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Improved Relationships for Peak Discharge Estimation at High Return Periods Using Geomorphological Characteristics: Case Study at Sultanate of Oman.

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Abstract

Flash flooding can occur, even in hyper-arid regions, due to relatively short, intense burst of rainfall such as during a thunderstorm. Even though flash floods are localized, they present a significant hazard because of their unpredictability and commonly very short duration. To estimate peak discharges of flash floods, morphometric analysis is used to understand the nature of the hydrological processes in a basin, in order to develop a relationship that enables estimation of peak discharge values, in terms of morphometric parameters. The study is conducted using 28 flow gauging stations, in the northern region of Sultanate of Oman, in two steps. The first step is the extraction of morphometric parameters from available Digital Elevation Models. The second step is to develop relationships to estimate peak discharges, at different return periods, using linear and nonlinear regression methods. The best obtained relationship is a nonlinear one in terms of the total number of streams across all orders, the relative relief ratio, and the effective rainfall, with a coefficient of determination ranging from 0.979 to 0.997 and mean percentage absolute errors from 26% to 45%, for examined return periods.