



Extreme Rivers for Future Climates - Simulation Using Spatial Weather Generator

Leszek Kuchar (1), Ryszard Kosierb (2), Sławomir Iwański (3), and Leszek Jelonek (4)

(1) Wrocław University of Environmental and Life Science, Wrocław, Poland, Institute of Meteorology and Water Management National Research Institute Wrocław, Poland (leszek.kuchar@imgw.pl), (2.) Institute of Meteorology and Water Management National Research Institute, Wrocław, Poland, ryszard.kosierb@imgw.pl, (3.) Wrocław University of Environmental and Life Science, Wrocław, Poland, slawomir.iwanski@up.wroc.pl, (4.) Institute of Meteorology and Water Management National Research Institute, Wrocław, Poland, leszek.jelonek@imgw.pl

In this paper an application of spatial weather generator for estimation of probability distributions changes of river flows for selected climate change scenarios and different time horizons are presented.

The main studies for the Kaczawa river basin located in Southwest region of Poland are carried out. 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. Idea of flow simulation in the Kaczawa river catchment for future climate conditions given by different scenario shall be presented in the paper.

First, on the basis of 25-years data series (1981-2005) for 16 stations of meteorological network within or around the Kaczawa river catchment basic climatology characteristics required by weather generator are computed. Then, 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 climatology characteristics are modified.

Then, spatial weather generator SWGEN 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 are applied to hydrological model Mike SHE to simulate daily flows for closing water-gauges. The flow are evaluated with different temporal step and characterized by pdf functions.

The application of spatial weather generator SWGEN 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, the catchment shows significant changes depending on the climate change scenario and time to lead.

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