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Statistical modelling of intermittence metrics in temporary rivers of the UK

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Temporary rivers (TRs) are important headwater features of river flow networks, varying dynamically in space and time and providing both terrestrial and freshwater habitats. In parts of the UK, TRs have become a source of tension between the public and regulators against a backdrop of the competing influences of natural variability, climate change and artificial influences. Despite this importance, such systems have typically been omitted from monitoring endeavours. Correspondingly, the occurrence, distribution and characteristics of TRs in the UK are poorly understood. An enhanced understanding of the features of TRs has the potential to underpin more robust evidence for the protection of aquatic habitats that are vulnerable to drying.

In this study, novel approaches to the statistical modelling of TRs in the UK are adopted to enable the simulation of intermittence metrics. Addressing the challenge of limited observational data, models are trained on data from both the UK and France, drawing on their temporal and spatial advantages, respectively, to maximise their robustness and ability to extrapolate spatially. The performance of a range of statistical modelling and machine learning approaches is evaluated, and applied in simulating intermittence metrics in the UK.

Preliminary validation results suggest that the modelling approaches are able to replicate observed intermittence metrics where data exist. Hierarchies of modelling approaches are derived which suggest certain families of models are more effective in simulating flow intermittency in TRs. The best performing models under validation are taken forward to simulate intermittence patterns beyond networks of observations, helping to identify core regions towards which further focus should be directed by the research and operational TR communities.

Information on the location, prevalence and intermittency of TRs is vital to enhance the efficiency of monitoring strategies with finite resources, and bolster community efforts to engage local stakeholders in gathering additional data.