At site flood frequency analysis for the Nile Equatorial basins

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Abstract
The specific objective of this study was to select the best flood frequency models for fitting flood flows using tests of descriptive ability: Chi-Square test, Kolmogorov–Smirnov test and analysis of tail behaviour of a range of extreme value distributions. The selected distributions were then applied in fitting flow peaks from the Nile Equatorial basins.

The focus of this paper is limited to the at-site analysis in the specific (semi-) humid climate region of the Equatorial Nile basins. The flow series were selected from the Equatorial Nile basin countries taking part in the FRIEND/Nile project, i.e. Kenya and Tanzania. The data used were annual maximum series with 12 stations in Tanzania and 17 stations in Kenya with periods ranging between 7–10 years and 27–45 years for Tanzania and Kenya respectively.

The AM series from the selected sites were analyzed using the exponential and Pareto quantile–quantile (Q–Q) plots. The analysis involved preparation of the Q–Q plots and analysis of the behaviour of the distribution in the upper tail. On the basis of the results of this analysis, the appropriate distribution was identified.

The selection between normal and heavy tail behaviour was also evaluated or cross-checked by the Kolmogorov–Smirnov test. The Chi-Square test was also used to evaluate the goodness of fit of the selected distributions. The number of sites where the Chi-Square test was rejected at the 10% significance level was determined.

The results revealed a normal tail distribution for most of the stations using AM series. However, for a few other stations heavy tail distributions were identified.

Based on the Q–Q plots, EV1/Gumbel distribution was selected for stations, which showed normal tail behaviour while GEV distribution was selected for locations showing heavy tail behaviour.

Keywords: Goodness of fit; Tail behaviour; Quantile–quantile plots