

Towards the development of a consistent uncertainty framework for hydrological predictions in South Africa

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Abstract South Africa has a long history of using hydrological models to solve practical water resources management problems. Despite recent international advances in uncertainty analysis, uncertainty has yet to be explicitly included as part of standard modelling practice in the country. This paper reports on the initial development of a model independent framework for ensemble streamflow predictions in gauged and ungauged basins in data-poor regions. The proposed framework is largely based on existing methods and data and includes *a priori* parameter estimation, a Monte Carlo framework and constraining model ensembles in ungauged basins through regional signatures of the catchment runoff response. Progress to date includes the modification of an existing *a priori* parameter estimation procedure that includes Monte Carlo sampling from probability distribution functions and the generation of model output ensembles. Two regional signatures have been developed, one based on the Budyko relationship and the other on the slope of the flow duration curve. A test application demonstrated that all the *a priori* ensembles produced behavioural flow duration curves, while only approximately 50% fell within the flow volume constraint. While the overall conclusion is that the framework is both theoretically sound as well as practical to implement, future work will focus on the development of additional regional catchment signatures and the use of the constrained ensembles in other water resources management tools, such as system yield models.

Key words modelling; South Africa; uncertainty; regionalization; regional signatures; model evaluation; Budyko; parameter estimation