



Simulation of Seasonal Extreme River Flows for Selected Climates Change Scenarios and Odra River Basin

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In this paper a simulation of seasonal extreme flow for Odra river basin and Kaczawa river catchment (Southwest region of Poland) for selected climate change scenarios are presented. The spatial weather generator (SWGGEN) for estimation of probability distributions changes of river flows for selected GCM models and different time horizons is applied. For the estimation of probability distribution river flow, daily data of SR solar radiation, maximum and minimum air temperature, and total precipitation were obtained for sixteen stations of hydrological network from Institute of Meteorology and Water Management. In addition, daily data of flows from 6 closing water-gauges (partial catchments) were collected. The idea of flow simulation in river catchment for future climate conditions given by different scenario are presented in the following sequence:

- Determination of climatologic characteristics of river basin stations
- Modification of climatologic characteristics according to the future climate scenario
- Data simulation with spatial weather generator
- Simulation of river runoff with hydrological model
- Construction of runoff probability distribution
- Estimation of runoff risk

On the basis of a 25-year data series (1981-2005) for 16 stations of meteorological network within the river catchment, basic climatologic characteristics required by weather generator are computed. A spatial correlations between variables and stations are added to the characteristics. Next, on the basis of information coming from three climate change scenarios (GISS, GFDL and CCCM) for years 2040, 2060 and 2080 basic climatologic characteristics are modified. Then, spatial weather generator SWGGEN is used to produce 500 years of synthetic data for 16 stations, given time horizon and scenario. The year 2000 as the background of potential changes in river flow is used together with 500 years of synthetic data. Next, generated data is applied to hydrological model Mike SHE to simulate daily flows for closing water-gauges. The flow is evaluated with different temporal step and characterized by Pdf functions.

The application of spatial weather generator SWGGEN combined with hydrological rainfall-runoff model (Mike SHE Ed. 2008) and climate change scenario, gives various possibilities to study changes in the river catchment coming up to 60–80 years. The probability distribution of the extreme river flow gives detailed information on the moment characteristics, confidence intervals and critical values. It is an important tool for a decision support system. In case of extreme daily flow in the Kaczawa River for considered periods, the catchment shows significant changes depending on the climate change scenario and time to lead.

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