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On-line updating of a distributed flow routing model – River Vistula case study

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This paper presents an application of methods of on-line updating in the River Vistula flow forecasting system. All flow-routing codes make simplifying assumptions and consider only a reduced set of the processes known to occur during a flood. Hence, all models are subject to a degree of structural error that is typically compensated for by calibration of the friction parameters. Calibrated parameter values are not, therefore, physically realistic, as in estimating them we also make allowance for a number of distinctly non-physical effects, such as model structural error and any energy losses or flow processes which occur at sub-grid scales. Calibrated model parameters are therefore area-effective, scale-dependent values which are not drawn from the same underlying statistical distribution as the equivalent at-a-point parameter of the same name.

The aim of this paper is the derivation of real-time updated, on-line flow forecasts at certain strategic locations along the river, over a specified time horizon into the future, based on information on the behaviour of the flood wave upstream and available on-line measurements at a site. Depending on the length of the river reach and the slope of the river bed, a realistic forecast lead time, obtained in this manner, may range from hours to days. The information upstream can include observations of river levels and/or rainfall measurements. The proposed forecasting system will integrate distributed modelling, acting as a spatial interpolator with lumped parameter Stochastic Transfer Function models. Daily stage data from gauging stations are typically available at sites 10-60 km apart and test only the average routing performance of hydraulic models and not their ability to produce spatial predictions. Application of a distributed flow routing model makes it possible to interpolate forecasts both in time and space.

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