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SIMPLIFICATION OF CROSS-SECTIONS FOR NYSA KLODZKA FLOOD ROUTING MODEL

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The Decision Support System for flood control in Nysa Klodzka catchment includes parts responsible for precipitation forecast, rainfall-runoff transformation, unsteady flow routing, reservoirs performance and the optimisation structure controlling the performance of the system. The problem to be solved, i.e. flood damages mitigation, requires repetitive simulations of flow transformation in open channels for many scenarios considered by optimisation software AND/OR decision maker for current measurements and updated forecasts. From the computation point of view, the most time consuming module is the module representing unsteady flow routing. To describe the flow transformation the set of the St. Venant equations is used.

For quasi regular cross-sections and the bottom slope of about 0.3 % one can expect subcritical flow conditions for the considered river reaches. However some local depressions with much higher bottom slopes causes disturbances, i.e. transition from subcritical flow to supercritical flow and back. Moreover, irregular shape of the cross-section and the problems involved in the determination of roughness coefficient, further complicate the calculations of flow transformation.

A simplified description of the channels geometry is used to avoid these difficulties. Our main concern is the schematization of channel shape in order to avoid traps of complicated cross-section contour and successfully apply St. Venant model. We would like to indicate the problem of "proper transformation" of hydraulic parameters such as cross - section area, hydraulic radius and conveyance. It is discussed on the basis of a simple trapezoidal channel. The key point in the whole procedure is an appropriate criterion for calibration. A flexible technique that can be used for more complicated shapes is also presented. The channel cross-section is described by specially designed set of parameters. Then a global optimization method, namely control random search,

is used to determine the values of these parameters.
The above described methodology was applied Nysa Klodzka river system. The CCHE 1D model (developed at the National Center for Computational Hydroscience and Engineering of the University of Mississippi, USA) were used to simulate the flow transformation in the channel. The applied methodology does not cause any significant loss of accuracy and guarantees the stability and sufficient rate of 1D computations.