Implementation of the TOPKAPI model in South Africa: Initial results from the Liebenbergsvlei catchment

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Abstract

Flash floods and droughts are of major concern in Southern Africa. Hydrologists and engineers have to assist decision makers to address the issue of forecasting and monitoring extreme events. For these purposes, hydrological models are useful tools to:

- Identify the dominant hydrological processes which influence the water balance and result in conditions of extreme water excess and/or deficit
- Assist in generating both short- and long-term hydrological forecasts for use by water resource managers.

In this study the physically-based and fully distributed hydrological TOPKAPI model (Liu and Todini, 2002),which has already been successfully applied in several countries in the world (Liu and Todini, 2002; Bartholomes and Todini, 2005; Liu et al., 2005; Martina et al., 2006), is applied in Africa for the first time. This paper contains the main theoretical and numerical components that have been integrated by the authors to model code and presents details of the application of the model in the Liebenbergsvlei catchment (4 625 km^2) in South Africa.

The physical basis of the equations, the fine-scale representation of the spatial catchment features, the parsimonious parameterisation linked to field/catchment information, the good computation time performance, the modularity of the processes, the ease of use and finally the good results obtained in modelling the river discharges of Liebenbergsvlei catchment, make the TOPKAPI model a promising tool for hydrological modelling of catchments in South Africa.

Keywords: hydrology, physically distributed hydrological model, TOPKAPI, South Africa