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Hybrid concept for the parameterization of the cascade of linear reservoirs for river flow routing using artificial neural networks

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The lack of hydraulic and morphological data in many cases does not allow for using hydraulic methods for the simulation of the flood wave transformation between two river cross-sections. Under such conditions, as a rational alternative to hydraulic routing, hydrological routing models appear to be a suitable in the practice for flow forecasting. These models, beside numerical hydraulic models (and also models belonging to the class of non-storage routing methods), are in operational use in Slovakia.

Usually, the morphological and hydraulic characteristics of the modelled river reaches and of the flow conditions are reflected in the routing model parameters, which are estimated by calibration and are kept constant for a given model during the simulation. In this contribution a new hybrid concept of model parameterization of the KLN model is presented. The KLN model is based on the state-space representation of the cascade of linear reservoirs. In the multilinear concept the travel-time parameter of the model was allowed to vary during simulation according to changing flow conditions.

The model parameter changes in time according to an assumed relationship between the travel time of flood peaks and of selected characteristics of the flood wave. This relationship was estimated using artificial neural networks (ANN). In order to include all several possible effects, several setups of the ANN, which could possibly affect the model parameter, were tested. The ANN was trained to estimate the optimal values of model parameter and is used on- line during the routing procedure. The proposed hybrid concept is compared with other models used in practice.