Application of linear moments and uncertainty analysis to extreme rainfall events in Sabah

Abstract

Linear moments (LM) has been applied in extreme rainfall study for several countries, including China, United States of America, and Peninsular Malaysia. In this study, the LM procedures were applied to extreme rainfall data corresponding to locations provided in Malaysia Urban Stromwater Manual (MSMA) to derive new design rainfalls. Different record lengths were considered to assess the changes in design rainfall, and Monte Carlo simulations were carried out to compute confidence interval of the derived design rainfalls. Based on the Goodness-of-Fit (GoF) test results, the Generalized Extreme Value (GEV) probability distribution was chosen to derive the design rainfalls. The updated design rainfalls at all four locations showed significant reduction at design rainfalls of 50-year ARI and above. The difference of the design rainfalls from shorter record lengths with respect to the full record length and the confidence intervals do not necessarily reduce with a longer record. In hypothetical cases where 100-yr ARI rainfall was added, the increase in design rainfalls did not exceed the upper bound of the confidence intervals. The derived confidence intervals hence allow for better risk assessment, and should be considered in the design of critical structures, i.e. dams.