

Floods simulation in the Crișul Alb River Basin using hydrological model CONSUL

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For the simulation of floods, in the Crișul Alb River Basin, Romanian hydrological model CONSUL with lumped parameters was used. This deterministic mathematical rainfall-runoff model compute discharge hydrographs on configured river sub-basins, their channel routing and composition on the main river and tributaries and finally their routing and mitigation through reservoirs, according to the schematic representation (topological modelling) of how water flows and integrate in a river basin. After topological modelling 42 sub-basins and 19 river reaches resulted for the Crișul Alb River Basin model configuration, established according to the position of tributaries, hydrometric stations and reservoirs that influence flow.

The CONSUL model used as input data, for each sub-basin, average values of precipitation and air temperature determined based on the measured values of weather stations in the basin. Calculation of average values was performed using a pre-processing program of meteorological data from rectangular grid nodes corresponding to Crișul Alb River Basin, averaging being achieved as weighted values based on the representativeness of these nodes for each analyzed sub-basin.

Calibration of model parameters was performed by the simulation of 25 rainfall-runoff events from the period 1975 – 2010, chosen to cover a wide range of possible situations in the case of floods formation. By simulating floods from the hydrometric stations located in the closing sections of river sub-basins were determined the infiltration and unit hydrograph parameters and by simulating floods from the hydrometric stations located in the downstream sections of the river reaches hydrometrically controlled were determined the routing equation parameters. The parameters thus determined allow building some generalization relationships of these parameters according to the morphometric characteristics of the river sub-basins (surface, slope) or river reaches (length, slope). Based on these relationships were then determined parameters for river sub-basins and river reaches hydrometrically uncontrolled. Finally, floods from the closing station of Crișul Alb River Basin were simulated. This operation allowed the recalibration of the CONSUL Model parameters for the analyzed river basin.

The results of the simulation with the CONSUL Model in the Crișul Alb River Basin showed that the model gives the best results, in particular in the case of floods generated by precipitation evenly distributed in space. Deviations of flow hydrographs simulated by CONSUL Model and observed are due to both model errors and insufficient meteorological and hydrological data. The main error is caused by the uncertainty related to the average precipitation computed values on each basin and its variable spatial and temporal distribution.

The paper presents the results obtained within the CLIMHYDEX project (“Changes in climate extremes and associated impact in hydrological events in Romania”, cod PNII-ID-2011-2-0073, <http://climhydex.meteoromania.ro>), project in which to estimate the impact of climate change and variability upon the maximum discharges from Crișul Alb River Basin will be achieved long-term simulations using hydrological model CONSUL.