



Continuous flow simulation in the Bârlad river basin, Romania

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This paper presents the partial results obtained into the project CLIMHYDEX ("Changes in Climate Extremes and associated impact on hydrological events in Romania") project that, among others, have as objectives the development of hydrological models at different spatial and temporal scales and the impact of climate change on extreme runoff in Bârlad catchment.

To estimate the impact of climate change and variability on the flow regime in Bârlad catchment CONSUL hydrological model, with lumped parameters, was used. This rainfall-runoff deterministic model simulates the most significant hydrological processes within a hydrographic basin: snow-melting, interception, retention in the depressions, evapotranspiration, infiltration, surface runoff, hypodermic runoff, percolation, base runoff. According to the schematic representation (physiographic modelling) of how water flows and collects in a river basin the model computes the discharge hydrographs on selected simulation points on the river network and then performs their routing and composition on the main river and tributaries.

After physiographic modelling resulted for Bârlad river basin: 56 sub-basins and 30 river reaches. CONSUL model was calibrated using historical data in Bârlad river basin by simulating the flow during 1975-2010.

Calculation of average precipitation and air temperature (hydrological model input data) for each sub-basin was performed using a pre-processing program of meteorological data from original rectangular grid nodes corresponding to Bârlad river basin, averaging being achieved as weighted values based on the representativeness of these nodes for each analyzed sub-basin.

In order to estimate the initial values of CONSUL model parameters the generalization relationships of these parameters based on morphometric characteristics of the river basin or river reach were used.

Calibration of model parameters was performed in two stages: (i) individual and (ii) globally. (i) Individual calibration on model structures was made based on the 25 rainfall-runoff events, chosen to cover a wide range of possible situations in the case of floods formation. First step was to determine, by individual basin calibration, the infiltration and unit hydrograph parameters, for the sub-basins controlled by gauging stations in the Bârlad river basin. These parameters allowed then the parameters estimation for the ungauged sub-basins. (ii) Global calibration of rainfall-runoff model parameters was done by simulating the flow on considered calibration period. This second stage allowed the recalibration of infiltration and unit hydrograph parameters at the sub-basins uncontrolled hydrometric as well the calibration of routing equation parameters.

CONSUL model simulation results 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 and observed are due to both model errors and insufficient meteorological and hydrological data. The main errors are caused by the uncertainty related to the average precipitation computed values on each basin and its variable spatial and temporal distribution.