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A long-term national-scale hydrological simulation of river flows across Great Britain

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The Centre for Ecology and Hydrology's national-scale hydrological model, Grid-to-Grid, can be used to estimate river flows and soil moisture across Great Britain. It is used operationally at the flood forecasting centre and there have been a number of studies on floods and climate change using this model, however to date, low flows and droughts have been comparatively neglected. The launch of a five-year NERC-funded interdisciplinary research programme "UK Droughts and Water Scarcity" is allowing us to address this.

Our work on one of these projects, MaRIUS (Managing the Risks, Impacts and Uncertainties of droughts and water Scarcity), uses the model to identify drought periods. The model is driven by a new long-term (1890 – 2012) precipitation dataset (CEH-GEAR) and estimates of potential evaporation. Model performance is assessed against observed river flows for both high and low flows. Gridded time series of monthly mean river flow and soil moisture from the model have been analysed to identify historic hydrological droughts across Great Britain using concepts such as severity and duration. We also investigate how drought occurrence and severity have changed over the last 100 years and identify regions that have been particularly susceptible to drought.