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Evaluation of combined contribution of uncertainty sources to total output uncertainty in water resource estimation in South Africa

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Abstract While the importance of quantifying different sources of uncertainty is well recognized, there have only been a few attempts within southern Africa to incorporate uncertainty estimates in water resources assessments, and their overall impacts are not well understood. Uncertainties are model, basin, region and climate zone specific, and while the basic principles referred to in the hydrological literature are relevant, they do not provide the specific answers for the region. The focus of this study was on the use of datasets and modelling tools that are frequently used for practical water resources estimation in South Africa. The analyses are based on scenarios of different sources of uncertainty which are then combined and propagated through the model to generate simulation ensembles that include the expected ranges of model output uncertainty. The results indicate that the major source of uncertainty is either rainfall or parameter value estimation depending on the sub-basin. The study suggests that, while input climate data always contributes substantially to total output uncertainty, there may be many situations where parameter uncertainty dominates and there is very little impact from evaporation and water-use uncertainties.

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