

Understanding hydrological processes and estimating model parameter values in large basins: the case of the Congo River basin

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Abstract Many large basins of the world are located in developing countries where the hydrometric networks are limited and where hydrological models have the potential to contribute to water resources management. However, it is difficult to ensure that models adequately represent the dominant hydrological processes, a problem further exacerbated by spatial scale issues and the typically large size of the modelling units. If models do not satisfactorily represent the hydrological processes, they may not be representing the runoff responses from ungauged areas and may not be useful for investigating the impacts of future water or land use developments. This paper reports on a study of the Congo River basin where the available stream flow data have been identified for 16 gauging stations within the total basin area of 3 680 000 km². The initial application of the model (Pitman monthly time-step model) involved manual calibration, which was followed by an exploration of the behavioural parameter sets in the context of the available basin physical property data (topography, drainage patterns, geology, soils, vegetation, etc.) in an attempt to constrain the plausible parameter sets to those that are conceptually realistic and consistent with real hydrological processes.

Key words hydrological modelling; large basins; parameter estimation