Geophysical Research Abstracts
Vol. 19, EGU2017-8602, 2017
EGU General Assembly 2017

Benchmarking hydrological model predictive capability for UK River flows and flood peaks.

Rosanna Lane, Gemma Coxon, Jim Freer, and Thorsten Wagener
University of Bristol, United Kingdom (R.A.Lane@Bristol.ac.uk)

Data and hydrological models are now available for national hydrological analyses. However, hydrological model performance varies between catchments, and lumped, conceptual models are not able to produce adequate simulations everywhere. This study aims to benchmark hydrological model performance for catchments across the United Kingdom within an uncertainty analysis framework.

We have applied four hydrological models from the FUSE framework to 1128 catchments across the UK. These models are all lumped models and run at a daily timestep, but differ in the model structural architecture and process parameterisations, therefore producing different but equally plausible simulations. We apply FUSE over a 20 year period from 1988-2008, within a GLUE Monte Carlo uncertainty analyses framework. Model performance was evaluated for each catchment, model structure and parameter set using standard performance metrics. These were calculated both for the whole time series and to assess seasonal differences in model performance. The GLUE uncertainty analysis framework was then applied to produce simulated 5th and 95th percentile uncertainty bounds for the daily flow time-series and additionally the annual maximum prediction bounds for each catchment.

The results show that the model performance varies significantly in space and time depending on catchment characteristics including climate, geology and human impact. We identify regions where models are systematically failing to produce good results, and present reasons why this could be the case. We also identify regions or catchment characteristics where one model performs better than others, and have explored what structural component or parameterisation enables certain models to produce better simulations in these catchments. Model predictive capability was assessed for each catchment, through looking at the ability of the models to produce discharge prediction bounds which successfully bound the observed discharge.

These results improve our understanding of the predictive capability of simple conceptual hydrological models across the UK and help us to identify where further effort is needed to develop modelling approaches to better represent different catchment and climate typologies.