of rain drop size and shapes within a volume, the classification of hydrometeors, and the ability to more accurately account for attenuation of the radar beam. Previous methods for QPE have used only the radar reflectivity ( $Z_h$ ) to estimate rainfall, but more recent methods can use a combination of  $Z_h$ , differential reflectivity ( $Z_{dr}$ ), specific differential phase ( $K_{dp}$ ), and specific attenuation ( $A_h$ ).

The radar variables perform differently depending on rain rate, attenuation, and bright band presence. This has led to the use of fixed threshold values within which the different estimators are used, or the variables are weighted based on performance. This new method to be presented will use fuzzy logic to try to form a more robust algorithm using combinations of the rainfall estimators  $R(Z_h)$ ,  $R(K_{dp})$ , and  $R(A_h)$ . For this a C-band dual-polarised radar based in Hameldon Hill, near Burnley, UK, will be used, alongside a rain gauge network for calibration and validation.