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Continuous flow modelling in Britain with hourly rainfall series generated by a random-parameter Bartlett-Lewis model

C. Prudhomme & T. Kjerdsen

Centre for Ecology and Hydrology, Wallingford, OXON, OX10 8BB, United Kingdom (C.Prudhomme@ceh.ac.uk)

Continuous flow modelling using a conceptually lumped rainfall-runoff model combined with observed and stochastically generated time series of hourly catchment average rainfall was undertaken for a selection of British catchments. The synthetic rainfall series were generated using a Bartlett-Lewis type model with a random parameter and an exponential cell distribution. The parameters of the rainfall model were estimated from observed rainfall series through a 2-stage fitting procedure, where the first stage identifies a number of almost optimal parameter sets able to reproduce average rainfall statistics. The second stage identifies the single parameter set giving the optimal model fit to the extreme value properties of the rainfall. The rainfall-runoff model adopted in this study is a four parameter version of the linear probability distributed model (PDM) developed at the Institute of Hydrology (Moore, 1985). The four parameters were estimated through an autocalibration procedure developed to optimise the model's ability to reproduce the extreme value properties of the observed flow series.

The modelling methodology is assessed in comparing first a set of indicators describing the catchment average rainfall, second peak floods produced from observed catchment rainfall with those produced with generated catchment rainfall. Depending on the quality of the results, such a methodology could enable the simulation of multi-decadal flow series in areas where observations are too short, thus improving the capacity for flood risk assessment.

Moore, R. J. (1985) The probability distributed principle and runoff production at point and basin scale. Hydrological Sciences Journal, 30(2), 273-297.