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Quantifying monthly areal rainfall uncertainty using a data-based stochastic rainfall generator

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ABSTRACT

This study aims to establish whether a data-based model of incorporating uncertainty in daily areal rainfall estimates can be adapted to a coarser monthly time scale and still provide reasonable uncertainty estimates for water resource modelling applications. The daily generator was formulated as a simple, efficient and robust model of stochastically generating sequences of uncertainty-impacted areal rainfall estimates from point rainfall measurements.

The data - based model is tested on 8 catchments spread across South Africa. It is found that the selected rain gauge combinations have an impact on one of the parameters of the model (the scaling factor) and the degree of bias on the standard deviation and skewness values of the generated stochastic sequences. A correlation-based rain gauge selection approach is proposed to minimise this bias.

Statistical analysis of the generated stochastic areal rainfalls shows that the data-based model provides realistic uncertainty estimates. However the actual bias on the low rainfalls (< 20th percentile) is between 0.9 – 46.8%. The importance of these rainfalls in water resource modelling applications though is low.