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Assessment of uncertainty in flood flows under climate change impacts

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The assessment of climate change impacts on frequency of floods is important for management of flood disasters. It is recognized that methods for the assessment are subject to various sources of uncertainty (choice of climate model and emission scenario, course spatial and temporal scales, etc.). This study investigates the climate change related uncertainty in the frequency of flood flows for the Upper Thames River basin (Ontario, Canada) using a wide range of climate models. Climate model outputs are downscaled using the change factor approach for 30-year time slices centered on years 2020, 2050 and 2080. To estimate natural variability, a stochastic weather generator is used to produce synthetic time series for each horizon and for each climate scenario. A number of realizations out of historical range are also produced for the 1979-2005 baselines using the weather generator. A continuous daily hydrologic model was then used to generate daily flow series for the baseline and for the future time horizons. A peak-over-threshold (POT) with Generalized Pareto Distribution is used to produce flood frequency curves for the four time horizons. The uncertainty involved with the POT modelling is also considered. The results indicate that use of unbounded GPD model should be employed for flood frequency analysis. A large uncertainty exists in all the projected future design floods. Probabilistic assessment of the uncertainty is carried out and it provides the estimation of flood magnitude-return period relationship with high level of confidence.

Biography

Slobodan P. Simonovic has over thirty years of research, teaching and consulting experience in water resources engineering. He actively works for national and international professional organizations. His primary research interest focuses on the application of systems approach to, and development of the decision support tools for, management of complex water and environmental systems. Most of his work is related to the integration of risk, reliability, uncertainty, simulation and optimization in hydrology and water resources management. He has received a number of awards for excellence in teaching, research and outreach. He has published over 350 professional publications and three major textbooks.

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