

## PAPER (6)

### Estimation of Regional Sub-Daily Rainfall Ratios Using SKATER Algorithm and Logistic Regression.

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#### Abstract

Developing Intensity-Duration-Frequency (IDF) curves is a paramount input in stormwater systems design. To construct these IDF curves, rainfall records at subdaily durations, provided by continuous rainfall recorders, are required; however, these recorders are seldom available in many locations of interest. To fill this gap, available meteorological and topographical information for a study area in Saudi Arabia are investigated to get an estimate of the ratios of sub-daily rainfall depths to the 24-h depths (sub-daily ratios or SDRs), via applying the following methodology. A spatially constrained regionalization approach is implemented, using the SKATER algorithm, based on 60 gauging stations, to form regions of contiguous stations, based on the similarities of their SDRs. Four different regions are formed, where each region shows consistent SDRs; yet distinctly different from other regions. Subsequently, a multinomial logistic regression model is built and trained, with commonly available meteorological and topographical information as explanatory variables, to determine to which region a specific location belongs. The model is validated based on a hold-out validation method and assessed through confusion matrix statistics to evaluate the model performance. The model shows high performance in predicting the correct regional SDR and it is extended to produce a gridded map covering ungauged areas. Based on this procedure, one can develop the IDF curve for any location within the study area, even if there is no rainfall recorder in that location.