



## **Seasonal UK river flow forecasts based on persistence and historical analogy**

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A range of methods for seasonal forecasting of river flows and groundwater levels for application nationwide is currently being developed for the United Kingdom (<http://www.hydoutuk.net/>). These methods include modelling approaches using either seasonal rainfall forecasts or historical rainfall series as input. Regression-based models for river flow forecasting using large-scale forcings, such as sea surface temperatures and climate indices, as predictors are also under development. The present study outlines river flow forecasting methods based on persistence and historical flow analogues. The underlying assumption for the latter is that sequences of river flow in the historical record that are similar to the recent past will provide valuable information on what flows will occur in the near future. Forecasts are made for the coming one and three months, using either persistence or one of two historical analogue methods. A weighted mean of the five most similar analogues is used as one forecast method, and an alternative is to shift this forecast to fit with the observed flow in the last month of observations. For each calendar month, catchment and forecast duration, the one of the three methods that has performed best in the past is selected for making the forecast. Here, performance is measured by the correlation between the hindcasts and the observed records.

The forecasts based on persistence of the previous month's flow generally outperform the analogues approach, particularly for slowly responding catchments with large underground water storage in aquifers. These are mainly located in the southeast of the country. Historical analogues make a useful contribution to the forecasts in the northwest. The one-month forecasts are better from May to October than during the rest of the year, and are better in the southeast than in the northwest. The three-month forecasts are poor in the northwest for most of the year. Overall, forecasts with significant (at the 10% level) correlations between hindcasts and observations exceeding 0.23 can be made for 81% (70%) of station-month combinations for the one-month (three-month) forecasts. The highest correlation is 0.98 (0.96).