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Hydrological and stochastic uncertainty: linking hydrological and water resources yield models in an uncertainty framework

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Abstract Standard approaches to water resources assessments in South Africa involve generating time series of natural hydrology using a hydrological model coupled with simulating reservoir storage, abstractions, return flows, etc. using a system yield model. To account for some of the uncertainties in the representivity of the natural flow simulations, the yield models currently include a stochastic streamflow generator and output a curve quantifying likely yields with different probabilities of exceedence. Recent hydrology model developments emphasise the importance of including parameter uncertainty, especially in ungauged basins. However, this has been considered difficult to achieve with existing yield models without major structural changes or large increases in computer run time. The alternative is to add a stochastic rainfall generator within a hydrological model that also includes parameter uncertainty, and to use the output ensembles with a yield assessment model without using the stochastic streamflow generation component. This paper reports on a comparison of the two approaches in terms of modelling efficiency, similarity of yield probability assessments, and the relative contributions of parameter and stochastic uncertainty. This initial study is limited to a single basin in KwaZulu-Natal Province, South Africa.

Key words uncertainty; hydrology models; stochastic modelling; yield estimation