Geophysical Research Abstracts
Vol. 18, EGU2016-6330-3, 2016
EGU General Assembly 2016

Analysis of an influence of the bias correction method on the projected changes of flood indices in the selected catchments in Poland

Marzena Osuch (1), Deborah Lawrence (2), Hadush K. Meresa (1), Jaroslaw J. Napiórkowski (1), and Renata J. Romanowicz (1)

(1) Institute of Geophysics Polish Academy of Sciences, Warsaw, Poland, (2) Norwegian Water Resources and Energy Directorate, Oslo, Norway

The aim of the study is an estimation of the uncertainty in flood indices introduced by bias correction of climate model variables in ten catchments in Poland. A simulation approach is used to obtain daily flows in catchments under changing climatic conditions, following the RCP4.5 and RCP8.5 emission scenarios. Climate projections were obtained from the EURO-CORDEX initiative, and time series of precipitation and air temperature from different RCM/GCMs for the periods: 1971-2000, 2021-2050 and 2071-2100 were used. The climate model outputs in the Poland area are highly biased; therefore, additional post processing in the form of bias correction of precipitation and temperature is needed. In this work we used four versions of the quantile mapping method (empirical quantile mapping, and three distribution based mappings: double gamma, single gamma and Birnbaum-Sanders) for correction of the precipitation time series and one method for air temperature correction (empirical quantile method).
The HBV rainfall-runoff catchment-based model is used to estimate future flow time series. The models are calibrated using the available precipitation, air temperature, and flow observations for the period 1971-2000. Model performance is evaluated using observed data for the period 2001-2010. We also verify performance using the EURO-CORDEX simulations for the reference period (1971-2000), both with and without bias correction of the RCM/GCM outputs. Finally, the models are run for the future climate simulated by the RCM/GCM models for the years: 2021-2050 and 2071-2100. Changes in the mean annual flood and in flood quantiles are analysed and the effect of bias correction on the estimated changes is also considered.
The results indicate substantial differences between climate models and catchments. The regional variability has a close relationship with the flood regime type. Catchments where high flows are expected to increase have a rainfall-dominated flood regime in the current climate, whereas in catchments dominated by snowmelt-induced flooding, only a small increase in extreme flows is projected.
The influence of bias correction method on the simulated flows was tested using the reference period. The results show that bias correction significantly improves flow simulations and flood indices. Differences in the performance of tested bias-correction methods were found, but these depend on the individual catchment. Bias correction can also influence estimated changes in flood indices, but this effect was small relative to the variability associated with different climate models.

The work was undertaken within the project “Climate Change Impacts on Hydrological Extremes (CHIHE)” Pol-Nor/196243/80/2013, which is supported by the Norway-Poland Grants Program administered by the Norwegian Research Council.