

Rainfall variability and uncertainty in water resource assessments in South Africa

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Abstract Rainfall variability includes both spatial and temporal variability and is a potential source of uncertainty in rainfall–runoff modelling. The reliability of rainfall estimates depends on the accuracy of measurements, the number of raingauges and the spatial interpolation approach used to integrate point observations. However, degrading raingauge networks in South Africa represent a challenge to adequately account for this variability and extend rainfall records in practice. Therefore, there is need for correction procedures that address the uncertainty that exists in using such sparse data. The objective of this study is to demonstrate the importance of correcting original interpolated data sets to improve long-term estimates of spatial and temporal rainfall characteristics within South African catchments. The focus is on the generation of long time series of spatial rainfall over periods that span very different raingauge network densities. The study, through specific example sub-basins (e.g. improvements in simulation statistics such as coefficient of efficiency (CE) values of untransformed flows from 0.59 to 0.82 and 0.52 to 0.74 for 1959–1990 and 1991–2000 periods, respectively, for X31A sub-basin) demonstrated that a simple correction procedure based on rainfall frequency characteristics can be used to remove some uncertainties in spatial rainfall estimations and consequently model simulations.

Key words rainfall variability; uncertainty; rainfall–runoff model; South Africa