



## **Flood Estimation in the UK Using a Revised Derived Distribution Method**

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Flood estimation in ungauged catchments is a challenging problem for practising engineers. Existing methods produce flood estimates which have large uncertainty in ungauged catchments. The purpose of this research is to demonstrate an alternative method which may produce more reliable estimates, and thus raise awareness of the approach in the flood research community so that it can be developed further.

The derived distribution method is an established theoretical method for flood estimation, and has the potential to be used in practice. The derived distribution method combines (either analytically or numerically) a probability distribution for extreme rainfall with a rainfall-runoff model, and this produces a probability distribution for flood magnitude. Previous studies have shown that the approach can work in principle, that it can reproduce flood magnitudes of gauged catchments, and that it can provide useful theoretical insights into the factors which exert control on flood magnitude.

Research into the application of this method was relatively active in the 1990s and early 2000s, but progress was limited: a major challenge is one that remains unsolved in the wider hydrological modelling community: how to estimate model structure and model parameters in ungauged catchments so that reliable flood estimates are produced.

Here we apply the derived distribution method (with a low-dimensional rainfall-runoff model) to a selection of catchments in the UK, a setting where the problem is simpler: a wet environment where runoff generating processes are relatively simple, with a dense observing network for both rainfall and floods, and a long history of previous studies to provide benchmarking. To reduce observational uncertainties, we will concentrate on floods with relatively low return periods (even these are poorly estimated by existing methods).

The presentation will conclude with suggested further research steps required to implement the method for ungauged catchments in the UK and beyond.