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Climate impacts on river flow: projections for the Medway catchment UK with HADCM3 and CATCHMOD

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Modelling the possible impacts of climate change on river flows can provide planners and managers with the information they need to make evidence-based decisions about meeting demands for water resources, managing flood risks and protecting ecosystems in future. However, alongside such climate impact assessments, robust decision-making requires careful consideration of the sources and relative magnitude of associated uncertainty. In water resources applications this is particularly important as the uncertainties include not only external sources of uncertainty such as emission scenario or climate model, but also uncertainties in input downscaling techniques, hydrological modelling structure and parameters, and river discharge observations. It is thus essential that any hydrological modelling investigation of climate impact on water resources includes a robust sensitivity and uncertainty analysis in order to better understand the implications of uncertainty in future climate for decisions.

We present future river flow projections for the river Medway, above Teston in southeast England; an area of strategic importance in water resources terms. The projections are based on output from the Hadley Centre Regional Climate Model (HadRM3) driven by the Hadley Centre climate model (HadCM3). River flow predictions are calculated using CATCHMOD, the main river flow prediction tool of the Environment Agency (of England and Wales). In order to use this tool in the best way for climate change predictions, we analyse model setup and performance using sensitivity and uncertainty analysis. We discuss the model's representation of hydrological processes and the uncertainty in predictions. We then analyse the projections of river flow under future climate. Both the hydrological model parameter uncertainty and structural uncertainty are found to be very significant in estimating relative uncertainty associated with projections of river flow. We show that this has significant implications for those making policy decisions based on such results.